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preface

The Federal program in solid waste management has maintained a strong interest in bibliography throughout its history, which dates back to the beginnings of Public Health Service activity in this field in 1941. At present the program's bibliographic work is based on the Solid Waste Information Retrieval System (SWIRS), a data bank storing abstracts, now totaling 36,000, of the worldwide literature on solid wastes and their management. The scanning of the literature, the abstracting and indexing, and the resultant data bank are kept current on a daily basis, and hundreds of requests from the public for information retrieval service are filled each year.

The January 1973 issue of the *Monthly Abstracts Bulletin* marked the beginning of a new effort to make the information acquired by SWIRS available to the public on a regular basis. The *Bulletin* replaces several documents--a publication on patents, the annual abstracts, which were published from 1964 through 1968 but not since then because of lack of resources, and the *Accession Bulletin*, a monthly annotated listing published from January 1970 through December 1971.

Although the *Monthly Abstracts Bulletin* does not cover all the literature being published on solid waste, numerous periodical and nonperiodical titles in both the foreign and domestic literature are screened for inclusion. No effort was made to separate strictly technical material from that which is more general. The bibliography is arranged in categories corresponding to the various administrative, engineering, and operational phases of solid waste management. Subject and author indexes are included in each issue, and a cumulative author and subject index will be issued as the 13th volume for each year.

The pages of the *Bulletin* were typeset from computer tapes. As will occasionally be noted, the system is not yet foolproof, but rather than go to the relatively high expense of bringing down the error rate further, it was decided to use the present copy, with apologies to the reader, since it serves the intended purpose adequately.

The project was the result of the combined efforts of the Solid Waste Information Retrieval System (SWIRS) and the Franklin Institute Research Laboratories, under contract 68-01-0447.

—JOHN A. CONNOLLY
Compiler

solid waste management
monthly abstracts bulletin

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AGRICULTURAL WASTE

73-4452

Behandlung von Fluessigmist. [Treatment of liquid dung.] *Wasserwirtschaft*, 62(11):356, Nov. 1972.

The Max Planck Institute has been charged by the Hessian Ministry for Landscape and Environment with research work concerning the development of systems for the aerobic treatment of liquid dung in stables. It is intended to use oxidation trenches in the stables so that the animal excrement falls directly into these trenches where they are treated with oxygen. Owing to the integration of the trenches in the interior of the stables, freezing of the excrement and bad biological equilibrium is avoided. Due to the oxygen treatment the development of bad odors can be kept to a minimum. (Text in German)

[23703]

73-4453

OGATA, T. Chikusan-kei haikibutsu no resaikuringu sisutemu ni tsuite. [On the abatement of animal waste by way of land disposal.] *Kogai to Taisaku*, 9(2):123-130, Feb. 1973.

Although land disposal seems to be best in dealing with animal waste, care must be taken not to cause soil pollution, since wastes do not move around very much in the soil, compared to their movement in atmosphere or in water, and they do not change their characteristics too rapidly. Such pretreatment as dewatering and drying is necessary. It would be ideal if livestock raising would be carried out side by side with horticulture, as used to be done. However, if there is too much organic acid and excess nitrogen and potassium in the soil, plant and vegetable growth would be hampered. It is necessary to apply animal wastes to paddy fields in the autumn of the year before. Care must be taken about the feed grown when animal wastes are used as fertilizer, as it may have a detrimental effect on cattle. If cattle excrement is applied raw to the field, at more than 20 tons per acre, farm labor becomes difficult. Low polymer compounds among organics in animal wastes would be easily decomposed in the soil by microbes, but nitrogen trioxide, sodium salt, etc., would easily get mingled with underground water. Phosphoric acid pollution must be avoided. Care must be taken not to wash animal wastes down into rivers, lakes, etc., on sloping ground. By aerobic treatment, nitrogen can be considerably eliminated. With application of calcium and magnesium, imbalance with potassium in soil can be rectified. In order to avoid excess nitrogen and organic acids, some sturdy plant variety can be selected, or timing of application of animal waste can be adjusted. Feeding methods for cattle can be improved, and kinds of feed can be controlled, in order to prevent the deterioration of nutrients composition of crops used as feed, due to excess animal wastes application. Although the number of cattle would increase, the land to be used for land disposal of animal wastes is limited, so that various measures must be taken. (Text in Japanese)

[23704]

73-4454

OTA, S. Nogyoyo hai-purasuchikku shori. [The disposal of waste plastics from agricultural activities.] *Nogy oyobi Engei*, 48(1):201-204, Jan. 1973.

The actual conditions of the disposal of vinyl chloride film and polyethylene film from gardening and agricultural activities are reported. According to a questionnaire in 1971, 70 percent of those are burned onsite, 11 percent are buried, 5 percent are sent to the disposal places in the city, 4 percent thrown into a river and sea, 3 percent burned jointly by the community, and 2 percent sent to reprocessors. Many of the disposal methods for waste plastics are still in the development stage but may be, in general, classified into the four methods, melting and reprocessing, crushing and reclamation, destruction by fire, and pyrolysis and returning to raw materials. In crushing wastes, the use of destruction-promoting agents such as polyhalogenized carbonyl compounds is being studied, in which particularly polyvinyl chloride film can be naturally decomposed by sunshine. In burning wastes, facilities for treating the poisonous gases and heavy metals from vinylchloride plastic are required to prevent secondary pollution. The burning method has an advantage that waste plastic can be disposed of in large quantities, but whether large scale centralized system is better or not, should be carefully examined according to the actual conditions. (Text in Japanese)
[23705]

73-4455

SCHILLING, E. E. Zur technik der konventionallen stalldungausbringung. [Technique of conventional dung disposal.] *Landtechnik*, 28(4):103-106, 1973.

Dung from conventional farms usually consists for the greatest part of solid substances while dung from mass stock keeping contains mainly liquid matter. The technique of dung disposal is characterized by transportation, dosing and distribution of the dung. Vehicles for the transportation of the dung must be adapted for unpaved roads and usually have one or two axles. Dosing of the dung is effected through a spreading device. According to the velocity with which the dung is led into the spreading device the quantities to be spread amount from 50 to 400 double quintals per hectare. The situation of the spreading device on the side or back walls of the vehicle determines the distribution of the dung in a small or large range. (Text in German)
[23706]

ANALYSIS OF SOLID WASTE

73-4456

IKENO, T. Nihon no kagaku to gijutsu. [Pollution in the Tokyo metropolitan area.] *Tokyoto no Kogai*, (146):20-34, July 1972.

Total wastes in Tokyo, Japan, amount to 155,000 tons daily, a total of 49,000,000 tons annually. Daily industrial waste is 114,000 tons. Sewerage treatment plants yield 26,500 tons. Households create 15,500 tons, which are disposed of by each municipality, in the suburban areas, but in the central area by the Tokyo Metropolitan Government. Despite the fact that there was no appreciable increase in population in the central part of Tokyo, the volume of wastes increased 2.3 times in the 10 years from 1961 to 1970, reaching 13,000 tons a day. These wastes are disposed of by metropolitan disposal facilities. Construction of new disposal facilities. Sanitary landfills, as well as transportation to sanitary landfills, are met by citizen protest and opposition campaigns, even though the government acts on the principle that the sacrifice necessitated by wastes disposal is to be borne equally by all, and wastes created in one locality are to be disposed of within that locality. Until there are facilities fully equipped to incinerate all wastes, sanitary landfill is a necessary evil. (Text in Japanese)
[23707]

73-4457

KURIHARA, S. Seikatsukei haikibutsu no seijo to sono shori no kosatsu. [Character of domestic refuse and thinking of treatment.] *Yosui to Haisui*, 15(3):296-298, Mar. 1973.

Characteristics of gas generated from a reclaimed area of Tokyo, 'Yumenoshima' (Dream Island), as of 1965 and another in Fukuoka City, as of 1970, was studied. At Yumenoshima, car-

bonic acid gas reached 12,000 to 45,000 ppm, 12 to 45 times its allowable limit of 1,000 ppm; carbon dioxide was 200 to 600 ppm, 2 to 6 times its allowable limit of 100 ppm; it was most intense right after landfilling. While reclamation was going on, sulfuric acid gas concentration was 4o to 60 ppm, 5 to 10 times its allowable limit of 5 to 10 ppm. However, 1 m above ground, these gases were pretty well diluted, so that only carbonic acid gas could be measured. At a spot where the refuse was burning by itself, gas concentration was higher the closer the spot was to the fire. At 0.5 m away from the fire, carbon monoxide was 3,000 ppm, carbonic acid gas was 20,000 to 30,000 ppm. When there is fire inside the refuse accumulation, the gas generated contained 10,000 ppm carbon monoxide (100 times of 100 ppm), and 15,000 ppm carbonic acid gas (15 times of 1,000 ppm), so that care must be taken in extinguishing the fire. Although no chlorine compounds could be detected at the time, it was only due to the fact that the ratio of plastic wastes was only 2 to 3 percent in 1965. By covering the ground with earth, the figures indicated that there was hardly any danger to human health. During reclamation, or a few days afterwards, temperature 50 to 70 cm underground was 79 C. At Fukuoka, boring was carried out on the reclaimed area, and examination was made of carbon monoxide, hydrogen sulfide, sulfur dioxide, nitrogen dioxide, methylcaptan, ethylmercaptan, ethylene oxide, phosgene, carbon tetrachloride, (by detecting tubes), and oxygen, nitrogen, methane, and carbon dioxide (by gas chromatograph). About 1.5 or 2 years after reclamation, methane was 40 to 60 percent of total gas, carbon dioxide was 30 to 40 percent and practically no oxygen was present, but oxygen gradually increased afterwards, reaching 15 percent 2.5 years later and methane and carbon dioxide decreased. (Text in Japanese)
[23708]

73-4458

KURIHARA, S. Seikatsukei kotai haikibutsu no seijo to sono shori no kosatsu. (II). [Character of domestic refuse and treatment.] *Yosui to Haisui*, 15(4):437-441, Apr. 1973.

The composition of refuse in Tokyo (1971), Madison City (1971), Britain (1965), and W. Germany (1970) is shown. The analysis shows; proportion of flammables and non-flammables in refuse; physical composition of domestic refuse, 1963 to 1971; change in total refuse; change in paper refuse; and plastics, garbage, and metal refuse, 1963 to 1971. With the drastic change in our mode of life, characteristics of domestic refuse have shown great change. In Tokyo and Kyoto, inflammables are around 80 percent and non-flammables 20 percent. With 1963 as 100, paper refuse rose as follows: 19670 128; 19680 162; 19690 183, 19700 191; and 1971--242. Also with 1963 as 100, plastics in 1967 was 250, in 1968--417, in 19690 600; in 19700 709, but decreased slightly in 1971 to 645. With 1963 as 100, garbage increased to 113 in 1964, 119 in 1965, and 126 in 1971. With 1963 as 100, metal refuse rose to 118 in 1964, 151 in 1965, 112 in 1966, 116 in 1967, 138 in 1968, 188 in 1969, 195 in 1970, and 295 in 1971. Meteorological effects on refuse and seasonal consumption-patterns are more pronounced in small cities than in big cities. (Text in Japanese)
[23709]

73-4459

MAHLOCH, J. L. Experimental error and data processing. *In* An investigation of the microbiology of aerobic decomposition of refuse. Ph.D. Thesis. [Lawrence], University of Kansas, Dec. 1970. p. 55-63.

A statistical analysis was made of moisture, volatile solids, pH, and COD tests. Evidence of sampling error was found primarily in temperature data and in the relationship between COD and volatile solids data. If a sample is representative, the correlation between COD and volatile solids should be good. Two samples used in performing replicate volatile solids determinations were sub-samples of one sample extracted from the system. This led to the hypothesis that comparable results from the volatile solids tests should be obtained if the initial sample was homogeneous. Results of parametric tests demonstrated that data values for each sub-sample are not significantly different. There seems to be no statistical basis for doubting the validity of the sampling technique. Because some experimental results were variable in nature, especially those of COD and volatile solids, it was de-

cided to smooth these data values and replot them. Satisfactory results were obtained from this procedure. The computer programs used during this study are described and listed. (This document is retained in the SWIRS library.)
[23710]

73-4460

MAHLOCH, J. L. Literature review. Environmental considerations. *In* An investigation of the microbiology of aerobic decomposition of refuse. Ph.D. Thesis. [Lawrence], University of Kansas, Dec. 1970. p. 14-19.
The rate of biological transformation of refuse is dependent on the composition of the refuse; if the organic matter is relatively amenable to decomposition, the rate of reaction will be fast. Supply of other nutrients such as nitrogen and inorganic ions is another factor in decomposition. Composition is dependent on geographic locality, economic status of an area, seasonal variations, time of collection, and type of collection employed. It is generally agreed that a large amount of cellulosic material is present in refuse. The amount of organic material present is determined by such things as volatile solids, COD, and BOD. The amount of organic matter exerts a pronounced effect on a refuse system: the numbers of microflora present. Nitrogen, phosphorus, and potassium are the most necessary additional nutrients required if biological decomposition is to be successful. Calcium added in the form of lime increased the numbers of all microflora significantly. Caution must be used in grinding refuse for composting. Fine grinding yields a large surface area to volume ratio, allowing excessive heat loss, whereas coarse grinding results in poor aeration and biological heating. Decomposition of refuse takes place faster under aerobic conditions, it is generally conceded. Another effect of aeration is generally to increase the numbers of aerobic organisms present. (This document is retained in the SWIRS library.)
[23711]

73-4461

MAHLOCH, J. L. Microbiological analysis. *In* an investigation of the microbiology of aerobic decomposition of refuse. Ph.D. Thesis. [Lawrence], University of Kansas, Dec. 1970. p. 41-53.
Microbiological analyses conducted during experimentation into the aerobic decomposition of refuse included counts of fungi and bacteria, identification of fungi, and grouping of bacterial isolates by their characteristics. A soil extract-yeast extract medium was used for enumeration of bacteria. The use of rose bengal for enumeration of fungi has been disputed, and so tests were run with and without it. The effect of rose bengal on fungal counts produced the following conclusions: there was a significant difference between counts with and without rose bengal; and there was no significant difference between counts in another medium with and without rose bengal. A description of the two media used in the experiment is provided in the text. In spite of conflicting data, there seems to be some advantage in incorporating rose bengal into a counting medium. When large numbers of fungi are present, rose bengal has the added advantage of having a bacteriostatic effect. Identification of fungi was performed by taking isolates from plates and transferring them to plates with potato dextrose agar. The process used to group bacteria is described in some detail. Because of confidence limits imposed by hypergeometric distribution, it was difficult to group one sample of isolates with any statistical validity. Thus, all isolates from one type of substrate were analyzed concurrently. (This document is retained in the SWIRS library.)
[23712]

73-4462

SCHARFENSTEIN, O. Hausmuell: flasehmuell. [Household refuse - bottles.] *Staedtehygiene*, 24(2):33-34, 1973.
From 1963 through 1970 the number of bottles produced in the Federal Republic of Germany increased by 85 percent, however, the weight of the glass used only increased by 49.4 percent. This discrepancy shows the efforts of the bottle producers to reduce the weight of individual bottles. It was found that one glass beverage bottle per inhabitant per week would have had to be removed as refuse, if all beverage bottles produced in Western Germany in the year 1970

had been thrown away in the same year. The weight of the glass per inhabitant per week would have amounted to 444 g. (Text in German) [23713]

AUTOMOBILE

73-4463

Car scrap disposal tax for Germany. *Waste Trade Journal*, 68(48):6, Nov. 30, 1972.
The German government is considering the use of a scrapping tax to be added to the cost of every new car sold. This would finance the disposal of used cars. Sweden already has a similar system. The government would use this money to finance the building of reduction and incineration plants, but it would be refunded to the last owner of the car when he turns it in. Thus the tax is more of a compulsory loan.
[23714]

73-4464

KAGIYA, J., AND S. TAKAHASHI. Haisha shori taisaku. [Discarded automobile disposal.] *Jidosha Gijutsu*, 27(1):67-73, Jan. 1973.
Although shredding of discarded vehicles is the only solution, the equipment is costly and there should be a guarantee that sufficient number of discarded cars available to make it pay. There is special loan offered by the Japan Development Bank to encourage installation of shredders. At the moment five shredder plants are in operation, invested by giant trading firms, which are closely connected with automobile manufacturers, scrap dealers, iron and steel manufacturers, etc. For one shredder, it requires 300 to 400 million yen (excluding land price), so that there must be at least 4,000 tons of scrap produced a month, which means about 8,000 smaller passenger cars to be discarded (0.5 tons scrap from one car). Price of scrap fluctuates so much, and it is difficult to predict when the steel industry would be in acute need of scrap. Another problem is how to avoid secondary pollution, since there is about 200 kg of impurities, including tire sheet, floor mat, glass, earth, waste oil, from each car to be disposed of. Scrap produced by carbecuing does not make good raw material for steel making. Prevention of secondary pollution requires cooperation of all the interested parties. (Text in Japanese)
[23715]

BULKY WASTES

73-4465

Shredded bulky rubbish used as daily cover in Tacoma demonstration project. *Solid Wastes Management/Refuse Removal Journal*, 16(3):22, 24, 26, 93, Mar. 1973.
This article describes Tacoma, Washington's, solid waste shredding system, which has one of the highest capacities in the world. The heart of the system is a 30-ton-per-hr refuse shredder. Oversize bulky wastes can, however, be processed at the rate of 40 tons an hr. The equipment and process are described and illustrated. Bulky wastes are shredded without difficulty and made into a fist-sized steel product which will landfill easily. Pulverization is also employed to convert the available bulky waste materials to a uniform, inert cover material.
[23716]

COLLECTION

73-4466

ENDO, S. Shujinsha no okeru jinkai oshikomibako no shoko sochi. [A lift for the charging box of a collection vehicle.] Japanese Patent Sho 47-28,813 owned by Tokyu Car Manufacturing Co., Ltd., Yokohama, Japan. Issued Aug. 30, 1972. 3 p.
This invention relates to a collection vehicle so designed that the charging box provided with a device to push wastes in the box can rise in connection with the movement of ram plate. Collection vehicle consists of the housing body for the compaction in box, the cylinder to move the ram and the ram axis, in which the ram pushes wastes in the housing body by an interlocking movement with the reciprocating motion of the cylinder to do both the charging and compaction. The discharging of wastes from the housing body is carried out by the inclination of the housing body, and by shortening the cylinders the body is returned to the original position. In the waste-collecting car under this invention, the

discharging of wastes can be very easily carried out. (Text in Japanese)
[23717]

73-4467

KREUZINGER, U. Umweltschutz per muellpipeline. [Environmental protection via refuse pipeline.] *Staedtehygiene*, 24(2):44-45, 1973.
The world's largest automatic refuse collecting plant has been put into operation in the Olympic village at Munich. It has a capacity of 80 cu m of refuse daily. The cost was about 6 million deutsche marks. Domestic refuse is thrown into the refuse shaft system in the houses and falls onto a cover, leading to a pipe system. This system has a range of about 76 hectares and is controlled by a central station. At determined intervals the covers are opened by means of compressed air and the refuse falls into the pipe system. By means of an air stream which has a velocity of 80 km per hr of waste and even bulky refuse is sucked to a central refuse collecting place where the refuse is compressed and fed into large containers. (Text in German)
[23718]

73-4468

Muellkanalisation: ein loesung fuer grosseidlungen. [Refuse sewer: a solution for large communities.] *U-das Technische Umweltmagazin*, (1):55, 1973.
Due to the increasing cost of refuse collection and the shortage of personnel the collection problem is becoming more and more critical. A new collection system has been developed in order to avoid such difficulties. Domestic refuse is thrown into the refuse shaft system in houses. It, then, falls onto a horizontal disc which is part of a valve leading to a pipe system which is connected to a central control station. At predetermined intervals of time a group of fans in the central station produces a vacuum and current of air, and the valves under the house shafts open automatically, the refuse is sucked to a central refuse collecting place where it is compressed and fed into large containers. The transportation air is cleaned in high capacity dust filters and then blown into the open air. (Text in German)
[23719]

73-4469

Pneumatische muellentsorgung im Olympiadorf. [Pneumatic refuse removal in the Olympic village.] *Muell und Abfall*, 5(2):56, 1973.
The approach that the pneumatic pipeline system for refuse removal in the Olympic village is installed incorrectly and does not work correctly has been rejected by the manager of the building enterprise. It was found out that one reason for the blocking of the system was that nearly all inhabitants of the Olympic village emptied the refuse between 6 and 8 p.m. into two of the seven refuse shafts. A new control program has been worked out taking into account the habits of the inhabitants. The total capacity of the system is sufficient which has been proved during the Olympic Games when besides the refuse of 15,000 inhabitants also 45,000 disposable dishes were removed every day. (Text in German)
[23720]

73-4470

Proceedings; 72nd Annual Conference of the Institute of Public Cleansing, Torbay, Scotland, June 2-5, 1970. 210 p.
The Conference proceedings consist of welcoming speeches, an agenda, and a long section devoted to many different collection and disposal vehicles. On the Conference agenda were topics such as the following: purposeful use of solid waste, disposal of packaging wastes, industrial health in the public cleansing services, pulverisation, and compaction systems. Judging by the great amount of space in the proceedings devoted to vehicle demonstrations, this aspect of the Conference appears to dominate all others. The exhibits were intended to provide Conference delegates with the opportunity to inspect and compare latest designs in vehicles, appliances, and equipment used in public cleansing. The descriptive material on equipment was based on information supplied by exhibitors. At the end of the proceedings, a complete list of delegates present at the Conference is provided. (This document is retained in the SWIRS library.)
[23721]

73-4471

SAKAMOTO, Y. Jinkaisha no jinkai katsuraku boshi sochi. [Auxiliary device for a waste collection vehicle to prevent refuse from falling out during compaction.] Japanese Patent Sho 47-24,811 owned by Tokyu Car Manufacturing Company, Ltd. Issued Aug. 4, 1972.

This invention is so designed that several fork bars which are driven by the mobile cylinder are inserted into the wastes charged in the waste box so that wastes will not fall down when the ram goes back after compacting wastes to the rear part. With this system, therefore, workers can easily do their work without coming in touch with refuse and also the falling of the piled wastes can of course be avoided, so that the loading of wastes on the collecting car can be performed more exactly and efficiently. (Text in Japanese)

[23722]

73-4472

TOGASHI, M. Jinkai shushusha e no jinkai tonyu sochi. [A device for charging refuse into a collection vehicle.] Japanese Patent Sho 47-28,814 owned by Tokyu Car Manufacturing Co., Ltd., Yokohama, Japan. Issued Aug. 30, 1972. 3 p.

This relates to a refuse collecting vehicle in which a container is mechanically lifted to the level of the waste-housing section of the collection vehicle and declined to charge wastes in the housing section, and when the waste container is not used, these devices are housed and maintained exactly and manual waste-charging work can be performed safely and exactly. The collection truck consists of a room in which a push in plate connected with a lift arm through a chain is provided movabely. In connection with the movement of the push in plate, the lift arm makes an up and down movement and at the same time the container is lifted upward and is lowered when wastes are charged into the body. And, in connection with lowering the lift arm, the container is rapidly brought down to the ground and the waste-charging work is finished. (Text in Japanese)

[23723]

73-4473

YONEDA, I. Jinkai shuyosha no okeru jinkai kak ikomi sochi. [Charging device for a refuse collection vehicle.] Japanese Patent Sho 47-24810 owned by Kyokuto Kaihatsu Kikai Kogyo Co., Ltd., Nihsinomiya, Japan. Issued Aug. 4, 1972. 3 p.

This concerns a charging in device for waste collection vehicle which has a mechanism so designed that both the charging and lifting actions of the ram can be performed continuously by a single rotary axis. In former waste collecting vehicles, since the mechanism to lift the ram when wastes are damped into the hopper and the mechanism to take in wastes charged are provided separately and these are so designed as to operate by the driving means such as respective hydraulic cylinders, the entire structure was complex and the operation control was of necessity troublesome. However, the mechanism under this invention which has a very simple link mechanism capable of working by a single rotary axis can permit both the lifting and charging actions of the ram to occur and the method also can compact wastes during the taking in operation of the ram. (Text in Japanese)

[23724]

COMPOST / COMPOSTING

73-4474

CARSTENSEN, U. Naturgemaesse bodenverbesserung durch frischkompost aus muellkompostierungsanlagen. [Natural improvement of soil conditions with fresh compost from refuse composting systems.] *Staedtehygiene*, 24(2):34-36, 1973.

Analyses of the nutritive value showed that refuse compost is 0.6 percent each nitrogen and phosphorus and 0.5 percent potash. The plant's demand for nutritive substances cannot be supplied by refuse sewage sludge composts alone, as there would be either a lack or a surplus of fertilizing substances. The successful application of fresh or rotted composts depends on the quality of the soil. It was found that soil with a porosity of 55 to 65 percent could be treated successfully even with fresh compost. For that with a porosity of 38 to 42 percent rotted composts are recom-

mendable, as fresh composts in this case would lead to a shortage of oxygen in the soil. Especially favorable is the application of fresh compost in autumn as the high content of easily decomposting organic substances lead to a post-rotting process on the fields which increases the yield. (Text in German)
[23725]

73-4475

KEHR, W. Q. Microbial degradation of urban and agricultural wastes. [Cincinnati, U.S. Environmental Protection Agency, Office of Solid Waste Management Programs, 1972. Reprint.] 8 p.
This article discusses the use of microbial decomposition of waste materials in order to make them reusable. Microbes are associated with the breakdown of complex organic substances, and while the exact processes are not known the processes can be utilized to degrade refuse. This paper contains the results of five studies funded by the Bureau of Solid Waste Management: the Johnson City Tennessee Composting Project; cellulolytic activity in municipal composting; feasibility study of the disposal of polyethylene plastic waste; conversion of organic solid wastes into yeast; and special studies of a sanitary landfill. (This document is retained in the SWIRS library.)
[23726]

73-4476

KEHR, W. Q. The Joint U.S. Public Health Service Tennessee Valley Authority Composting Project, Johnson City, Tennessee. *In* Microbial degradation of urban and agricultural wastes. [Cincinnati, U.S. Environmental Protection Agency, Office of Solid Waste Management Programs, 1972. Reprint.] p. 185-186.
This article describes the composting process as it is being carried out in this experiment. At the beginning of the process the mesophilic flora predominate. These are the organisms that are able to flourish in the temperature range of 25 to 45 C. The metabolic activity of these microorganisms raises the temperature of the compost, consequently they die off and thermophilic species take over. These are those which grow at temperatures above 45 C. This process is affected by the presence of oxygen. At Johnson City they have found that windrows that are aerobic reach temperatures as high as 75 C and have no objectionable odors. Those which are not turned and, therefore, become anaerobic reach only about 55 C and the temperatures drop dramatically after the first 2 weeks of composting. At the Johnson City plant researchers have worked at developing an inoculum of microorganisms that would speed the decomposition process, but this research has been inconclusive. Studies have shown, however, that the addition of certain chemicals to the compost may supply the flora with essential nutrients. The Johnson City plant has also conducted research on the mortality of pathogens associated with refuse and sludge. The benefits of compost to the soil are also discussed. (This document is retained in the SWIRS library.)
[23727]

73-4477

KIEFER, W. Rekultivierung mit Klaerschlamm-Muell-Kompost. 8. Informationsgespraech des ANS in Blaubeuren am 24. April 1970. [Recultivation by sewage sludge - trash compost. 8th Conference of the Working Group for the Utilization of Communal Wastes in Blaubeuren, April 20, 1970.] *Staedtehygiene*, 22(2):39-41,1971.

The Blaubeuren composting process is described. The compost is made of 25 percent sewage sludge with 75 percent domestic refuse collected from about 29,000 inhabitants. Organic industrial wastes suitable for composting are processed, too. Crushed glass splinters are eliminated by 10 mm mesh screen. Aerobic fermentation is done over 1 week in 120 cu m cells, followed by maturation in rows over another month. A new facility will make itpossible to obtain ripe compost after fermentation in cells over 4 weeks. The temperature, humidity, and oxygen conditions in the cells are controlled automatically. The necessary oxygen supply is determined from carbon dioxide measurements.I01 The humidity content is first set at 50 percent, and is gradually reduced to 35 percent to facilitate screening. The maturation process is monitored by regular ammonia and sulfide tests.
[23728]

73-4478

Planung eines Kompostwerkes. [Planning of a composting plant.] *Bundesgesundeitsblatt*, 16(5):74-77, 1973.

The article serves the purpose of giving information on how to construct a composting plant according to the stage of the art and the approved technique. A composting plant should guarantee in combination with a refuse incinerating plant or a sanitary landfill that all wastes from a determined area are removed correctly. The wastes which will be treated in the composting plant must be classified according to the expected quantity and according to their suitability for the different composting processes and the desired compost quality. The decision and the location as well as the space demand of the plant should be made with consideration of the collection area, transport distances to the sanitary landfill, and the market outlet, and possibilities of connection to the local supply systems. The composting method should be chosen with regard to the intended utilization of the compost. If the compost shall be sold as high-quality manure a more complicated composting technique will have to be applied. At the present time five different composting procedures proved to be efficient: composting in rotting piles without pre-treatment, composting in rotting piles with previous shredding, controlled pre-rotting of the refuse, and, if necessary, subsequent composting in rotting piles, and controlled pre-rotting of the refuse after shredding and subsequent composting in rotting piles. It is recommended that the domestic refuse be treated together with sewage sludge which has to be dewatered first so that the humidity in the mixture is the desired 40 to 55 percent. A joint treatment of domestic refuse and sludge has important financial advantages. (Text in German)

[23729]

73-4479

Planung eines Kompostwerkes. [Planning of a composting plant.] *Muell und Abfall*, 5(1):1-6, 1973.

The present sheet serves the purpose of giving information on how to construct a composting plant according to the state of the art and the approved technique. A composting plant should guarantee in combination with a refuse incinerating plant or a sanitary landfill that all wastes from a determined area are removed correctly. The wastes which will be treated in the composting plant must be classified according to the expected quantity and according to their suitability for different composting processes and desired compost quality. The decision and the location and space demand of the plant should be made with consideration of the extension of the collection area, transport distance to the sanitary landfill, and the market outlet and possibilities of connection to the local supply systems. The composting method should be chosen with regard to the intended utilization of the compost. If the compost shall be sold as a high-quality manure a more complicated composting technique will have to be applicated. Five different composting procedures proved to be efficient: composting in rotting piles without pre-treatment, composting in rotting piles with previous shredding, controlled pre-rotting of the refuse and if necessary subsequent composting in rotting piles, and controlled pre-rotting of the refuse after shredding and subsequent composting in rotting piles. It is acceptable to treat the domestic refuse together with sewage sludge which has to be dewatered first so that the humidity in the mixture must be 40 to 55 percent. A joint treatment of domestic refuse and sludge has important financial advantages. (Text in German)

[23730]

73-4480

STRAUB, H. Kompostierung der abfaelle, sinnvollste methode. [Refuse composting0 the most rational method of disposal.] *Umwelt*, (3):56-61, June 1972.

The advantages of composting over incineration and dumping are reviewed. Composting can be applied to domestic refuse and similar wastes to which also sewage sludge can be added, while metal parts, glass and plastics should be removed. These together with other wastes, also unfit for composting, account for some 30 percent by weight, whereas the reduction in the waste volume achieved by composting is greater than for either dumping or incineration. The raw

waste should be treated in closed digesters at temperatures of 50 to 70 C. A determined carbon to nitrogen ratio should be maintained, and temperature, humidity content and oxygen supply should be controlled. If compost is not marketable, the wastes should be homogenized mechanically, and disposed of on sanitary landfills. Compost from domestic refuse, containing valuable nutrients and trace elements, represents a precious fertilizer, primarily for recultivation, amelioration, and for intensive cultures. Combined refuse-sewage sludge composts have increased nitrogen contents and improved physical properties. Composts are able to improve the physical properties of the soil, to loosen it up, increase soil humidity and humus content, and to prevent erosion. Composting should be applied in combination with incineration and sanitary landfill, and be developed mostly in rural areas. (Text in German)
[23731]

73-4481

WILES, C. C., AND L. W. LEFKE. Solid waste composting. *Journal of the Water Pollution Control Federation*, 44(6):1,104-1,107, June 1972.
The complex problems connected with composting as well as voices in favor and against composting as a disposal and reclamation method are presented. Although interest in composting of solid wastes has declined in recent years, public awareness became more evident in 1971 with economics remaining as its major deterrent to its effective utilization as a solid waste management method by municipalities. In the literature, there are different and opposing views as to the future usefulness of composting as a method for managing solid wastes. The low dollar value for the compost product, aggravated by a nonexistent market and farmers' prejudice, were reasons making composting currently unattractive from the economic standpoint. This economic unattractiveness was caused by the application of a double standard when comparing composting with other disposal methods. A demand for compost will develop in future years, and it is improper to assume that composting as a large-scale recycling process will remain defunct. The real economics of composting are not well presented, and learning how to apply the process best under present circumstances is the way to make composting the method of choice for recycling organic wastes. Processing and compost utilization are discussed, such as: different methods of processing poultry manure onsite; adding composted bark to the soil; leaf-composting by communities; and disposal of cannery wastes on soils as soil conditioner and to help prevent the contamination of waterways with inorganic chemical fertilizers.
[23732]

73-4482

WILEY, J. S. Composting of organic waste; an annotated bibliography. [Savannah, Georgia, U.S. Department of Health, Education, and Welfare, Technical Development Laboratories,] Feb. 1958. 126 p.
This bibliography was written at the Communicable Disease Center and contains only materials written after 1950. Earlier bibliographies also exist. This document contains brief abstracts of the literature which is reviewed. The subject matter is limited to composting and does not cover the related fields of digestion and fermentation. There is an author index. (This document is retained in the SWIRS library.)
[23733]

73-4483

Zur Verbesserung des wachstrums salzgefachrdeter pflgnzen an bundesstrassen durch muellkompost. [Improving the growing of plants which are endangered by salt by means of refuse compost.] *Allgemeine Forstzeitschrift*, 28(9/10):172, 1973.
Rotted refuse compost shall improve the resistance to salt of plants lining the highways. The compost neutralizes the salt concentration in the soil so that it is no longer available for the plants, thus preventing the salt from being washed into the ground. (Text in German)
[23734]

DISPOSAL

73-4484

ABE, T., H. ANDO, O. INOMATA, Y. SHIMIZU, S. MATSUZAWA, AND S. OTSU. Pori enka biniru

haikibutsu no kansuru kenkyu. (dainiho) Pori enka biniru no datsuinka suiso. [Studies on polyvinyl chloride waste. (2) Dehydrochlorination of polyvinyl chloride.] *Kogai*, 7(5):217-223, Sept. 1972.
Polyvinyl chloride (PVC) can free hydrogen chloride (HCL) at a relatively low temperature, and this treatment is essential to PVC before final pollutionless combustion or degradation treatment. Experiments were carried out in order to study the optimum condition for the pretreatment of PVC. For the lab experiment, a nickel crucible of approximately 200 cc capacity containing wood alloy was used as a bath for the test tube. The emitting HCl was led into a triangular beaker. A larger scale dehydrochlorination system applicable for an industrial use was also used. The equipment was a conveyor furnace made of a stainless pipe of a 17 cm diameter, 200 cm in length, which was heated by electricity from outside. A mesh belt of 10 cm width was passed through the tube at a speed between 1 and 10 miles per hr. The rate of dehydrochlorination of PVC increased with increasing temperature. The results showed that a complete elimination of HCl from PVC required 30 minutes of treatment at 300 C or more than 10 minutes of treatment at 350 C. However, the rate of dehydrochlorination changes with the quantity of PVC and the type of the the equipment; tests are necessary in actual designing. (Text in Japanese)
[23735]

73-4485

ALEXANDER, R. R. Flushable sanitary napkin. Canadian Patent 922,852 owned by the Kendall Co., Boston, Massachusetts. Issued Mar. 20, 1973.
A bonded nonwoven fabric suitable for use as a flushable cover for a disposable diaper or a sanitary napkin is produced by bonding a thin web of textile-length fiber with a fugitive binder comprising a mixture of a soft acrylic binder and polyvinyl alcohol. Such a fabric has sufficient tensile strength to function usefully as a cover whether dry or damp, but then after use may be readily disposed of by flushing since it disintegrates into a thin fibrous slurry when agitated in water.
[23736]

73-4486

DAVIDSON, C. M., AND J. R. DESHAIES. Removal of sulphur dioxide from waste gas. Canadian Patent 924,872 owned by Canadian Industries Ltd., Montreal, Quebec, Canada. Issued Apr. 24, 1973. 12 p.
The process herein described is a method for removing sulfur dioxide from waste gasses through reaction with hydrogen sulfide in a moving bed of catalyst containing variable proportions of two types of catalyst particles. One type contains adsorbed sulfur dioxide; the other type is capable of adsorbing additional sulfur dioxide. By adjusting the proportions of the two types of catalyst, minimum escape to the atmosphere of sulfur dioxide and hydrogen sulfide is accomplished. Elemental sulfur produced by the reaction between the sulfur dioxide and hydrogen sulfide is adsorbed on catalyst particles and recovered by cycling the catalyst from the reactor through a regeneration unit.
[23737]

73-4487

Die drohende abfallstatistik. [Current refuse statistics.] *Gesundheitstechnik*, (11):234-235, Nov. 1972.
The residential refuse quantity increases by 1 percent annually while that of bulky refuse even by 10 percent per year. In 1970 the quantity of domestic refuse amounted to 300 kg per year per inhabitant, that of industrial refuse was also 300 kg per year per inhabitant. Sanitary landfill reduces the refuse volume by 30 percent, the composting method combined with sanitary landfill by 60 percent, composting combined with incineration by 70 percent and incineration combined with reuse of the residue by 90 percent. All three methods prevent soil and water pollution, but have other disadvantages. Plastic bags and other plastic material cannot be composted and have to be removed separately. Incineration causes air pollution by harmful gases like hydrochloric acid even if flue gas cleaning plants are used. The new Refuse Disposal Act will improve the situation in the field of refuse removal as it states that refuse removal shall no longer be a problem of the individual cities and communities but it rules that planning and performing of

refuse removal shall be effected by the lender in order to guarantee a hygienic disposal of the refuse. (Text in German)
[23739]

73-4488

DIETERICH, M. L. Waste disposal system and method. Canadian Patent 922,853 owned by Standard Products Co., Cleveland, Ohio. Issued Mar. 20, 1973.

A human conveyance such a trailer or bus has a fuel burning engine and a toilet which discharges to a waste storage tank. Effluent from the storage tank is fed to an evaporating device where the effluent is subjected to a first temperature which evaporates the effluent to form effluent vapor. The effluent vapor is directed to a second heating device which subjects the waste to a second temperature substantially greater than the evaporating temperature. The heating device which subjects the effluent vapor to the second temperature may be defined by the intake or exhaust ports of the fuel burning engine.
[23738]

73-4489

DUNZ, W. Diskussion der beseit igungsmethoden. [Discussion of disposal methods.] *Muell und Abfall*, 5(2):29-32, 1973.

An evaluation of the different disposal methods is given. The sanitary landfill method can be applied for disposing of urban refuse as well as part of the commercial and industrial refuse. The neighborhood of the sanitary landfill usually is not influenced in a negative sense. However, the land needed for a sanitary landfill is important so that in the long run this system is not feasible. The specific annual costs amount to 8 to 12 deutsche marks per ton. The composting method should only be applicated for wastes which can be biologically decomposed so that the urban refuse but not commercial and industrial refuse can be treated by this method. The volume reduction amounts to 50 percent, the specific annual costs are 25 deutsche marks per ton of refuse. An advantage of this method is that sewage sludge can be treated together with the refuse. The incineration method can be applicated for all kinds of urban and commercial refuse, while it is limited for industrial refuse and sludges. The volume reduction is 85 percent and the specific annual costs amount to 25 to 30 deutsche marks per ton of refuse. As the combustible component in the refuse increases continuously incineration is the most suitable removal method for the future. (Text in German)
[23740]

73-4490

FERBER, M. Abfallbeseitigung. [Solid waste disposal.] *VDI-Z*, 114(9):640-642, June 1972.

General problems and trends in the solid waste disposal area in West Germany are outlined. The volume fo solid waste will continue to grow at a rate of 5 percent yearly, with decrease in the density. Domestic refuse in West Germany contains some 23 percent paper and cardboard, 16 percent putrescible waste, 10 percent glass, 5 percent scrap iron, 2.5 percent plastics, including less than 1 percent of polyvinyl chloride (PVC), 2.5 percent textiles, and 41 percent a fraction below 20 mm diameter. The rate of recycling is about twice as high as in the United States, while reuse is limited due to manual sorting and separate collection being prohibitive, and due to technological possibilities. Though dumping prevails, sanitary landfills, where waste is spread in layers with a maximum thickness of 50 cm, and covered by some inert material daily, are preferable. Some 2 percent of the total waste are composted, and new composting plants are under construction. Composting is most attractive for small towns and farming regions. Combinations of solid waste incinerators with composting facilities represent a growing trend. Compost is often mixed with fertilizer or peat. Efforts to convert compost fiber material into hardboard are in an experimental stage. Incineration, though expensive, is being applied to some 20 percent of the total waste, and to 58 percent in cities of over 500,000 inhabitants. Special wastes require chemical or thermal treatment prior to safe disposal. (Text in German)
[23741]

73-4491

HANAOKA, K. Hai purasuchikku shori no genjo. [Present situation of waste plastics disposal.] *Sangyo to Kankyo*, 2(4):77-81, Mar. 1973.

Production of plastics in Japan has leveled off after sudden growth prior to 1970. Of 5,128 tons of plastic produced in 1970, 1.3 million tons of plastic, 730,000 tons from general households, and 570,000 tons from industries are to be disposed of. Some of them are being reutilized as civil engineering, construction, agricultural, fisheries, industrial, and horticulture materials. Although there are improved type of incinerators for plastic, there is no perfect one which would prevent secondary pollution. Thermal cracking, turning plastics into monomers or oligomers, is a hopeful area. The Association was jointly established by the Petrochemical Industrial Association Vinyl Chloride Industry Association, and Japan Plastic Industry Federation at the end of 1971, to cope with waste plastic problems. At present, with the cooperation of Funahashi Municipal Government and citizens, data is being obtained by collecting waste plastics separately from other wastes and trying to reutilize and develop new uses. A Takuma type special incinerator is being constructed at a laboratory, and aided by the Sanyo Denki Co. (Electric Machinery) and Mitsubishi Heavy Industries Co., a plant is being built to further studies on thermal cracking of plastic. In Nov. 1972, a council to establish policy on vinyl chloride wrapping material wastes made its start. The problems to be solved are to examine the economics of reutilization and to determine sharing of expenses. (Text in Japanese)
[23742]

73-4492

HIRSCHHEYDT, A. V. Ueber versuche zur beseitigung von abfalloelen und oelhaltigen abfaellen mit hilfe der kompostierung. [Removal tests of waste oil and oleiferous waste materials by means of composting.] *Wasser un Boden.* (10):316-318, Oct. 1972.

Tests have been conducted concerning the influence of waste oils and oleiferous waste materials on the composting process and on the growth of vegetation treated with compost containing oily residue. Increasing quantities of waste oil have been added to raw compost and then mixed in concrete mixers. It was found that the addition of oil resulted in higher temperatures in the rotting material, a fact which, however, did not influence at all the rotting process itself. The development of microorganisms was not hampered but with increasing oil contents the depth of the zone of microorganisms decreased. As a result of the tests it was found that concentrations of up to 3 percent of mineral oil with reference to the initial dry substance will not retard the rotting process. These concentrations will also not endanger the growing of plants even if the compost is not diluted. (Text in German)
237430

73-4493

IMOTO, M. Purasuchikku zairyo no jukeu. [The end of plastic materials.] *Kinzoku,* 42(3):33-40, Feb. 1972.

Japan at present creates 2.5 million tons of plastic waste per year, and soon 5 million tons will have to be treated. The most difficult treatment is that of domestic refuse from urban homes, which contains more than 10 percent of plastics. The waste collected in Tokyo in 1969 was 3.24 million tons and contained approximately 9.7 percent of plastic. As a method of separating various types of plastics, the author suggests the use of various solutions with certain specific weights in which various plastics may sink or float. For instance, polyvinyl chloride containing heavy halogen will sink and will be separated, and only floating plastics may be decomposed by heat. Another solution is, as has been suggested by many, mixing in the plastic a molecular chain which ends with oxygen, or a copolymer with carbon monoxide, which will make photodegradation of plastic easier. However, photodegradable plastics are obviously impractical. Since plastic has high caloric value once it is burned, many noncombustible additives are mixed in order to avoid fire hazard. But in recent fires, it has been revealed that many people died from the toxic gases emitted from plastic construction material, rather than the fire itself. The additives used for noncombustible plastics are mostly halogens, and large sources of toxic gases. (Text in Japanese)
237440

73-4494

KIROV, N. Y., ED. Solid waste treatment and disposal. Ann Arbor, Michigan, Ann Arbor Science Publishers Inc., 1972. 205 p.

This clothbound book is an international edition of the proceedings of the 1971 Australian Waste Disposal Conference, held at the University of New South Wales. The papers included in this conference are already in the SWIRS as they were originally issued at the time of the conference. This volume covers many aspects of solid waste management, including sampling characterization, transport and disposal by landfill, dumping, incineration, and composting. Special problems covered are disposal of radioactive wastes, wood wastes, waste from coal mines, and the effects of wastes disposal on air and water pollution. Aspects of salvaging and reuse of wastes such as glass, paper, metal, plastics, oils, chemical, and industrial water also are considered. (This document is retained in the SWIRS library.)

[23745]

73-4495

KUHLMANN, A., AND H. WALDEYER. Stretegische und wirtschaftliche Fragen der Muell- und Abfallverarbeitung. [Strategic and economic questions of refuse treatment.] *Muell und Abfall*, 5(2):42-46, 1973.

An analysis of the minimum costs for different refuse removal systems has been established. Minimum cost for sanitary landfills was established for a collection range of 2.5 to 6.5 km and population density of 500 to 4,000 inhabitants per sq km. Minimum cost in composting plants was established for a collection range of 3.6 km and a population density of 4,000 inhabitants per sq km. The respective data for refuse incineration plants are 11.5 km collection range and 1.7 million inhabitants. As a result it can be stated that cost varies inversely as the population so that sanitary landfills are more economic for less populated regions while incineration plants should be constructed in larger towns and cities. Sanitary landfills should have an annual throughput of at least 6,000 tons and should be run if possible in connection with a volume reduction system like composting or incineration. The 50,000 dumps in Germany should be closed and be replaced by 1,000 to 2,000 sanitary landfills. (Text in German)

[23761]

73-4496

MAHLOCH, J. L. An investigation of the microbiology of aerobic decomposition of refuse. Ph.D. Thesis. [Lawrence], University of Kansas, Dec. 1970. 197 p.

Since knowledge concerning the biology and chemistry of refuse decomposition is necessary for understanding and designing proper refuse disposal systems, the aim of this thesis was to investigate the microbiology of refuse decomposition and its association with various chemical parameters. Three types of substrates were investigated: mixed refuse; paper wastes; and grass and leaves. Only the aerobic phase of decomposition was considered. Samples were extracted every other day starting from the initial day of substrate incubation. The experiment lasted 48 days. Data variables measured were temperature, pH, moisture, volatile solids, COD, numbers of bacteria, and numbers of fungi. The primary conclusion from the study was that rapid microbial degradation of solid wastes can be accomplished by use of an aerobic system with proper regulation of the environmental factors. Chemical parameters of the solid waste substrates, such as moisture and pH, were important in controlling microbial metabolism. A succession of bacteria and fungi were observed during the course of substrate incubation. Predominant fungi in the substrates were Trichoderma, Geotrichum, Rhizopus, Penicillium, Aspergillus, and Cladosporium. (This document is retained in the SWIRS library.)

[23749]

73-4497

MAHLOCH, J. L. Application of the results. *In* An investigation of the microbiology of aerobic decomposition of refuse. Ph.D. Thesis. [Lawrence], University of Kansas, Dec. 1970. p. 141-145.

One goal in sanitary landfill disposal methods is to return the refuse to the earth and reclaim the land as quickly as possible. Current landfill

designs do not facilitate refuse decomposition. Results of this study show that aerobic stabilization of refuse occurs rapidly, within 30 to 50 days, provided that the environmental conditions are favorable. Therefore, surface stabilization seems to be a realistic method for rapidly returning refuse to the earth. Temperature data from this study show sharp peaks in temperature when surface stabilization is attempted, followed by a decline. COD and volatile solids graphs also show the same general pattern. Numbers of bacteria present in the substrate systems indicate that a good portion of the initial decomposition of refuse was accomplished by bacteria. For bacterial decomposition to occur, microbes must be in contact with the substrate and require a liquid interface for good activity. On the other hand, fungi are able to spread throughout the substrate without needing food. Some type of mixing, therefore, is required for optimum bacterial activity. Changes in pH had an effect on the numbers of bacteria and fungi present in paper and grass and leaves wastes. However, only with the paper substrate was the decomposition significantly affected. Since paper wastes lowered the numbers of bacteria, it seems true that bacteria play a predominant role in the initial phase of refuse decomposition. (This document is retained in the SWIRS library.)
[23746]

73-4498

MAHLOCH, J. L. Discussion of results. *In* An investigation of the microbiology of aerobic decomposition of refuse. Ph.D. Thesis. [Lawrence], University of Kansas, Dec. 1970. p. 132-141.

The discussion begins with an analysis of the growth of microbes and resulting problems in treating refuse aerobic decomposition. One problem is the lack of uniform distribution of nutrient elements. Nitrogen, phosphorus, and trace metals are not uniformly available in solid wastes as they are in liquid wastes. An important interrelationship among variables is that of pH with the numbers of microorganisms. The pH was particularly noticeable in paper wastes and grass and leaves substrates. The effect of water addition is striking. A decrease in volatile solids and COD was noted after the addition of water; an increase in numbers of bacteria resulted; the numbers of fungi increased concurrently with a decrease in bacteria. A statistical evaluation of results was accomplished through use of a correlation matrix. The three variables significantly correlated with temperature were numbers of fungi, numbers of bacteria, and time. Time was correlated inversely with temperature, as were numbers of fungi; numbers of bacteria were directly correlated. The pH was inversely correlated to volatile solids, COD, and numbers of fungi, but directly correlated to numbers of bacteria. This would indicate that satisfactory decomposition of refuse was occurring. Moisture content was significantly correlated with numbers of fungi in an inverse manner, confirming reports that fungi prefer lower moisture contents than bacteria. Rapid changes in fungal numbers during initial stages of decomposition were caused by changes in the type of available substrate. Data indicate that numbers of fungi increase with time. However, since the amount of available substrate decreases with time, this type of correlation seems implausible. (This document is retained in the SWIRS library.)
[23747]

73-4499

MAHLOCH, J. L. Introduction. *In* An investigation of the microbiology of aerobic decomposition of refuse. Ph.D. Thesis. [Lawrence], University of Kansas, Dec. 1970. p. 2-4.

One estimate has it that average production of solid wastes in the United States is 5.3 lb per person per day, and that the cost for disposing of solid wastes is $4.5 billion per year. One method of handling solid wastes is by conversion or recovery and recycling. However, lack of interest or economic incentive has often caused failure for this approach. Most composting facilities have likewise failed in this country because of high expenses and lack of markets. Two land disposal methods are incineration and landfilling. Incineration has not been very successful due to costs and stringent air pollution requirements. Two major methods of solid waste disposal involve biological degradation of waste products. Because so little is known about the biological processes involved in solid waste disposal or the factors governing these processes, the research

herein described had as its purpose a greater knowledge of these biological processes. Biological processes are both aerobic and anaerobic, occur under many environmental conditions, and involve many different wastes. For this research, the range of factors and type of wastes studied were limited. Therefore the research done for this study may point the way to future solutions to solid waste disposal problems. (This document is retained in the SWIRS library.)
[23748]

73-4500

MAHLOCH, J. L. Literature review. Biological considerations. *In* An investigation of the microbiology of aerobic decomposition of refuse. Ph.D. Thesis. [Lawrence], University of Kansas, Dec. 1970. p. 19-29.

The two most important factors influencing biological decomposition in refuse are the environmental parameters and the microflora present. The most important types of microflora are the bacteria, actinomycetes, and fungi. Mechanisms such as antagonism and competition for the substrate cause complex interactions between fungi and bacteria. Data and analyses are presented with regard to the question of whether inocula are of value as they relate to the initial source of microflora involved in refuse decomposition. Various studies are outlined concerning work on the role of bacteria and actinomycetes in decomposition of proteins and cellulose, respectively. The controversy over the role that fungi play in refuse decomposition is also examined by the paper. One investigator determined the percentage of various fungi present during the thermophilic phase of composting. They were: Geotrichum, 33 percent; Penicillium, 40 percent; Mucor, 11 percent; Sporotrichum and Trichoderma, 9 percent; and Aspergillus, 6 percent. (This document is retained in the SWIRS library.)
[23750]

73-4501

MAHLOCH, J. L. Literature review. Environmental considerations. *In* An investigation of the microbiology of aerobic decomposition of refuse. Ph.D. Thesis. [Lawrence], University of Kansas, Dec. 1970. p. 5-14.

Biological transformation of solid wastes is dependent on two major factors0 number and type of organisms present and the environmental constituents operating on the system during the transformation. A majority of transformations are performed by the microflora present. The most important factors in the aerobic decomposition process are temperature, pH, moisture, composition of the refuse, and aeration. Each of these is discussed in the paper. Temperature influences the rate of reaction and the types of microflora present. These influences are somewhat dependent on each other because denaturation of key enzymes at elevated temperatures or resistance to denaturation is dependent on the genetic make-up of the organism. Research has shown, for example, that in one sample as temperature rose to 45 C, the flora was predominantly Geotrichum, but at 55 C, the flora was exclusively Cladosporium. Temperature observations can be used to determine the extent of decomposition. The pH effect on biological processes in refuse decomposition is revealed in the type of microflora present. In general, fungi prefer acid conditions; bacteria prefer neutral or slightly alkaline conditions. Usually during decomposition the pH decreases and then becomes alkaline during the final stages. The role of moisture is also examined. In biological literature, the amount of available water is often related to relative humidity. Bacteria usually require a relative humidity between 90 and 99 percent for growth and survival. Fungi can germinate and grow at lower temperatures. From various data, it would appear that a moisture content of 60 percent is adequate for microflora. (This document is retained in the SWIRS library.)
[23751]

73-4502

MAHLOCH, J. L. Recommendations for further research. Bibliography. *In* An investigation of the microbiology of aerobic decomposition of refuse. Ph.D. Thesis. [Lawrence], University of Kansas, Dec. 1970. p. 150-197.

The author has concluded his study of the microbiology of aerobic decomposition of refuse with several recommendations for further research. For one thing, a comprehensive

statistical evaluation of the sampling procedure for solid waste systems should be made. The effect of anaerobic versus aerobic conditions and the presence or absence of nutrients needs investigation. Further study is recommended into the biological parameters for measuring available water and the effect of optimum moisture on the biological response of the refuse system. A method of accurately determining fungal activity in refuse systems needs to be developed, as well as a determination of the relationship between the activity and standard dilution-plate counts. A better method for characterizing bacterial groups in the refuse substrate should be found. Finally, an investigation into a proper choice of parameters to monitor a refuse system and its application to full scale systems would be useful. A long bibliography follows the set of recommendations. The final section of the thesis is a series of appendices, which deal with the following topics: description of media and reagents used in biological tests; description of computer usage in this research; description of boxes used for substrate incubation; description of multipoint inoculator; tabulation of experimental results; and a description of Penicillium isolates. (This document is retained in the SWIRS library.)
[23752]

73-4503

NAKAMURA, M. Haikibutsu shori jittai chosa hokuku. [Waste disposal research.] *Seisan Kenkyu*, 25(2):76-79, Feb. 1973.
The amount of the wastes discarded per one person per day is, according to a report, 1.1 kg for Tokyo, of which 10 percent are plastic wastes. The disposal of these wastes falls into the two methods, sanitary landfill and burning at the present time. In the case of landfill, the refuse naturally decomposes when it is buried, and the glass and porcelain wastes which are unchangeable and solid can be effectively used for reclamation, whereas the plastic wastes are unsuitable for the landfill work because they are less stable. In general, incineration is sanitary, and the ash obtained is 5 percent by volume of the wastes before burning and suitable for landfill. Wastes containing a small amount of plastics cause no problems in burning, but when the amount of plastics exceeds 10 percent of refuse, high temperature produced in burning causes damage to the inner walls of incinerator, or the molten plastic clogs the grate before burning. Also, polyvinyl chloride which occupies about 20 percent of all the plastic output causes damage to the furnace, Cottrell precipitator, and chimney stack giving off hydrogen chloride, and the heavy metals added as an age resistor are liable to giving pollution. Moreover, in this report, the results of investigation on the cleaning factories in Chiba prefecture, the Kobe area, and the Tokyo Metropolis are given. (Text in Japanese)
[23753]

73-4504

PIERAU, H. Feste abfallstoffe. [Solid waste.] *Gesundheitswesen*, 34(Special issue, 2): 73-76, 1972.
In order to reduce the environmental load the removal system of solid waste should be reorganised. Domestic and industrial refuse should as far as possible be removed together. First of all an analysis of the quality and quantity of the refuse, especially of industrial waste should be established based on which regional refuse removal plans should determine the optimum positions for the removal sites. Dump sites and small incineration plants which do not meet the technical requirements any more should be closed. The refuse should be treated in central sanitary landfills and in potential incineration or composting plants. Special maps should be issued informing about water protection areas and regions where refuse could be deposited without endangering the environment. Special personnel should be trained so that they are familiar with environment problems. Control equipment should be installed not only in incineration and composting plants but also in sanitary landfills in order to control the development of gases in the site and to determine the stability of the refuse body with regard to subsequent construction. (Text in German)
[23754]

73-4505

RASCH, R. Ueber die chemische Bindung von Chlorwasserstoff in den Rsuchgasen von Muell-

verbrennungsanlagen. [Chemical bonding of hydrogen chloride in flue gases originating from refuse incinerators.] *Aufbereitungstechnik*, 13(12):772-776, 1972.
The operating principle of a scrubber for throughputs to 50,000 cu m per hr is briefly reviewed. Parallel to the wet removal of hydrogen chloride from the flue gases of incinerators, dry bonding to quicklime will gain increasing importance. However, the process is efficient only at gas temperature below 400 C. A ratio between chloride and oxide of more than 10 to one is required for the beginning of chemical bonding. (Text in German)
[23756]

73-4506

ROECKINGER, F. Fortsetzungsserie ueber fragen des umweltschutzes im Budesminiszerium. [Refuse removal and cleaning methods of industrial flue gases.] *Umweltschutz - Staedtereinigung*, 10(1):7-15, 1973.
In 1970 the annual refuse quantity of the city of Vienna amounted to 2.3 million cu m weighing 347,000 tons. The refuse quantity is expected to increase by 1985 to 9.5 million cu m annually. As there is not enough land available for a sanitary landfill the city of Vienna decided to construct a refuse composting plant. In this plant the refuse is screened and the fine particles are moistened with water and then kept in rotting piles for about 6 months. The final product is a high quality fertilizer which can be easily sold. However, only 6 percent of the total refuse of Vienna can be disposed of by this method. Therefore the most effective system to dispose of refuse is incineration. The incineration plant in Vienna has a Martin grate which guarantees a complete combustion of the refuse. From there the slag passes into an impact crusher where the ferrous parts are separated. The incineration plant has a throughput of 720 tons per day. (Text in German)
[23755]

73-4507

TABASERAN, O. Muellbeseitigung in Istanbul. [Refuse removal at Istanbul.] *Muell und Abfall*, 5(2):46-48, 1972.
The annual refuse quantity at Istanbul is estimated to amount to about 1 million tons. The pick-up system covers about 80 percent of the streets. The main part of the refuse is transported to four deposit sites, where reusable material, which amounts to about 33.8 percent of the total refuse quantity, is sorted out. The remainder is dumped into the refuse pit without being covered with soil or other inert material. Two incineration plants have been constructed. The smaller one has a throughput of 6 tons per hr and burns the refuse on roll grates. The second incineration plant started work 1 year ago and has a throughput of 12 tons per hr. It disposes of a furnace of 12 m length and burns the refuse on roll grates by adding the combustion air from below and above. (Text in German)
[23757]

73-4508

WELFE, E. Landliche abwasser-gefahr unterschaetzt. [Rural effluents - danger underestimated.] *U-das technische umweltmagazin*, (10):40-52, Oct. 1972.
A special problem with regard to water pollution arises from the dumping of refuse, garbage, bulky refuse and other wastes along the river banks. A survey conducted in 1971 at a river section 16.5 km long, without any industrial enterprises in the surrounding area, found that there were more than 148 dumping places. According to the type of dumped refuse physical and chemical changes of the water take place. Control measures and penalties have not improved the situation so it will be necessary to install special instruments which will continuously monitor the water quality. Water pollution caused by rain cannot be easily determined as it depends not only on the intensity of the precipitation, but also on the topographic situation. Another source of water pollution that is very often neglected is lead. From the exhaust gases of motor cars lead gets into dust in the streets and from there rain washes it into the sewer. Thus it enters the biological cycle and accumulates in fish. Research work concerning lead in bodies of water is absolutely necessary. (Text in German)
[23758]

73-4509

WENZEL, W., AND L. CHAUSSY. Method of removing vaporized lead from gases. Canadian Patent 924,871 owned by Rheinische Braunkholenwerke AG, Cologne, Germany, and W. Wenzel. Issued Apr. 24, 1973.

Use of lead as a heat exchange medium has advantages over other materials. However, it has been virtually unavoidable when using lead for such purposes at temperatures in excess of 900 C, that substantial lead vapor pressure develops which greatly increases with increasing temperatures. If substantial quantities of lead mix with heat transfer gasses, lead losses occur and the gasses are contaminated. The invention herein described intends to provide an improved method which eliminates the lead vapor from gasses contacting liquid lead. Gasses, after having been brought into contact with the liquid lead for the purpose of heat exchange, are contacted with other liquid metals which cause precipitation of the vaporized lead.

[23759]

73-4510

WOGROLLY, E. Beseitigung von kunststoffabfaellen heute und morgen. [Removal of plastic wastes today and tomorrow.] *Umweltschutz-Staedtereinigung*, (2):25-29, 1973.

The annual refuse quantity in Austria amounts to 5 to 6 million cu m of which the quantity of plastic waste lies between 2 and 6.5 percent. The percentage of polyvinyl chloride in the refuse is about 0.5 percent and even in 1980 will not exceed 1 percent. Plastic wastes in sanitary landfills do not have a harmful influence on the environment as plastics are inert materials which do not decompose into harmful substances, and are compacted to a minimum volume. As to the treatment of plastic wastes in a composting plant they do not have any negative influence on the composting process. When incinerated in an adequate furnace, plastics burn without contributing to ash and slag and decompose into carbon dioxide and water. Waste products in the plastic processing industry like foil wastes and plastic chips can be recycled by producing a granulate which is then added to the raw material. Owing to the increasing demand of plastics in household and industry, the recycling problem will become more urgent in the future. Classification and shredding of plastic wastes will be the prerequisite to recycle plastic material which may then be used for the production of synthetic wood and paper or transformed into fuel oil. (Text in German)

[23760]

HAZARDOUS WASTES

73-4511

Aus der Taetigkeit der LAG. [About the activity of the Laender study group on 'refuse removal.'] *Muell und Abfall*, 5(2):53, 1973.

At the present time the study group 'refuse removal' is concerned with the problem of refuse transportation and the determination and classification of special refuse. The study group entered into negotiations with the chemical industry to return waste chemical salts and discussed the problem of how to treat this critical refuse in a manner that the environment is not submitted to harmful influences. Owing to the great number of junk car shredders the study group recommended introduction of licenses for the construction of further shredding plants in order to avoid having the government pay subsidies to the scrap industry because of excess capacity. (Text in German)

[23762]

73-4512

BLACK, R. J. Requirements for information and education programs. *In* Proceedings; National Working Conference on Pesticide Disposal, National Agricultural Library, Beltsville, Maryland, June 30-July 1, 1970. p. 125-126.

Problems are evident in deciding how to disseminate information to the public and to groups of large-scale pesticide users. Householders are the most difficult group to educate. Mass media must be utilized, but with information that is limited to short, easily understandable procedures. Instructions may have to be varied according to local conditions. The assumption is made by the author that the public is more sophisticated today to the problems of environmental issues, so that the use of mass media

should be effective in reaching them. Results of explaining to the public the dangers of radiation during an eclipse of the sun are encouraging in terms of other dissemination. Large-scale users of pesticides will need more detailed information than the general public. The usual channels for new technical information would be most effective. These include the farm advisor, chemical supplier, manufacturer, State and local health department, and trade magazines. State solid waste agencies are also a resource. Public Health Service Publication No. 1912 provides a complete listing of the directors of these agencies. In order to convey information effectively, the following questions on pesticide disposal must be answered: What action is needed? What do we want to say? To whom do we want to tell it? (This document is retained in the SWIRS library.)
[23763]

73-4513

BREIDENBACH, A. W. Application of solid waste research to pesticide disposal. *In* Proceedings; National Working Conference on Pesticide Disposal, National Agricultural Library, Beltsville, Maryland, June 30-July 1, 1970. p. 120-123.
Although the use and regulation of pesticides are not within the framework of responsibility of the Bureau of Solid Waste Management, studies bearing on the disposal of pesticide containers and the effects of pesticides on solid waste processes are within the Bureau's responsibility. Projects which are relative specifically to individual pesticides or their groups is fairly small; examples are wastes which require final detoxification before disposal or reclamation processes can be effective, and wastes which have known degrees of pathogenicity, chemical toxicity, or corrosive characteristics. Disposal of pesticide wastes and containers has proceeded along two lines of research: improvement and refinement of existing practices; and applying a portion of our resources specifically to the disposal of special wastes which require final detoxification. In the recycling field, efforts have been directed toward using cellulosic wood wastes as a substrate to which pesticides might be attached chemically. Batch-type and continuous compost procedures were effective in reducing levels of organophosphate pesticides. Thermal degradation experiments have been examined, in particular the possibility of destroying pesticide materials if combustion is aided by oxidizing agents and binders. Land disposal efforts are also under way. Degradation of pesticide manufacturing process liquors by application to highly alkaline soil areas is another area of research. An analysis of sea disposal techniques and experiences is discussed. The author recommends for the disposal of empty pesticide containers that they be subjected to incineration or pyrolysis under controlled time and temperature conditions, or that they be disposed of in a well-designed and operated sanitary landfill with adequate surveillance. (This document is retained in the SWIRS library.)
[23764]

73-4514

BUREAU OF VECTOR CONTROL AND SOLID WASTE MANAGEMENT. Memorandum on used pesticide container management. Sacramento, California Department of Public Health, July 27, 1971. 6 p.
This short document discusses the problem of disposal of pesticide containers. It recommends that all such containers be disposed of at Class I or perhaps Class II disposal sites, where there is no possibility of contamination of ground water. Reuse of pesticide containers is technically feasible, although there does not seem to be economic justification for it. If containers were to be cleaned out and reused, it is most likely that this work would be done by private contractors. The Bureau of Vector Control and Solid Waste Management makes a series of recommendations on which it feels future regulations regarding pesticide and pesticide containers should be based. (This document is retained in the SWIRS library.)
[23765]

73-4515

CALKINS, J. R. Report of State programs0 Michigan. *In* Proceedings; National Working Conference on Pesticide Disposal, National Agricultural Library, Beltsville, Maryland, June 30-July 1, 1970. p. 71-74.

On June 27, 1969, the Michigan Department of Agriculture action to cancel nearly all permits to use DDT became effective. This left the State with the problem of what to do with pesticide that was still in the possession of industry, dealers, or homeowners but could not be used. Private groups such as the Boy Scouts and individuals began to agitate for public collection campaigns; some of these actually took place. The author, however, points out that the Department of Agriculture did its best to discourage such efforts, even in the face of criticism, because of the very great dangers of having uninformed adults and children dealing with toxic chemicals about which they knew nothing. Also the collected quantities of pesticides were more dangerous in the aggregate than they had been scattered about in people's garages and cellars in 1-lb sacks or aerosol cans. A leaflet has been printed to be used by pesticide holders, and it is available free to the public. To obtain a copy, write to the Michigan State University Cooperative Extension Service, and ask for Extension Bulletin E-664, Farm Science Series. The guidelines are basically these. Homeowners should dispose of DDT products on their own land, by careful burial. Large holders such as farmers or pest control specialists can either bury the waste on their own land or request that it be picked up by the State and incinerated at the Dow Chemical Co.'s special chemical waste incinerator. A list of the poison control centers in the State is included on the guidelines leaflet. These recommendations apply only to DDT and cannot be taken to apply to any troublesome chemical one might happen to have lying around the house or place of business. (This document is retained in the SWIRS library.)
[23767]

73-4516

CATH, W. S. Report of state programs0 summary. *In* Proceedings; National Working Conference on Pesticide Disposal, National Agricultural Library, Beltsville, Maryland, June 30-July 1, 1970. p. 78-84.

The author of this article is affiliated with the National Association of State Departments of Agriculture and conducted a survey of programs in all the States dealing with collection, storage, and disposal of unwanted or illegal pesticides. All the States' programs, or in many cases, lack of programs, are briefly mentioned; only the States whose representatives have spoken at this conference are excluded. Most of the States were doing nothing at the time of this survey about pesticide collection or disposal. Some of them are at least seeking ways of dealing with the problem. Pennsylvania, Montana, New Hampshire, and West Virginia provide pesticide holders with disposal guidelines and/or collection points. Pennsylvania has an incinerator in the southeast section capable of handling them. Some States recommend that they be put in approved sanitary landfills. For the most part, however, it is apparent that the States have not solved the problem of pesticide disposal. (This document is retained in the SWIRS library.)
[23766]

73-4517

CHANDLER, N. Report of state programs--Massachusetts. *In* Proceedings; National Working Conference on Pesticide Disposal, National Agricultural Library, Beltsville, Maryland, June 30-July 1, 1970. p. 67-70.

In late 1969, the Massachusetts Pesticide Board restricted the use of DDT, dieldrin, and other so-called hard pesticides. A copy of the amended rules and regulations is a part of this article. The Massachusetts Department of Natural Resources through its Division of Forest and Parks embarked on a program to collect these restricted pesticides. The Division has recently acquired title to the Naval Annex in Cohasset, with several ammunition bunkers, seemingly a logical place to store the pesticides until a method of disposal could be adopted. News releases were sent out from the Division of Forest and Parks that any agency or individual in the State could bring whatever quantitites of pesticides they had to any one of several State Parks during 3 weeks in January; a second collection period was set for May. All collected materials were trucked to Cohasset and sealed away. The amounts of pesticides collected are listed. Three problems developed with this program: a continuing trickle of pesticides being brought to collection points; opposition from the Cohasset residents to the storage of the wastes

in their town; and difficulty in determining what to do with them. Some of the liquids are stored in containers of uncertain age, and the agency is trying to find a safe disposal method as soon as possible. (This document is retained in the SWIRS library.)
[23768]

73-4518

CONNER, J. T. Report of the National Agricultural Chemicals Association. *In* Proceedings; National Working Conference on Pesticide Disposal, National Agricultural Library, Beltsville, Maryland, June 30-July 1, 1970. p. 12-26.
The National Agricultural Chemicals Association, located in Washington, D.C., has formulated guidelines for many aspects of the handling of pesticides and other potentially dangerous agricultural chemicals. Included in this articles are brief statements of their recommendations on the following topics: in-plant pollution control for pesticide manufacturers, as well as waste prevention, control and recovery measures; general disposal methods; specific waste treatment and disposal; special problems to be dealt with regarding the various major classes of pesticides; procedures in the event of fire in a pesticide warehouse; spill control and cleanup; container inspection procedure; and prevention of leakage during transport. (This document is retained in the SWIRS library.)
[23769]

73-4519

DAY, H. M. Report of review committee of Chemical Specialties Manufacturers Association. *In* Proceedings; National Working Conference on Pesticide Disposal, National Agricultural Library, Beltsville, Maryland, June 30-July 1, 1970. p. 4-11.
The Insecticide Division of the Chemical Specialties Manufacturers Association has undertaken a series of surveys, the results of which are available to those interested in reading them. Some results are included in the report. The topics of the surveys are: the number of aerosols used for pesticides on the home and garden market; the number and kinds of packaging used in the garden and home market exclusive of aerosols; State legislation and recommendations relating to pesticide containers; disposal methods available for pesticide containers; a review of the Mississippi State University project on container incineration; decontamination methods suitable for pesticide containers; pesticides available for the home and garden market; types of pesticides and containers used by pest control agencies; and types of pesticides used in aerosol containers. The author recommends that the participants in the conference, since they are the best informed people in the area of pesticides, formulate recommendations to be promulgated by all the States so that laws are reasonable and uniform. (This document is retained in the SWIRS library.)
[23770]

73-4520

FARKAS, E. M. Federal coordination of pesticide disposal information. *In* Proceedings; National Working Conference on Pesticide Disposal, National Agricultural Library, Beltsville, Maryland, June 30-July 1, 1970. p. 127-130.
The author discusses ways in which the government has attempted to coordinate pesticide disposal information. Both Federal and State information and education programs have been directed toward emphasizing the safe handling and application of pesticides in order to prevent accidents and avoid harmful residues. Since 1963, a nationwide pesticides safety information program has been conducted using filmed spot announcements. Also, the proper application of pesticides has been emphasized in seminars for agricultural producers. However, the question of pesticide disposal has received insufficient attention at best. The wealth of new information available on potential harm from pesticides has, unfortunately, helped to confuse the public, which is interested basically in knowing what to do with its bug bomb when it is empty. Thus the government and other agencies must strive to arrive at more definitive answers to these questions. Responsibility for coordinating immediate and comprehensive dissemination of projected new guidelines on disposal will rest with the Information Panel of the Interdepartmental Working Group, composed of public information and education officers from the De-

partments of Agriculture, Interior, Defense, and Health, Education, and Welfare. (This document is retained in the SWIRS library.)
[23771]

73-4521

FENDO, A. Department of Defense disposal program. *In* Proceedings; National Working Conference on Pesticide Disposal, National Agricultural Library, Beltsville, Maryland, June 30-July 1, 1970. p. 96-98.
The author discusses the Federal Property and Administrative Services Act of 1949, which assigns responsibility for supervision and direction over the disposition of excess and surplus property to the Administrator of General Services Administration. This Administrator delegated to the Secretary of Defense the responsibility for disposing of excess and surplus property generated by Defense. The Department of Defense Disposal Program is involved in effecting the orderly disposal of personal property in a way which assures maximum Federal utilization through transfer, donation to satisfy valid requirements, optimum monetary return for sold property, and minimum need for abandonment or destruction. During Fiscal Year 1969, Defense disposed of property with an acquisition cost of about $4.2 billion. Only when various avenues of utilization and donation are exhausted is property made available for sale to the public. In the case of military items with hazardous or lethal characteristics, they are cut, burned, crushed, melted, or otherwise deformed in a manner precluding reconstitution of the property for the purpose originally intended. Sales administered by the Program are carried out by the Defense Logistics Services Center. They are conducted on a competitive bid basis, normally by sealed bid, spot bid, and auction methods. Invitations for bids are published, including information with respect to Federal laws, regulations, and restrictions imposed on certain items such as insecticides, fungicides, and rodenticides. In the event of a disposal action requiring special consideration, such as the ban on sales of Defense surplus insecticides containing DDT, the freeze remains in effect until the Department develops an effective method for disposal. (This document is retained in the SWIRS library.)
[23772]

73-4522

HALLIDAY, H. E. Report of state programs--Wisconsin. *In* Proceedings; National Working Conference on Pesticide Disposal, National Agricultural Library, Beltsville, Maryland, June 30-July 1, 1970. p. 75-77.
In January of 1970 the sale and use of DDT and derivative products was banned in the State of Wisconsin. Industry was urged to take back from dealers and distributors any affected products. The Department of Natural Resources made available 64 installations around the State to which anyone holding banned pesticides could bring their waste. Now the problem of disposing of the collected pesticides remains. There are also other pesticides0 some cyanide pellets and mercury compounds among them--that have been collected and must be disposed of. The problem of getting rid of pesticide containers is a continuing one which in the opinion of the author ought to be the responsibility of the State. At this time, Wisconsin has not determined what method to use to dispose of its stores of illegal or condemned pesticides and is hoping that workable guidelines will be developed by the Working Committee on Pesticides or some other reputable body of experts. (This document is retained in the SWIRS library.)
[23773]

73-4523

HILL, R. M. Recall and disposal. *In* Proceedings; National Working Conference on Pesticide Disposal, National Agricultural Library, Beltsville, Maryland, June 30-July 1, 1970. p. 89-93.
This is a slightly bitter recounting of the perils of attempting to recall 2,4,5-T, a pesticide which had been ruled unsafe by the Federal government. The clerical task of notifying all those dealers with products containing the formulation on their shelves was mammoth, and only a few cooperated with the recall. Others hid the product, refused to return it, or offered to sell it back to the supplier. Even those who willingly complied were hampered by strict government regulations about shipping the broken and improperly labeled cartons of pesticide. Once the

chemical companies got their product back, the disposal problem became acute. At present it is not solved, and the companies involved are waiting for the promised Department of Agriculture guidelines on the disposal of this banned product. (This document is retained in the SWIRS library.)
[23774]

73-4524

INOUE, Y., AND S. MORISAWA. Hoshasei haikibutsu no chichu shobun mondai. [Ground disposal of radioactive wastes.] *Nippon Genshiryoky Gakkai-shi*, 15(1):3-15, Jan. 1973.
Foreign examples of ground disposal cannot be immediately adopted in Japan, where population is dense and underground water is being utilized as well water. However, examples in the United States (Hanford and Oak Ridge) are given. As to solid wastes, examples of Windscale and Savannah River, and Chalk River, Idaho, are given. For gaseous wastes, Clebsch calculates that they would stay underground for 250 days. Ground disposal cost of low level waste liquid is only 0.5 yen per cu m, but at medium level, it increases to 250 to 540 yen per cu m, and at high level, 2,700 yen per cu m. When medium level wastes are to be buried in tunnels, it costs 200,000 yen per cu m, and when put in caissons, 100,000 yen per cu m. If high level waste liquid is to be buried, it costs 3 million yen per cu m: 12 percent for protection against radiation, 12 percent for burying, 16 percent for transportation, 28 percent for packaging, and 32 percent for labor costs. The disposal site must be chosen taking many things into consideration, such as distance from wells used for irrigation, for drinking water, sea, lakes, and rivers. The water table must be deep, or velocity of underground water low, ion density of underground water low, porosity low, soil density great, and precipitation low. No international agreement concerning protection on hereditary effect has been reached. Various future researches are suggested. (Text in Japanese)
[23775]

73-4525

JANSEN, L. L. Estimates of container numbers by size, type and formulations involved. *In* Proceedings; National Working Conference on Pesticide Disposal, National Agricultural Library, Beltsville, Maryland, June 30-July 1, 1970. p. 27-53.
This article presents summary data from the Pesticide Review, which is published annually by the Agricultural Stabilization and Marketing Service, U.S. Department of Agriculture, and from 'Quantities of Pesticides Used by Farmers, 1964 and 1966', published by the Economic Research Service of the same department. Tables and charts give data under the following headings: domestic sales of pesticides, divided into herbicides, insecticides, and fungicides; unit price in dollars per lb, in the same three subdivisions; millions of acres treated for each type of pesticide; usage rate in lb per acre; and chemical cost in dollars per acre. Also provided are data indicating weighted percentage estimates of active pesticide ingredients, proportional usage and packaging sizes for formulated pesticides by class and formulation types; farmer usage of technical and formulated pesticides by class; farmer usage of formulated pesticides by formulation types and package size; and millions of containers used in the United States. Projections for the future are made. (This document is retained in the SWIRS library.)
[23776]

73-4526

LOUCKS, C. S. Hazardous materials regulations. *In* Proceedings; National Working Conference on Pesticide Disposal, National Agricultural Library, Beltsville, Maryland, June 30-July 1, 1970. p. 94-95.
The author as a representative of the Department of Transportation (DOT) discusses the labeling and shipping requirements of this department concerning hazardous materials. He points out that for the most part these regulations do not apply to pesticides, since they are concerned with hazards during shipping, such as fire or explosion, and not hazards from use or storage of the product after shipping. Small aerosols such as are used for pesticides are ex-

empt from the DOT ruling on aerosols, although some larger aerosol containers might be subject to regulation. (This document is retained in the SWIRS library.)
[23777]

73-4527

PECK, B. T. Report of state programs--Connecticut. *In* Proceedings; National Working Conference on Pesticide Disposal, National Agricultural Library, Beltsville, Maryland, June 30-July 1, 1970. p. 54-58.
The Connecticut Board of Pest Control met on May 15, 1970, to formulate guidelines for homeowners having DDT and other pesticides on hand that they wish to dispose of. It is probably safer to put these chemicals in the trash along with other refuse, preferably wrapped in heavy newspaper or in a plastic bag to prevent leakage, than to attempt to dispose of them in some more complicated way. Collection crews should be notified and the pesticide disposed of in a sanitary landfill, where the other refuse will absorb much of the leachate and it will not be able to contact ground water. Drs. Dewey and Pendleton of Cornell University issued a factsheet on pesticide disposal, indicating that incineration is probably the best way to dispose of them, but at present not enough is known about the dangers of air pollution. In any case there is no installation in Connecticut capable of handling large amounts of pesticides. The author is not in favor of public and separate collection for pesticides because of the difficulty in storing and handling quantities of such hazardous wastes. If it is necessary to collect this type of waste in one place, the operation should be carefully supervised by a pesticide expert to avoid poisoning of land, crews, storm runoff, and any other area. Fire protection of pesticide storage is discussed in a Cornell Fact Sheet, 4-77 of the Chemicals-Pesticides Program. There is no mention made in the article of any enforced Statewide program or law for pesticide management. (This document is retained in the SWIRS library.)
[23778]

73-4528

PUTNAM, R. C. Investigation of the necessary conditions for proper decontamination and combustion of organic pesticides and pesticide containers. *In* Proceedings; National Working Conference on Pesticide Disposal, National Agricultural Library, Beltsville, Maryland, Juen 30-July 1, 1970. p. 108-119.
The purpose of a project described by the author was to investigate methods of combustion applicable to pesticide residues and their containers, and to devise a means for their destruction which would keep environmental pollution to a minimum. On the basis of several investigations, the conclusions of the study were summarized and include the following. Pesticides may be destroyed by combustion at temperatures normally achieved by burning wood, paper, cardboard, or plastics. The material of highest toxicity, the original pesticide, is more than 99 percent destroyed. Pollution by end-products such as sulfur dioxide and hydrogen chloride would depend on whether or not they are formed by the pesticide and the quantity of pesticide destroyed. Binding agents perform an important service in retaining pesticides in order to complete combustion. Oxidizing agents are useful in lowering the temperatures required for completing combustion and in aiding oxidation. Oxidizing agents appear unnecessary in the presence of binding agents. Mineral oil is a satisfactory binding agent. Polyethylene serves the same purpose as mineral oil; additionally, it is a suitable liner for most pesticide containers. Combustible pesticides should be packaged in light polyethylene packs or bags surrounded by a combustible container such as corrugated or fiber cartons. (This document is retained in the SWIRS library.)
[23779]

73-4529

SCOTT, R. C. The role of the Extension Service in the disposal of pesticides. *In* Proceedings; National Working Conference on Pesticide Disposal, National Agricultural Library, Beltsville, Maryland, June 30-July 1, 1970. p. 124.
The author discusses the role of the Extension Service of the U.S. Department of Agriculture in

programs relating to disposal of pesticides and used pesticide containers. That role is educational. It involves helping people understand the nature of the problem; laws relating to disposal; information about alternative means for disposal; and relaying problems to the research staff. The approach to this role varies from State to State, depending on their laws. A pesticide coordinator is at each Land-Grant University campus who has, as part of his responsibility, to maintain liaison with State regulatory agencies. He also works through Extension specialists to inform people about methods and programs for disposal of pesticides and containers. (This document is retained in the SWIRS library.)
[23780]

73-4530

SHUMAN, F. L., JR. Incineration technology progress report. *In* Proceedings; National Working Conference on Pesticide Disposal, National Agricultural Library, Beltsville, Maryland, June 30-July 1, 1970. p. 103-107.
Research on incineration of pesticides was conducted under a U.S. Department of Agriculture grant. Objectives of the research include determination of combustion temperatures and volatile products of selected pesticides, investigation of the use of chemicals and other materials used in decomposition of pesticides and containers, investigation of the use of indigenous soil microflora as an aid in decomposition of pesticides in soils, determination of the requirements for pesticide containers that are readily combustible, and development of specifications for an incinerator or other device for the disposal of pesticides and containers. Recent major efforts have been concentrated in model-prototype studies relating to incineration as a method of disposal for left-over pesticides. A model incinerator could only be a scaled-down version of a large incinerator, since incineration is a chemical reaction and since chemical reactions cannot be modelled according to the principles of dimensional analysis and similitude. However, the nature of chemical reactions is not influenced by the magnitude of the quantities of the materials involved; thus a small-scale model using the same design as a large unit would yield quantities of effluent gasses which were proportional to those emitted from a large incinerator. The model would comprise a primary combustion chamber, a secondary combustion chamber, a liquid pesticide feed system, a system for metering and monitoring the fuel, air, and pesticide input, and a system for sampling and monitoring effluent gasses. Operating conditions were established on the basis of previously determined temperature requirements (900 C, 1652 F). In order to maintain this temperature, required input rate of butane was 0.95 cu ft per minute and corresponding air input rate was 32 cu ft per minute. Variables involved in the study were liquid pesticide feed rate, excess primary combustion air, and excess secondary combustion air. Various pesticide-fuel-air rates were tested to determine the optimum ratio for minimizing noxious off-gasses. Sulfur dioxide concentration was a maximum at a pesticide injection rate of 1.82 gal per hr. This series of tests did not produce data which would provide for an accurate prediction equation for predicting the performance of the prototype from that of the model. (This document is retained in the SWIRS library.)
[23781]

73-4531

Suggestions of the ten study groups. *In* Proceedings; National Working Conference on Pesticide Disposal, National Agricultural Library, Beltsville, Maryland, June 30-July 1, 1970. p. 131-141.
The National Working Conference on Pesticide Disposal has concluded its proceedings with the recommendations of the study groups operating at the Conference. Each of the ten has made very specific recommendations relevant to their areas of concern. These groups and some of the subgroups are listed. Group I dealt with community disposal including collection and temporary storage. Subsumed in the Group are container disposal and 'banned' chemicals. Group II dealt with recycling alternatives. Group III worked on incineration ideas. Group IV, alternate uses, was broken down into home and garden supplies, and large stocks. The fifth group discussed ground disposal including individual user and mass disposal from collections, etc. Group VI, long-term storage, was concerned with the storage of

pesticide wastes and containers for at least 5 years pending construction and availability of approved disposal facilities. Group VII dealt with packaging and contamination recommendations. Industrial and plant disposal was the working topic of Group VIII. Group IX discussed collection at retail stores and individual users. The final group, Group X, analyzed use of sanitary landfills and concluded that they are acceptable for detoxified pesticides and detoxified containers. (This document is retained in the SWIRS library.)
[23782]

73-4532

TABOR, E. C. Air pollution problems of pesticide disposal. *In* Proceedings; National Working Conference on Pesticide Disposal, National Agricultural Library, Beltsville, Maryland, June 30-July 1, 970. p. 99-101.
One important component of air pollution control is the development of air quality criteria, as required by federal legislation for each pollutant designated by the Department of Health, Education, and Welfare. Publication of the criteria document for pesticides is scheduled for 1975. Only a small amount of data on ambient concentrations of a few pesticides is available now. Measurement of air-borne pesticides is difficult because of the large variety and numbers being used, lack of suitable collection methods, and analytical problems encountered. When considering the pesticide disposal problem, one must contend with not only the pesticides themselves, but also containers, treated materials, soil residues, and other factors. The author gives examples of the attendant problems encountered in combustion of pesticides; specifically discussed are compounds usually considered as organics, nitrogen-containing organic compounds, chlorinated organic compounds, thiophosphates, and biocides containing metals. Disposal by burying may result in decomposition of unstable biocides which yield gaseous products that could pollute the air. The most difficult problem concerning air pollution appears to center on disposal of vast amounts of biocides left as residues on vegetation, debris, and in the soil. Carriers may transport such biocides for great distances. DDT was found in dust samples in Cincinnati which originated in Texas, for example. Perhaps it would be economically feasible to treat pesticides as raw chemicals and reprocess them into more useful materials. No really satisfactory method for their disposal without contributing to air pollution may be possible. (This document is retained in the SWIRS library.)
[23783]

73-4533

WAGNER, K.-H., AND I. SIDDIGI. Gefaehrliche stoffe in bodenverbesserungsmittein. [Dangerous substances in soil improving agents.] *Naturwissenschaften*, 60(3):160-161, 9713.
Refuse, sewage sludge and compost are used on a large scale for agricultural purposes. Analysis of compost and sewage sludge showed that high concentrations of toxic arsenic, lead, cadmium, mercury as well as of the polycyclic aromates like 3,4-benzpyrene and 3,4-benzfluoranthene were contained in these substances. As sewage sludges and compost are used as soil improving agents especially in viniculture their continuous application leads to accumulation of these dangerous substances not only in the soil but also in plants and vegetables so that a harmful influence on the environment is the consequence. (Text in German)
[23784]

73-4534

WINTERLE, E. R. Report of state programs0 Florida. *In* Proceedings; National Working Conference on Pesticide Disposal, National Agricultural Library, Beltsville, Maryland, June 30-July 1, 1970. p. 59-70.
In 1969 the Florida Pesticide Law was amended to provide for 'restricted pesticides', such as DDT. Such a pesticide was defined, and it was further stated that it is unlawful to hold, offer for sale, sell, or distribute such pesticides without a license and unlawful to use such without a permit. This amendment left many restricted pesticides in the hands of persons with no permit to allow possession or use. By April of 1970 considerable pressure had developed for State and federal officials to provide the public with a way to dispose of these persistent chemi-

cals without endangering public health or the environment. The U.S. Department of Agriculture had initiated plans to install an incinerator for disposal of pesticides in the Southeast, probably in Mississippi, so each County Extension Agency was asked to designate collection stations in the area. A publicity campaign was urged in the communities to encourage people to take advantage of this disposal program. Metal containers are used to seal and transport the pesticides to an underground storage bunker to await disposal at the new incinerator. It is still legal to burn bags and combustible containers in all counties of the State except Dade (Miami area). A copy of the Florida law governing pesticide handling is included. (This document is retained in the SWIRS library.)
[23785]

73-4535

WITT, J. M., J. CAPIZZI, W. S. STATON, AND R. L. GOULDING. Considerations preliminary to development of a waste pesticide management system. *In* Proceedings; National Working Conference on Pesticide Disposal, National Agricultural Library, Beltsville, Maryland, June 30-July 1, 1970. p. 85-88.
Oregon is attempting to develop a method of disposing of pesticides and pesticide containers. One project is an experimental waste pesticide and pesticide container disposal system in Klamath County; the basis for this disposal is the hypothesis that complete degradation can be effected through chemical alteration and subsequent soil-surface disposal of the these waste pesticides by means of the soil microorganisms and other degradative methods. The Oregon State Department of Agriculture and its Advisory Committee on Synthetic Chemicals in the Environment are in the preliminary stages of developing Statewide plans to govern waste pesticide practices. The four major components of any pesticide program are discussed here. These four elements are: transport to accumulation sites; accumulation site location and design; ultimate disposal; and a monitoring system. Three types of disposal can be considered. Containers perhaps can be decontaminated and reused, or crushed after cleaning and landfilled. Pesticides may also be suitable for landfill but only if the site is hydrologically sound. Waste liquor can be held in lagoons or tanks for biological degradation. Incineration of both containers and pesticide is a third alternative. (This document is retained in the SWIRS library.)
[23786]

HEALTH/SAFETY

73-4536

GOETTSCHING, H. Infektionsgefaehrdung durch haushaltmuell. [House-garbage and bacteria.] *Staedtehygiene*, 23(6):141-144, June 1972.
Results of an opinion poll conducted with physicians and of related investigations on the presence of pathogenic germs in domestic refuse are reviewed. The health-hazard spectrum of domestic refuse ranges from insignificant to epidemic risk according to different experts. Vectors of leptospirosis, typhus, paratyphus, salmonellenteritis, brucellosis, tularemia, hepatitis, poliomyelitis, tetanus, botulism, tuberculosis, and trichinosis were detected in refuse, and also protei, Pseudomonas aureginosa as well as streptococci and staphylococci were found. Virulences of pathogenic germs such as poliomyelitis virus, Salmonella, Brucella abortus, Clostridium tetani, Bacillus anthracis, Spirochaeta icterohaemorrhagiae and Ascaridia larvae under natural conditions and at elevated temperatures in wastewater, manure, garbage, trash, or soil are given. (This document is retained in the SWIRS library.)
[23787]

73-4537

GOETTSCHING, H. Krankheiten durch muell--vorschlaege zur abhilfe. Illnesses caused by refuse--corrective proposals.0 *Staedtehygiene*, (10):230-236, 1972.
Many types of disease are transmitted because of deficiencies in the system of refuse collection and disposal. Refuse bins and containers which are used by several householders are often placed in a corner which is easily accessible to children, dogs, and other animals. Particularly dangerous in this connection are medical laboratories and institutes which do not remove their refuse separately, but together with other

domestic waste. It is absolutely necessary that medical and hospital refuse should be removed in special plastic bags and collected separately. High-rise buildings should use efficient refuse disposal devices in order to avoid illnesses caused by contact with the refuse. Modern refuse collection vehicles have considerably reduced the danger of infections during this phase of refuse removal. The most harmless method of refuse removal with regard to human health is incineration. Because of the high temperatures in the incineration furnaces all pathogenic germs are absolutely destroyed. The composting method is dangerous, especially if refuse and sewage sludge are composted at low temperatures or without a prerotting process. Germs may remain alive and can be transferred when utilizing the compost. The most doubtful method with regard to the transfer of illnesses is the dumping of refuse. Pathogenic germs in the refuse may get into contact with surface water bodies together with seeping water or may penetrate together with the rain directly into the groundwater. Also, when throwing refuse into gravel pits which are filled with groundwater, pathogenic germs may get into direct contact with the groundwater. Since in the Federal Republic of Germany there is no uniform legislation with regard to refuse removal, it is absolutely necessary that the present laws and regulations must be concentrated and if necessary corrected in order to guarantee that no illness is transferred because of insufficient refuse removal systems. (Text in German)
[23788]

73-4538

HEROLD, W., G. PABST, AND F. SCHOLZ. Sicherheitstechnik, Brandschutz und Hygiene in Muellverbrennung-sanlagen. [Safety, fire protection and hygienic conditions in refuse incineration plants.] *Mitteilungen der VGB*, 52(6):483-490, Dec. 1972.

In order to avoid having refuse collection vehicles fall into the refuse bin the emptying platform should be constructed in such a manner that only a small feeding inlet is left open and the refuse is emptied onto a slide leading into the interior of the bin. Workers in the bin have to be secured by a rope, while the workers at crushers and hammermills must be protected against chips by means of walls provided with security glass. Special clothes must be worn by the personnel cleaning the heating surfaces in order to protect them against acids. Fires in refuse bins, which may develop owing to physical or electrostatic processes, should be fought by stationary fire extinguishing equipment with water or foam. The hygienic situation in refuse bins is critical especially because of the development of dust, the contents of which may rise up to 20 mg per cm m. The refuse dust contains bacteria or toxic substances causing serious illnesses. Therefore, it must be provided that personnel who work directly in the interior of the refuse bin are equipped with dust masks and special clothes. (Text in German)
[23789]

73-4539

MUELLER, G. Hygienische belange bei der vorbehandlung von klaerschlamm. [Concerns of hygiene in the primary treatment of sewage sludge.] *ISWA (International Solid Wastes and Public Cleansing Association) Information Bulletin*, (7):22-27, June 1972.

Hygienic aspects of the primary treatment of sewage sludge are outlined. The presence of pathogens in sewage constitutes a major concern in primary treatment. The behavior of the pathogens in wastewater is influenced by the type of purification treatment applied and the specific morphology and physiology of the germs. Viruses expelled from their host cells, or in dead host cells, remain in a state of repose and have no metabolism of their own, while bacteria are independent and equipped with all the regulating mechanisms and enzyme systems required for producing their cell substance and for reproduction. The organic matter contained in wastewater or in sewage sludge may sustain such heterotrophic, pathogenic organisms whose reproduction is, however, hindered by other external factors, such as absence of body temperature and the presence of protozoa, enzyme systems, and chemical compounds. The behavior of pathogens in sewage sludge is also influenced by differences in its composition and certain metabolic performances or particularities of their metabolism (e.g., lipid accumulation, need

for animal protein, faculty of attaining permanent form, and the ability to exist in anaerobic medium). It is thus evident that not only do bacteria and viruses behave quite differently during the purification process but also that, depending on the kind of bacteria, the influence of aerobic or anaerobic sludge stabilization must be quite different. This means that observations of one species can not be generalized for other species, and that the degree of stabilization or mineralization cannot be taken as criteria for the presence or absence of pathogens. Sludge stabilization, whether it be aerobic or anaerobic, cannot be regarded as a disinfection process. Investigations revealed no decrease in the number of pathogens in raw sewage for the last few years, and even increased incidence of hepatitis, salmonelloses and bovine cysticercosis was noticed. Pathogens are transmitted in a closed cycle from an infected human through sewage sludge used in agriculture back to humans or animals again. (Text in German)
[23790]

INCINERATION

73-4540

BARNISKE, L. Muellbeseitigung durch Verbrennung. [Waste disposal by incineration.] *Schriftenreihe der Vereins fuer Wasser-, Boden- und Lufthygiene*, (38):219-226, 1972.
In the Federal Republic Germany (FRG) about 30 large incinerators are presently in operation burning the waste of 20 percent of the population. The heating value of trash in the FRG ranges between 1,200 and 2,000 kcal per kg on the average, with the minimum being 800 kcal per kg and the maximum at 3000 kcal per kg. The combustion chambers of incinerators are mostly operated with temperatures between 850 and 1,200 C. The solid residual matter from incineration amounts to 10 and 16 percent of the initial volume. The flue gases developing amount to between 4,000 and 5,000 cu m per ton of trash. The flue gases carry along 2 to 10 percent of the charged trash weight in the form of fly ash. According to legal regulations the dust emission by incinerators may not exceed 250 mg per cu m. This concentration is reached only with electrostatic precipitators. For the cleaning process in electrostatic precipitators the flue gases must be cooled at least to 350 C. In most cases the most efficient form of flue gas cooling is the use of the flue gas heat for power production or for heating. If this is not feasible the combined incineration of trash and sewage sludge provides an alternative with the liberated heat used for drying the sludge. No such incinerator is in operation yet, however, in the FRG. Measurement of the hydrogen chloride emissions in the vicinity of incinerators in Germany has shown that the maximum allowable emission concentration laid down in the Verein Deutscher Ingenieure (VDI) guidelines has not been exceeded in a single case. (Text in German)
[23791]

73-4541

BECKERT, P. Bau und Betrieb der Muellverbrennungsanlage Zuercher Oberland. [Construction and operation of the incinerator at Zuercher Oberland.] *VGB Kraftwekstechnik*, 53(3):139-144, 1973.
The new incinerator at Zuercher Oberland, Switzerland, is described. The waste material is loaded into the charging funnel of the incinerator by a semiautomatic crane. The refuse storage bunker has a volume of 2,000 cu m. The refuse is pushed onto the grate through a water-cooled shaft in the lower section. The grate has been designed for a capacity of 5.0 tons per hr and for heating values ranging from 1,100 to 2,200 kcal. The gate area available for combustion covers 15.4 sq m. The flue gases are cooled in a Sulzer radiation boiler with a capacity of producing 12.5 tons per hr of steam. The flue gases leaving the boiler have a temperature of 230 to 240 C and a dust concentration of 2.5 to 3.0 g per cu m. They are cleaned in an electrostatic precipitator to a residual dust concentration of less than 100 mg per cu m. The slag is tapped off together with the ash and the fly ash is collected in the electrostatic precipitator. The grate is a backward stoking grate. Measurements of the dust concentration in the cleaned gas yielded an amount of 74 mg per cu m. A cost calculation yielded gross operating costs of 18.70 deutsche marks per ton of refuse. The gain from the sale of electricity reduces this cost to 9.35 deutsche marks. In the

spring of 1973 a second and third incinerator boiler unit will be put into operation. Each unit will have a throughput of 150 tons per day. (Text in German)
[23792]

73-4542

CIAFFONE, C. P., C. A. RICHMOND, AND A. W. GRAHAM, JR. System and process for conveyance and incineration of waste material. Canadian Patent 919,510. Issued Jan. 23, 1973.
This is a closed system for conveying sewage sludge from filters and incinerating it. This system is efficient, sanitary, and odorless. A pneumatic ejector is used in conjunction with a receiving means, a discharge pipe, and an incinerator. This provides a means for collecting the waste and subjecting it to sufficient air pressure so as to convey it to the incinerator. The manual operation is limited to one loading and unloading step. By keeping the line sealed in transferring the waste up to a high level and into the incinerator, movement, transfer, and discharge of the waste is accomplished. The use of a flared adapter as the connection between the discharge pipe and the incinerator serves to spread the charge as it enters the incinerator. The closed system also allows the operation to be performed sanitarily and confines the odor which is inherent in handling such waste. The air pressure in the system ranges from 5 to 100 lb per sq in.
[23793]

73-4543

COLLEY, D. G., C. A. SNYDER, AND R. M. LELIAERT. Dust collector. Canadian Patent 924,247 owned by the Wheelabrator Corporation, South Bend, Indiana. Issued Apr. 10, 1973.
This device is an apparatus for removal of solids from gaseous medium by the use of a filter surface in the form of filter tubes from which the filter cake is removed by a reverse burst of high pressure gas without stopping filter flow and in which the gaseous medium with suspended solids is baffled for introduction into the filter section in a manner not to interfere with the disposal of the removed filter cake and to enhance solids separation.
[23794]

73-4544

CROSS, F. L., JR. Agricultural waste disposal by incineration. *In* Handbook on incineration. Guide to theory, design, operation, and maintenance. Westport, Connecticut, Technomic Publishing Co., Inc., 1972. p. 53-54.
Of the 2,280 million tons of solid waste produced in the United States in 1968 about half was agricultural wastes. Historically, most of this waste has been returned to the land, but the industrialization of agriculture has rendered this traditional solution economically unsound. A large portion of this type of waste is crop residue. If this residue has been generated at a plant, it can be burned to provide heat or power. Incineration of agricultural waste is a field in which very little has been done. (This document is retained in the SWIRS library.)
[23795]

73-4545

CROSS, F. L., JR. Costs of incineration. *In* Handbook on incineration. Guide to theory, design, operation, and maintenance. Westport, Connecticut, Technomic Publishing Co., Inc., 1972. p. 48-49.
Costs of incineration depend on the equipment and the system used. Installation costs vary from about $13 per lb per hr of capacity for commercial incineration installations to $20,000 per ton of installed capacity for municipal incinerators. To upgrade such large units costs around $12,000 per ton of daily capacity. A table is presented which gives the relative costs of the different types of units0 commercial, municipal, pit, auto body, conical, pathological, sludge, and apartment house. Costs are given in each of four subcategories0 capital costs, installation, maintenance, and operating. Another chart shows that incinerator and scrubber costs are not directly proportional; at a capacity of around 630 lb per hr incinerator costs begin to rise much more abruptly while scrubber costs begin to level off. Approximate costs for control equipment that would be applicable to incinerators are presented on a dollar per actual cu ft of gas handled basis. (This document is retained in the SWIRS library.)
[23796]

73-4546

CROSS, F. L., JR. Determining emissions from incinerators by sources testing. *In* Handbook on incineration. Guide to theory, design, operation, and maintenance. Westport, Connecticut, Technomic Publishing Co., Inc., 1972. p. 43-47.

The trend in State capitals is to set air pollution standards by the 'State of the Art' technique, which means that as soon as any industry utilizing a specific process reaches a new lower emission level, all new plants of that type are required to meet the new standard. The most exact and desirable method for determination of atmospheric emissions is source testing. However, this is also the most difficult and expensive method. The most common applications of source testing data are evaluation of a plant for compliance with air pollution control regulations and in design of air pollution control equipment. Emission standards for industries are being adopted by the Environmental Protection Agency (EPA), and this agency has recently issued new test procedures for stack emissions. The advantages of the EPA system are that it presents a single national source testing procedure, utilizes available test equipment, established more uniform flow control conditions in the sampling train, and it improves isokinetic sampling. Diagrams are presented that show both the American Society of Mechanical Engineers and the EPA sampling trains. Isokinetic sampling is one of the most controversial functions of emission monitoring; definition of particulate matter is another thorny point. (This document is retained in the SWIRS library.)

[23797]

73-4547

CROSS, F. L., JR. Future trends in incineration. *In* Handbook on incineration. Guide to theory, design, operation, and maintenance. Westport, Connecticut, Technomic Publishing Co., Inc., 1972. p. 55-57.

The Environmental Protection Agency projects that by 1977 the amount of solid waste generated in the United States will increase to 13.7 lb per day per capita. That incineration will be called upon to reduce the volume of all this refuse is inevitable. Ocean disposal is coming under increasing regulation, composting seems uneconomical, and the markets for recycled materials are not sufficiently great to make resource recovery for most refuse pay. It is the projection of this author that the current sanitary landfill boom will peak around 1975, after which time the need for energy and the scarcity of suitable land near population centers will encourage incineration. Large municipal incinerators with waste heat recovery equipment will replace smaller commercial and onsite units, and many industrial wastes will also be incinerated, either because of new disposal laws or in order to recover some valuable metal. A list of experimental slagging or waste heat incinerator systems is given. Charts present the projections for disposal systems until 1980. (This document is retained in the SWIRS library.)

[23798]

73-4548

CROSS, F. L., JR. Handbook on incineration. Guide to theory, design, operation, and maintenance. Westport, Connecticut, Technomic Publishing Co., Inc., 1972. 64 p.

This handbook on incineration describes incineration as a method of volume reduction and points out that some ultimate disposal method is needed for the residue. Incinerator classification is given, along with descriptions of the classic types of units and basic elements of design. Special types of incinerators such as conical burners, open pit, starved air, and pathological incinerators are also covered. Air pollution control, incinerator costs, maintenance, resource recovery, and future trends are discussed in subsequent chapters. A bibliography is provided, as well as appendices showing available films on solid waste management, quantities of refuse expected from various types of establishments, and refuse classification schemes, and a short glossary defining terms in the solid waste and incinerator fields. (This document is retained in the SWIRS library.)

[23799]

73-4549

CROSS, F. L., JR. Incineration of industrial wastes. *In* Handbook on incineration. Guide to theory, design, operation, and maintenance. Westport, Connecticut, Technomic Publishing Co., Inc., 1972. p. 26-32.

This section of the document discusses the various types of incinerators especially well suited to the disposal of industrial wastes, a class of materials that may be very heterogenous. Slurries, sludges, and other liquid/solid mixtures can be fired into multiple hearth, fluidized bed, or wet air oxidation units. Plastics, tars, and sticky or viscous wastes burn in rotary kiln incinerators. Liquid waste incinerators are usually quite simple in design and construction, the basic principle being the atomization of the waste. Contaminants in the waste such as chlorine require air pollution control equipment tailored to the specific waste and type of incinerator. Open pit incinerators will burn wood wastes and other low-ash high heat materials, but particulate discharges from these installations are often troublesome. For limited amounts of various types of wastes it is frequently necessary to have several different incinerators, each fairly small. A table of the characteristics of small capacity systems is given. There is also a rating chart to aid management in deciding what type of incinerator is best for the particular waste each plant has to deal with. A systems approach should be used to maximize the efficiency of waste handling, permit resource recovery, and minimize the waste at the source. (This document is retained in the SWIRS library.)
[23800]

73-4550

CROSS, F. L., JR. Methods of air pollution control. *In* Handbook on incineration. Guide to theory, design, operation, and maintenance. Westport, Connecticut, Technomic Publishing Co., Inc., 1972. p. 33-39.

The emissions associated with incinerators are smoke, odor, and particulates. Control over smoke and odor can be accomplished by good design and operation of the unit, especially temperature control. To control particulates, control equipment must be added to the incinerator. An incinerator environmental rating chart is shown to compare the impact of various types of incinerators on the environment. Up to now, most incinerators, especially the smaller ones, have been equipped with only low energy control devices such as expansion chambers or baffled spray chambers. As pollution standards become more strict, high energy units are needed; these include electrostatic precipitators and high energy scrubbers, such as Venturi scrubbers. Regulatory officials are becoming more intolerant of the less obvious types of pollutants, like metals, organic acids, and chlorides. These are not removed by electrostatic precipitators. Scrubbing systems will remove them, although in some cases an absorbent such as caustic must be used to extract the gasses. A chart relating the control devices that may be applicable to each incinerator type for the reduction of visible emissions, odor, and particulates is presented. (This document is retained in the SWIRS library.)
[23801]

73-4551

CROSS, F. L., JR. Operation and maintenance of commercial sized units. *In* Handbook on incineration. Guide to theory, design, operation, and maintenance. Westport, Connecticut, Technomic Publishing Co., Inc., 1972. p. 23-25.

Although large incinerators are usually operated by unionized operators with special training and job descriptions, this is very rarely the cost with smaller onsite units. Janitors and other personnel running these small incinerators are frequently completely ignorant of the basic principles of incineration and the routine maintenance needed to control burning and air pollution. Only New York City has programs of training and licensing operators; this system should be widely copied. The items in incinerator operation that are controlled by the operator are burning rate, draft, auxiliary burner, and air pollution control equipment. The burning rate is dependent upon a constant feed and maintaining a uniform type of fuel entering the unit. The draft is regulated by the barometric damper and by the individual overfire and underfire air adjustments above and below the grates in the primary combustion chamber. Temperature in the in-

cinerator is regulated by the waste feed and by the auxiliary burner. Air pollution control equipment will require special operator training. Suggestions are made as to how to improve combustion efficiency, reduce corrosion, extend refractory life, and reduce emissions. (This document is retained in the SWIRS library.)
[23802]

73-4552

CROSS, F. L., JR. Resource recovery through incineration. *In* Handbook on incineration. Guide to theory, design, operation, and maintenance. Westport, Connecticut, Technomic Publishing Co., Inc., 1972. p. 50-52.
Current thinking in the incineration community today is that the most satisfactory solution to the resource recovery dilemma is to devise a system which will combine resource recovery from components of refuse as well as energy recovery by means of waste heat utilization for heating or power generation. The typical incinerator in such a layout will have a front-end system for upgrading the refuse and making it uniform in size and quality. The metal and glass can be removed at this point or can be reclaimed from the residue after burning. The remaining residue can be used as an aggregate for construction. The Bureau of Mines has a plant to reclaim values from incinerator residue at College Park, Maryland. The debate over whether metal and glass should be left in to aerate the burning mass or removed before charging continues. Contamination of both metal and glass result from incineration, but there are also damages to the incinerator itself. If the residue must be landfilled, the cost of this disposal will lower the economic desirability of this system. (This document is retained in the SWIRS library.)
[23803]

73-4553

CROSS, F. L., JR. Special use incinerators. *In* Handbook on incineration. Guide to theory, design, operation, and maintenance. Westport, Connecticut, Technomic Publishing Co., Inc., 1972. p. 14-22.
Four types of special use incinerators are discussed in this chapter0 conical burners, open pit, fluidized bed, auto body incinerators, pathological units, starved air, flue fed, and apartment house units. The conical burner is very cheap and simple to build and operate, but is not suitable for refuse. Originally designed for disposal or of sawdust and wood wastes, it burns refuse incompletely and with a great deal of air pollution. To control emissions on such a unit costs more than the incinerator itself. The open pit incinerator was developed by Du Pont to burn high density/low ash materials, such as wood waste. The process is a batch one, and air pollution potential necessitates a buffer zone around the installation to prevent particulate matter from falling on neighboring areas. Although this unit has been used to handle refuse, it is not usually used for this purpose and is probably not particularly suitable for this type of waste. Pathological incinerators are used to oxidize organic materials at clinics, hospitals, and SPCA's. Because these wastes have such a high water content, a drying grate and secondary chamber are essential. Auto body incinerators are being replaced to a large extent by shredders, but incinerators, in conjunction with or in place of shredders, are often feasible for a regional auto disposal plan. Modification costs for apartment incinerators to control air pollution are estimated. (This document is retained in the SWIRS library.)
[23804]

73-4554

CROSS, F. L., JR. Trends in air pollution regulations. *In* Handbook on incineration. Guide to theory, design, operation, and maintenance. Westport, Connecticut, Technomic Publishing Co., Inc., 1972. p. 40-42.
The principle areas of regulatory activity with regard to air pollution from incinerators are smoke or visible emissions, odor, and particulates. Standards in all three areas are becoming more stringent. A typical example of this downward trend is in particulate emissions, in which the EPA passed a standard of 0.08 grains per cu ft for incinerators. This can be compared to the 1949 standard set by the American Society of Mechanical Engineers of 0.85 lb of particulates per 1,000 lb of flue gas, which is approximately equivalent to 0.41 grains per at standard

cu ft. Permissible visible emission levels are also being lowered; a number of States have now passed a No. 1 Ringlemann limit, and 0 visible emissions limits are anticipated for the near future. Soon the Ringlemann Chart will be abandoned for the opacity rating for both white and black plumes; 20 percent opacity will probably be the permissible level for incinerator stacks. (This document is retained in the sWIRS library.)
[23805]

73-4555

DARNSTAEDT, T. Staedteportraet: Frankfurt. Notfalls 'ein taschentuch vor den mund.' [The city portrait: Frankfurt. 'In emergencies a handkerchief around the mouth'.] *Umwelt*, 3(2):32-34, 1973.
Although Frankfurt is plagued by air pollution and water pollution it has solved the trash disposal problem. The city's trash is burned in a large incinerator. The heat produced by this process is used for heating the entire northwest area of the city. The only emission source in this area is the stack 110 m high rising from the incinerator. The former dump site of the city was turned into a recreation area. It still gives off polluting substances into the groundwater. (Text in German)
[23806]

73-4556

EMU, O. Purashineta--Morinaga purasuchikku senyo shokyakuro. M. O. Placinator--Morinaga--plastic incinerator.0 *Kotai Haibutsu*, (8):134-135, Dec. 1972.
The M. O. Placinator features a newly developed air-blowing system by which black smoke and offensive odors can be completely removed, a combined performance of the water-cooled wall structure and the natural convection of hot air, a simple and compact small structure having a total weight of 1 ton and a set-up area of only 2 sq m. The waste hot water can be easily used, and the unit has a very inexpensive cost of installation. This Placinator is suitable for plastic product makers, rubber product processors, schools, hospitals, hotels, and others who create a great quantity of plastic and rubber wastes. The required area for the installation of the furnace is only 1 by 2 m for type 10 and type 20. The method of combustion is a forced air system, and the available burning capacity is 10 to 15 kg per hr for type 10 and 20 to 25 kg per hr for type 20. The hot water supplying capacity is 430 liters per hr for 90 C temperature hot water, and 624 liters per hr for the 80 C temperature hot water. (Text in Japanese)
[23807]

73-4557

ENKE, C. Korrosionsschaeden und ihre Verhuetung. [Corrosion damages and their prevention.] *Wasser Luft und Betrieb*, 17(3):82-85, 1973.
One of the most problematic and corrosion-prone air polluters is the incinerator. As soon as combustion takes place in a reducing atmosphere, hydrogen sulfide is formed apart from carbon monoxide if sulfur-containing material is burned. Even in an oxidizing atmosphere corrosion cannot be avoided because sulfur dioxide and sulfur trioxide are formed, the latter mainly in the presence of of excess air. In incinerators an ideal conduction of the combustion process is not feasible because of the varying composition of refuse material. However, through the operation with excess air plus continuous monitoring of the oxygen concentration and of the gaseous pollutants such as sulfur trioxide, hydrogen chloride, and nitrogen dioxide, less corroding combustion can be achieved. Corrosion problems occur also in electrostatic precipitators used for dust collection in industrial off-gases. Such gases frequently contain up to 50 percent water vapor by volume. The walls of the precipitator can be efficiently protected against this corrosion by avoidance of undercooling. Any protection of the walls of electrostatic precipitators installed behind modern steam generators where the flue gas has a temperature of 145 C remains difficult. In this case corrosion is unavoidable with the present state-of-the-art. (Text in German)
[23808]

73-4558

Fudojirushi taika seihin0 beikoku J-M-sha no gijutsu teikei ni yoru. [Fudo refractory products0 by arrangement with J-M in the U.S.] *Kotai Haibutsu*, (18):106-107, Dec. 1972.

The Fudo acid-proof castable products, STR-120, STR-100, and STR-80, as an internal lining material for the incinerators and their fire flue and the desulfurization equipment requiring an acid resistance, and the plastic high-ALS as a lining material for the alkaline waste liquid incinerator are introduced. The acid-proof castable product, composed of the burnt agalmatolite, silicate powder, artificial light aggregate, powdered sodium silicate as a binder, and a curing agent and a plasticizer, has a strong corrosive resistance against the acid gases such as sulfuric acid gas, sulfuric acid and chlorine gases, and the acid liquids such as sulfuric acid, hydrochloric acid, and nitric acid, and has a heat resistance up to 800 to 1,200 C together with a relatively stable high strength after being heated. The setting time of this product in construction work is 2 to 4 hr for the first setting, and for the final setting is 24 to 48 hr, thus developing the prescribed strength in an early stage. The compressive strength is 130 to 300 kg per sq cm at 110 C and 200 to 240 kg per sq cm at 1,000 C for the spray work. The bending strength is 45 to 90 kg per sq cm under the same condition, and the thermal conductivity is 0.42 to 0.65 kcal per mhr C at 250 C. (Text in Japanese)
[23810]

73-4559

Furukawa no odei kanso shokyaku sochi, shokyakuro-yo denki shujin sochi. [Furukawa type drying and incinerating equipment for sludge, and electric dust collection equipment for incinerators.] *Kotai Haibutsu*, (8):112-113, Dec. 1972.
This is a type of drying and incinerating equipment for sludges, such as for sewage sludge, water-containing organic matter, waste oil-containing sludge, and factory wastes. It is provided with an air-current drying having a drying capacity of 80 tons per hr, a rotary fire grate as the main burning means, a kiln as the secondary burning means, a wet type dust collecter and deodorizing equipment. The sludge is fed to a mill, then sent into a drying tube where it is dried using hot air from the incinerator. It is, then, completely burned out in the main combustion chamber and the secondary combustion chamber. The unique feature of the equipment is that the two burners of the incinerator achieve rapid drying and combustion with a good efficiency. The great coefficient of the heat capacity of the air-current dryer makes the scale of the equipment smaller. Different kinds of wastes having different combustion rates can be regulated to a constant rate, thus raising the efficiency of combustion. The equipment has the three available types, I, II, and III. Of these, type I has a disposal capacity of 1 to 5 tons per hr, the type II0 1 to 7 tons per hr, and the type III0 two capacities, 1 ton per hr and 3 tons per hr. (Text in Japanese)
[23811]

73-4560

IWAI, S., AND H. HARUYAMA. Purasuchikku haikibutsu to toshi gomi shokyakuro no mondaiten to taisaku. [Problems and countermeasures for a combined plastic waste and city waste incinerator.] *PPM*, 4(1):21-30, Jan. 1973.
It is estimated by the two writers that out of the 11,000 tons a day of plastic waste produced, 8,000 are mixed with city wastes. The repair costs of incinerators have been climbing since 1968, when the percentage weight of plastic wastes was 5 to 8 percent, because the present type of incinerator is not suitable for burning plastics. It is comparatively simple to deal with hydrogen chloride and to eliminate nitrogen oxides. Separate collection of plastic wastes would increase collection costs which, even now, are rising 6 to 12 percent every year. Technical problems in incinerating plastics are: plastics get melted and cause a high temperature flame, both of which damage the incinerator; there is corrosion of the incinerator due to acidic gas generated when polyvinyl chloride and similar plastics are burned; there is very much smoke; and problems arise from heavy metals in paints and plasticizers. A new type of stoker was developed and tests were made at a pilot incinerator with 2.63 cu m capacity, with mixed wastes. With an efficient stoker, draft around the incinerator floor was good, increasing its capacity (sometimes reaching 480 kg) and temperature sometimes exceeded 1,200 C. However, soot and dust were emitted because the flame frequently got in contact with the wall which was not sufficiently heated. If exposed metal parts are maintained at 40 to 120 C, there

is no corrosion due to hydrogen chloride. If the waste gas temperature is reduced to less than 100 C, a rubber lining or plastic coating can be used to prevent corrosion. For elimination of fly ash, an electric dust collector is better than a Venturi scrubber. (Text in Japanese)
[23809]

73-4561

KOTTMANN, E. Erfahrungen beim Betrieb von Abfallverbrennungsanlagen mittlerer Groesse. [Experience with the operation of medium size incinerators.] *Luftverunreinigung*, 36-37, Dec. 1972.
Medium-sized incinerators have throughput capacities up to 1,500 kg per hr. They are used for burning waste in department stores, hospitals, and apartment houses. Dust concentration measurements taken in these incinerators have revealed that the limit value of 150 to 200 mg dust per cu m (referred to 7 percent carbon dioxide, 0 C and 760 torr) set by the Technical Directives for the Maintenance of Clean Air is in most cases exceeded. Although a combustion temperature of 800 C is reached the gases do not remain long enough in the afterburning zone because it is not large enough in most cases. For dust cleaning of these gases centrifugal separators in the form of simple cyclones or multiklones are used exclusively. These collectors have a low collection efficiency for fine dust. The incomplete combustion plus the unsatisfactory dust removal has in many cases led to an abandoning of incineration in favor of dumping. The problem could be solved by installation of more expensive equipment such as electrostatic precipitators or by the joint operation of a large incinerator by several medium-size enterprises. (Text in German)
[23812]

73-4562

LARUE, P. G. Smokeless and odorless domestic incinerators. Canadian Patent 924,189 owned by Calcinator Corporation, Bay City, Michigan. Issued Apr. 10, 1973.
The invention described related to incinerators for burning various kinds of combustible refuse, trash, and garbage. In particular, an incinerator is described which is designed to return off-gasses or byproducts from primary combustion in a separate chamber (more commonly known as the secondary chamber), where these off-gasses or byproducts of primary combustion are led into an atmosphere of temperatures exceeding 1,000 F. They are intermixed with oxygen or passed through a flame commonly known as an afterburner at a predetermined air flow rate so that the gasses are reburned. Since they belong to the hydrogen family, they are reduced to their lowest forms, namely, carbon dioxide and water.
[23813]

73-4563

LEUSCHER, K. H. Massnahmen zur vermeidung von rohrabzehrungen in muellkesseln. [Measures for avoiding corrosion in incinerators.] *VGB Kraftwerkstechnik*, 53(2):87-93, 1973.
Pipes in incinerators are subject to corrosion and erosion. Corrosion is the chemical attack of flue gases on the pipes at higher temperatures (low-temperature corrosion is not considered). Such corrosion occurs in incinerators primarily in the combustion chamber and in the first flue. The evaporator, superheater, or intermediate superheater with wall temperatures between 350 and 550 C are mostly affected. After termination of several years of research it can be said that all corrosion on pipes of incinerators burning domestic refuse are due to reactions with chlorine compounds. Erosion is caused by the ash components in flue gases. Erosion occurs increasingly after points of deflection of the flue gas and at points of high flue gas speed. Preventive measures against corrosion and erosion start with the design of incinerators. A sufficiently large design is important to avoid overloading of the combustion chamber which leads to a lack of air. Homogenizing of the refuse and smoother supply of the waste into the combustion chamber are also important preventive measures. The secondary air has an important influence on the prevention of corrosion. The oxygen concentration of the flue gases shall drop below 8 to 9 percent. The incinerator Munich North has been in operation for 32,500 hr and burned 870,000 tons of waste. Apart from erosion-corrosion caused by the soot blower no damages have yet occurred which proves that in-

cinerators can be operated without major pipe damages. (Text in German)
[23815]

73-4564

LINDERMAIER, H. 3,2 MW dampfturbosatz mit kondensationsanlage 'System Heller' der muellverbrennungsanlage 1 in Wien. [3.2 MW steam turbine system with condensation plant 'System Heller' of the refuse incineration plant 1 in Vienna.] *Brennstoff-Waerme-Kraft*, 24(12):445-447, Dec. 1972.
The city of Vienna decided to install in the municipal refuse incineration plant a condensation steam turbine system which transforms the steam into electrical energy. About 25 percent of the generated power is used for the refuse incineration plant itself, while 75 percent is sent to the public power supply system. Three incineration furnaces are equipped with one boiler each, having a refuse demand of 8,000 kg per hr each. The three boilers feed a turbine which drives a rotary current synchronized generator. The waste steam from the turbine is led into a condenser where it is mixed with a cooling condensate. This mixture is divided into one stream of cooling condensate and one of boiler water. The cooling condensate is pumped through the cooling elements in the dry cooling tower, where it is cooled back and fed again into the mixing condenser. The condensation cycle is completely closed so that water and condensation losses are avoided. The boiler water is pumped from the condensate line into containers from where it is fed through a preheater into the boiler again. The cooling tower consists of 12 cooling columns two of them forming a cooling delta each. The cooling elements consist of small rib heat exchangers. The cooling capacity is controlled by changing the quantity of cooling air by means of flaps in the side walls of the tower. (Text in German)
[23814]

73-4565

MK-shiki enkei kikaika bacchi shokyakuro (Tokkyo). [MK-type rotary automatic batch incinerator.] *Kotai Haibutsu*, (8):126-129, Dec. 1972.
This incinerator has a cylindrical structure which is excellent with respect to structural durability, combustion efficient, and the maximum utilization of radiant heat. Especially, in this incinerator suitable for the sewage sludge, or similar ones, the flame can smoothly circle along the round walls and the reflected heat can be effectively concentrated on the center of the furnace, and therefore wastes can be burned out constantly and efficiently throughout the furnace. The incinerator also has an independent drying room for the wastes of a high-water content. The wastes charged from the charging hopper are first sent to the drying room where they are forcibly dried with a 600 to 800 C temperature of combustion gas from the furnace, and subsequently the dried wastes are dropped into the furnace in a fixed quantity so that the temperature of the furnace will be kept constant. The wastes then are burned out inside the furnace with a hot air from the hot air-generating equipment while being stirred. The disposing capacity of this type incinerator is made available in 50 to 60 tons per day. (Text in Japanese)
[23816]

73-4566

Mobiler verbrennungsofen fuer die hausmuellabfuhr. [Mobile incineration furnace for domestic refuse removal.] *U-das technische Umweltmagazin*, (1):53, 1973.
A mobile incineration furnace for the incineration of domestic refuse has been developed working automatically so that no skilled personnel is required and the furnace can be operated by the refuse collection workers. The furnace consists of a feeding system, a rotary furnace, an ash container and a ventilation system. The dimensions of the furnace are laid out in a manner that it can also be driven on the roads. (Text in German)
[23817]

73-4567

Moyasuta shokyakuro. [Moyaster incinerator.] *Kotai Haibutsu*, (8):120-133, Dec. 1972.
This line of incinerator has the three models, the incinerator for animal wastes, the MH-type incinerator for chemical wastes, the patented

recombustion furnace, and special incinerators. Generally, the Moyaster incinerator features the use of a special refractory most suitable for every waste, the structure in which fire-proof and heat insulating bricks are used in the outside of the special refractory to prevent the escape of heat and to enhance its safety and durability, with steel panels covering the inside bricks. The incinerator for animal wastes is typical among others which is characterized by the complete removal of smoke and odors, as well as the complete combustion of wastes by a special post-combustion system. The efficiency of the removal of smoke and odors is more than 99.5 percent in case of this incinerator. To complete the combustion of waste, jet burners, as an assistant means for combustion, are provided, along with plural nozzles, in the combustion room, which permits the flame to go into the inside of wastes and facilitates an instant rise of the temperature inside the furance. (Text in Japanese)
[23818]

73-4568

Muelldraftwerk stellinger moor. [Power generating plant on refuse basis at Hamburg.] *Elektrizitaetswirtschaft*, 72(4):103, 1973.
A new refuse incineration plant with a throughput of 260,000 tons of refuse annually has been taken into operation at Hamburg. It consists of two refuse boilers and furnishes the steam for two turbines fo 16 megawatt providing for power supply. The waste steam from the turbines is condensed in an air condenser. (Text in German)
[23820]

73-4569

Muellkraftwerk stellinger moor arbeitet. [Power generating plant on refuse basis starts operation.] *Energie*, 25(2):53, Feb. 1973.
A new refuse incineration plant with a throughput of 260,000 tons of refuse annually has been put into operation at Hamburg. It consists of two refuse boilers and furnishes the steam for two 16 megawatt turbines providing for power supply. The waste steam from the turbines condenses in an air condenser. (Text in German)
[23819]

73-4570

NITTETSU, K. Sangyo haikibutsu shokyakuro sochi. [Incinerating facilities for industrial wastes.] *Kotai Haibutsu*, (8):102-103, Dec. 1972.
This incinerator is provided with a voltax burner which creates a circling air flow for complete combustion of industrial wastes, additionally involving a mechanism which performs a mechanical stirring process in cases where solid wastes are subject to burning. The voltax burner has a structure which makes a circling flow of the air in the combustion room and sprays a fuel into the air flow. Due to a complete mixture of fuel and air it brings a high rate of generating heat, 9 million kcal per cu m per hr. In the voltax burner, 90 percent of the combustion is completed inside the burner and the length of flame is 450 to 600 mm, so that no more combustion room is required. For example, the cylindrical side long type incinerator for plastic wastes, in which air is blown in a tangential direction, can burn out a 20 to 70 percent mixture of polyethylene and polyvinyl chloride, each of which is crushed to 5 to 7 mm size beforehand, at a supply rate of 15 to 25 kg per hr, an air flow rate of 1.2, a furnace temperature of 1,250 C, and a combustion load capacity of 1.8 million kcal per cu m per hr. In this case, charged wastes stacked up on the bottom of the furnace are soon heated, melted, decomposed, evaporized, and burned in a very short time. This furnace also can burn out the sulfuric acid sludge incapable of predrying. (Text in Japanese)
[23821]

73-4571

Oesterreichische Alpine Montangesellschaft. Muellveraschungsanlagen; ein beitrag zum umweltschutz. [Refuse incineration plant; a contribution to environmental protection.] Vienna, Austria, Mar. 1972. [8 p.]
The brochure describes the design and working principle of the 'Model Zeltweg' prototype incinerator plant of the Alpine Montangesellschaft. It is used for incineration of municipal refuse, which may also include some industrial refuse. Its capacity is about 7 cu m or 2

tons per hr, which means that in single shift operation the incinerator can cope with refuse generated by a town of about 20,000 inhabitants. From the arriving trucks, the refuse is dumped into a receiving bunker, from whence it is transferred by a grab crane into a hopper which feeds it into a horizontally disposed, slightly inclined rotary kiln 1.9 m in diameter and 9 m long. There, due to continuous rotation of the burning refuse, thorough incineration takes place, so that only clinker, ash, and hot fumes emerge from the exit side of the kiln. The flue gases are completely burned in an adjoining combustion chamber. Prior to release into the atmosphere, the flue gases pass through an electrostatic precipitator for removal of suspended dust. The solid residues, on leaving the kiln, drop into a water tank. From there they are conveyed mechanically to the outside, provisionally dumped, and subsequently transferred to proper dumping or landfill sites. It is claimed that this sytem practically eliminates any of the air or water pollution inherent with conventional incinerators. (Text in German) (This document is retained in the SWIRS library.)
[23822]

73-4572

PLIBRICO JAPAN CO., LTD., TOKYO (JAPAN). PM-gata kobunshi haikibutsu shokyakuro. [PM-type high polymer waste incinerator.] *Kotai Haibutsu*, (8):104-105, Dec. 1972.

This incinerator is the one specializing in plastic wastes in which the Plibrico indefinite-type refractory material is employed as a seamless wall having an excellent durability against the corrosive gases peculiar to plastics and high temperature. The furnace structure consists of the first combustion room, the matrix block, and the second combustion room. The first combustion room controls the combustion of wastes and completely converts combustibles to gas, and the gas from this furnace is sent through the matrix block, which is the heart of the incinerator connecting the first combustion room with the second combustion room, to the second combustion room where black smoke, offensive odors, etc., are completely removed. A completely confined state is maintained for a high temperature, and a bad odor peculiar to plasics is also removed. The structure of the furnace is simplified, in addition to the use of the excellent and special refractory material, so that any place tending to cause trouble will be eliminated, and with the furnace, plastic wastes can also be burned in the same way as common wastes. The available capacity of burning wastes covers several types ranging from 15 to 30 kg per hr, 30 to 50, 50 to 75, 75 to 100, 100 to 140, and even over 150 kg per hr. (Text in Japanese)
[23823]

73-4573

POETSCHKE, H. Entstaubung und Verbrennung. [Dust collection and combustion.] *Wasser, Luft und Betrieb*, 17(3):86-91, 1973.

All measures against air pollution require knowledge of the actual pollutant concentration of the atmosphere which necessitates a number of different measurement units. Gas chromatography plays an important role in air monitoring. In the United States it is considered the only useful method for the measurement of hydrocarbons in the ambient air. A unit operating with gas chromatography has been brought onto the West German market. With it carbon monoxide, methane and the total hydrocarbon concentration can be determined. Four, six or 12 fully automatic analyses can be performed per hr. For measurement of the dust concentration indoors and outdoors the konimeter is used. For emission monitoring in a thermal power plant a sampling probe is installed in the stack. The sampling probe is made of special material which does not absorb sulfur dioxide. In the probe head a dust filter is installed. Via a second fine dust filter the gas is pumped to the analyzers (infrared analyzer for sulfur dioxide). For dust removal the electrostatic precipitator and cloth filter are widely used. A review of their operating principle is given. For a new steel manufacturing plant with oxygen lancing converter a wet electrostatic precipitator with water circulation was selected. Another steel manufacturer in West Germany has developed a new method for disposal of its solid waste products by composting to avoid the emissions from incineration. The solid waste material is mixed with sludge from water purification and homogenized in a rotating drum with simultaneous biological decomposi-

tion. A novel underpressure drum ventilation helps to accelerate the decomposition process. (Text in German)
[23824]

73-4574

POHLE, R. Betriebserfahrungen mit der Muellverbrennungsanlage der Stadt Nuernberg. [Operating experiences with the incinerator of the city of Nuremberg.] *VGB Kraftwerkstechnik*, 53(2):93-99, 1973.
The experiences gained with the incinerator in Nuremberg during the first 3 years of its operation are discussed. In order to keep corrosion at the heating surfaces and the electrostatic precipitator at a minimum the incinerator is operated 24 hr a day 7 days a week. Incrustations on the walls of the chamber occurred very soon. Water jets directed parallel to the walls prevented any further incrustations. Extensive measurements of the flue gas composition in the combustion chamber revealed that without secondary air supply carbon monoxide values of more than 0.5 percent occurred locally. The total oxygen concentration was then below about 5 percent. With secondary air injection (about 10,000 cu m per hr) the peak carbon monoxide concentrations dropped in number and magnitude. Through lateral injection the carbon monoxide peak concentrations could not entirely be avoided. It is very likely, however, than an additional frontal injection of secondary air would bring an improvement. The largest carbon monoxide concentrations were measured at those points where corrosions were noticed. Minor disturbances occurred during the charging process through blocking bulky parts and at the slag tap-off through larger iron parts. In the electrostatic dust precipitators dust bridges formed and the screw conveyor for the dust tap-off from the electrostatic precipitators had to be replaced. The specific operating costs for 1971 amounted to 19.58 deutsche marks per ton of waste. (Text in German)
[23825]

73-4575

RASCH, R. Alles wird wieder zu Staub. [Everything returns to dust.] *Umwelt*, 3(1):49-53, 1973.
A comparison of the available solid waste disposal methods (sanitary landfill, composting, and incineration) shows that a controlled volume reduction within 1 to 2 hr is only feasible with incineration. In the sanitary landfill decomposition processes are most difficult to control. It is granted that complete combustion is difficult to achieve in small incinerators. Therefore they should not be allowed in residential areas. In large incinerators a complete combustion is achieved by uniform charging, continuous operation, and high combustion chamber temperature. Analyses in the large incinerator in Duesseldorf revealed that the amount of volatile organic acids in the waste gases were near the lower detection limit. Of the 4 million tons of sulfur dioxide emitted per year in the Federal Republic of Germany, 12,000 tons come from incinerators. They also emit each year 5,000 tons of mitrogen oxide, 8,000 tons of hydrogen chloride, 50,000 tons of hydrogen fluoride, and 4 million tons of fly ash. Nothing is known about the emission of heavy metals. An examination of power plants and incinerators has shown that toxic heavy metals such as lead, zinc, and arsenic are deposited in various sections of the heat exchanger which means that a considerable portion is not emitted into the environment with fly ash. (Text in German)
[23826]

73-4576

RIEDLINGER, R. A. Aufbereitungseinrichtungen in muellyerbrennungslagen. [Treatment equipment in incinerators.] *Mitteilungen der VGB*, 52(6):498-503, Dec. 1972.
The disposal of waste by incineration involves the delivery of the waste to the incinerator, the actual incineration and the disposal of the residual matter such as dust, sulfur dioxide, hydrogen chloride, nitrogen oxides, glass, etc. Standard equipment included in incinerators are cranes, electrostatic precipitators and cyclones for cleaning the waste gases, and a purification basin for sedimentation of the dust in the water from quenching the slag. Other optional equipment include the shredder for bulky refuse, devices for sifting the ash and for separation of scrap from the refuse, a waste oil treatment system, filter presses for the sludge, flue gas

scrubbers, etc. Of all these, the shredder is increasingly gaining importance. Detailed descriptions of a shredder and hammermills are given. The shredder usually operates with a throughput of 300 cu m per hr. The conveyor belts transporting the bulky material to the shredder must be 2 m wide. Slowly moving steel plate conveyor belts are recommended. The steel plates should have a thickness of 8 to 16 mm. Hammermills usually operate with two rotors. The operating principle of the hammermill and the shredder is very similar, both crush the object into small pieces. The hammermill has little hammers, the shredder smashing rings. To avoid any fire hazard it is advisable to spray the refuse with water. A shredder or hammermill should be installed only where high quantities of bulky refuse accumulate, i.e., in cities with a population of more than 50,000. The additional costs then amount to 10 percent of the gross incineration costs. (Text in German)
[23827]

73-4577

SAKAMOTO, S. Jinkai nado no nensho hoho. [A method of combusting dust.] Japanese Patent Sho 47-35148 owned by Mitsubishi Heavy Industries, Ltd., Tokyo, Japan. Issued Sept. 4, 1972.
This invention relates to a method of combusting wastes and dust in which the wastes and dust of irregular combustion characteristics can be burned without giving off offensive odors or harmful gases, the remaining combustible wastes in the ashes can be minimized, the wastes and dust can be burned without giving damage to the furnace such as the cracking of the furnace bricks, clinker trouble, melting loss, and destruction due to unequal expansion. The heat of the exhaust gas is effectively utilized and the condition of combustion can be controlled continuously and easily. Wastes or dust are fed to a dryer, the dried wastes or dust are burned out in combustion equipment, a part of the exhaust gas coming out of the combustion equipment is recycled through an air-preheater, the preheated air is fed into the combustion equipment, and both the temperature and volume of the exhaust gas to be recycled are regulated according to the quality of the wastes or dust. If low quality wastes are charged, the lowering of the temperature of exhaust gas is detected and both the temperature and volume of recycled gas are greater so that the temperature of combusting air to be fed to the dryer is raised. (Text in Japanese)
[23828]

73-4578

Sangyo haikibutsu shokyakuro--Sekiyu kagaku seihin haikibutsu senshoro to kakushu tokusho senshoro. Industrial waste incinerator--special incinerator for petrochemical wastes and other special incinerators.] *Kotai Haibutsu*, (8):120-125, Dec. 1972.
The incinerator, suitable for various special wastes such as waste oils, waste tar, carbide residues, and various kinds of plastics, consists of the first combustion chamber, the second combustion chamber, and the third combustion chamber, in which wastes are burned for gasification on the grate of the first combustion room and then burned out at 400 to 500 C in the first combustion room to decompose into ashes and gas. The gas from the first combustion room is sent to the second combustion room where it is again burned with the air containing a heavy oil at a high temperature of 1,200 to 1,400 C and then sent to the third combustion room where the gas is completely burned out in a swirling state to mostly remove the black smoke and odors. This type of incinerator uses a special rotary burner which makes little noise and is easy to handle, and it has also a special regulatory device and control system by which the variations in the amount of gas from the first combustion room with different plastics can be controlled. The gas containing chlorine produced when polyvinyl chloride is burned is introduced into a gas scrubber, followed by a neutralizing treatment using an alkaline solution. And, in this system, a catalytic combustion system which uses a oxidizing catalyzer is also employed to remove most hydrocarbons by oxidization at 260 to 360 C. (Text in Japanese)
[23829]

73-4579

SHIGAKI, M. [Special combustion furnaces for plastic.] [*Water Treatment Techniques*], 12(9):21-24, 1971.

Existing plastic incinerators have such faults as sporadic black smoke formation due to batch-type feeding, quick deterioration due to lack of experience and construction expenditure, and lack of exhaust gas treatment and attendant air pollution and corrosion. A research group drawn from various industries and government agencies has designed a special plastic incinerator with the following considerations: plastic is shredded to even sizes and continuously fed by a quantitative supply feeder; with an air adjustment device, the combustion gas is mixed with air and the furnace is kept at a high temperature0 between 1,000 and 1,200 C; crushed plastic is fed by a screw feeder and air is jet-supplied into the furnace; a flat-bed is used in order to avoid clogging of grates by thermo-set plastic and foam styrene; special consideration is given to the storage bunker and hopper; the screwfeeder and the air nozzle are protected from heat radiation by a water-cooled jacket; there is no device for continuous ash elimination, but special materials in plastic are dispersed in the air and captured by the wet dust collector; a Wagner type Venturi scrubber is installed for hydrogen chloride, hydrogen oxides, and cyanides; all the systems after the Venturi scrubber are lined with rubber, ceramic, and FRP in order to prevent chlorine corrosion; for larger public incinerators, an automatic fuel supply controller can be installed. The test furnace was designed for a small capacity of 60 kg per hr, with special care for small details such as double duct casing, the use of heat radiation for combustion air, and adjustable air jet quantity. The entire system is designed compactly, for easy mass production and transportation. (Text in Japanese)
[23830]

73-4580

SIETH, J. Muellverbrennung: Ein Luftreinhalteproblem? Wege zur Minderung der Chlorwasserstoff-Emissionen. [Incineration: an air-pollution problem? Ways of reducing hydrogen chloride emissions.] *Luftverunreinigung*, 43-51, Dec. 1972.

In incinerators of the Federal Republic of Germany no measures are generally taken against gaseous emissions. The incinerators are equipped with electrostatic precipitators which remove the dust from the off-gas. Measurements of the gaseous emissions from incinerators in the years 1971 to 1972 yielded a hydrogen chloride concentration of 1 g per cu m sulfur dioxide at 0.6 g per cu m, and hydrogen fluoride at 10 mg per cu m. The concentration of hydrogen chloride is so high that a stack incrementation is necessary. In order to give an idea of the required stack incrementation at an increase of the presently valid maximum allowable average emission value from 2 g to 2.5 g per cu m, diagrams are given in which the stack height isohypses are plotted dependent on the waste gas volume flow, temperature, and maximum emission concentration. The following parameters were used for the diagrams: average emission level 5 m, average wind velocity 4 m per second, maximum concentration difference 0.075 mg per cu m, exit velocity of the waste gases 20 m per second. It can be seen that, for example, the stack height is 177 m with a waste gas flow of 300,000 cu m per hr and a maximum hourly average concentrations of 2 g hydrogen chloride per cu m and a waste gas temperature of 200 C. Independent of increasing the stack height of incinerators other measures must be taken to reduce the gaseous pollutants. They comprise the actual reduction of the pollutant, the processing of the obtained reaction products and the disposal of the obtained waste product by dumping, discharge into the sewer, or chemical-technical recycling. A cost calculation for the installation of an electrostatic precipitator for dust removal with subsequent hydrogen chloride absorption and neutralization and evaporation of the scrubbing water yielded operating costs of 1.730 deutsche marks per ton of waste. Scrubbers are very suitable for the removal of the gaseous pollutants in incinerator off-gases. (Text in German)
[23831]

73-4581

STOCKMAN, R. F. Plastic burner. Canadian Patent 922,583 owned by The Air Preheater Company, Inc., Wellsville, New York. Issued Mar. 13, 1973.

This invention is a plastic incinerator. A meltable plastic is first reduced to a liquid. The liquid is heated to the point of vaporization and the vapor is burned as it leaves the surface of the liquid,

before being exhausted to the surrounding atmosphere.
[23832]

73-4582

Tokkyo sasaki-shiki semi kikairo--rojin homu to onsui puru e no yonetsu riyo. [Patented Sasaki semi-automatic incinerator--application of waste heat to heating an old people's home and an indoor pool.] *Kotai Haibutsu*, (8):98-101, Dec. 1972.
This mechanized furnace is the vertical, cylindrical, and independent type which has completely independent furnaces for every five chambers having an advantage of making possible a three-dimensional combustion of wastes in the high furnace, thus giving the system a high combustion efficiency. The body of the furnace, built of a refractory, a heat insulation material, iron-reinforced concrete, and a steel panel, has an air-tight structure which is not affected by the open air, minimizing the amount of radiant heat. In the combustion chamber, two waste receivers are mounted crosswise to prevent the direct stack up of wastes on the grate, which enhances the combustion efficiency because of increased surface area of combustion of more than 30 percent. The ignition loss with the structure of this furnace was 3.27 to 3.81 percent. For the utilization of waste heat, about 100 tons per day of hot water from this type of furnace, constructed in the city of Tateyama, Chiba Prefecture, are being supplied to an old people's home where 100 persons are living, and to an indoor warm water pool with 25 m long and seven courses. (Text in Japanese)
[23833]

73-4583

TOSHIAKI, S. Gomi shokyaku hatsuden ni tsuite. [Electric generation by refuse incinerator.] *Netsukanri to kogai*, 24(11):17-24, Nov. 1972.
Data on electrical generation by a refuse incinerator are discussed. Refuse has an average heat value of 1,800 kilocalories per kg, so that it yields 800 to 1,200 C of inner temperature in the incinerator which works 24 hr by means of a continuous stoker. Consequently a method for the effective use of heat is introduced also to protect the apparatus absorbing the heat setting up the boiler. Electric generation by refuse incineration requires large capital expense; however, the generated electricity can be consumed to run the plant. This makes it possible to decrease the expense for electricity. For instance an example in Yokohama, Japan, shows: required electric power for the incinerator 3,200 kw, generated electric power 2,800 kw, and buying electric power 1,950 kw. The problem in electric generation by incineration is that heat value of refuse depends largely upon the quality, season, and even the climate conditions. Secondly the quantities of plastics in refuse has the tendency of increase. Plastic refuse, especially vinyl chloride generates chlorine and hydrochloric acid gas, noxious gasses, and often causes erosion in the boiler and incinerator, and further when these noxious gasses are exhausted it causes pollution problems. Actually if the 20 percent vinyl chloride in plastic dust is assumed, the generated acid becomes more than 5,000 ppm. (Text in Japanese)
[23834]

73-4584

VALDESPINO, J. M. Incinerator toilet. Canadian Patent 922,855 owned by Tekmar Corporation, New York, New York. Issued Mar. 20, 1973.
This apparatus for disposing of solid and liquid waste matter includes means for separating the liquid matter from the solid matter, for comminuting and burning the solid waste matter, and for treating and discharging the liquid waste matter from the apparatus. The device has means for producing and confining a flame substantially to an area around the inner wall of a combustion chamber to incinerate the comminuted solid matter and means for chemically treating the waste liquid prior to discharge.
[23835]

INDUSTRIAL WASTES

73-4585

ALBERTSON, U., AND S. BERGKVIST. New environmental control techniques at the ASPA mill. *Paper Trade Journal*, 157(14):24-25, Apr. 2, 1973.

Munksjo AB is building a new 60,000 ton per year bleached softwood kraft pulp mill adjoining one of similar size in Sweden at its Aspa mill site. The project is unusual in that it incorporates many pollution prevention processes developed in conjunction with the Swedish industry's cooperative pollution abatement study, named SSVL. The special pollution control features include: oxygen bleaching in a completely closed liquid system; a nearly closed filtrate system for the rest of the bleach plant; collection of temporary discharges; and treatment of contaminated condensates. With these measures it is estimated that total BOD discharge will be reduced by 75 percent to about 35 lb per metric ton. Lignin discharge will be reduced by 50 percent. The new mill is due to start up late in 1973.
[23836]

73-4586

ASHIDA, H., E. IWASAWA, S. YOKOYAMA, S. NISHI, AND M. KOMAKINE. Sangyo haikibutsuryo to sono shori shobun no jittai ni kansuru kosatsu. [Observations on the volume of industrial wastes and their treatment and disposal.] Presented at the 1972 National Environmental Sanitation Meeting, Niigata, Japan, Oct. 19-20, 1972. Tokyo, Ministry of Health and Welfare, Japan Environmental Sanitation Center, 1972. 5 p.

A survey of industrial wastes has been conducted every year since 1970 by the Japan Environmental Sanitation Center at the request of prefectural governments. The results of such surveys undertaken for six prefectures in 1971 are tabulated. For the whole country daily waste is estimated to be 1.52 million tons. Questionnaires were sent to check the method of industrial waste disposal at the factory level, to see how much is disposed of within the factory, how the rest is transported out of the factory, and how much is disposed of at which terminal disposal facility. The results showed that not much is disposed of within the factory. Some of the wastes are accumulated without being treated. After incineration or some other treatment, some are used for reclamation. Some wastes taken out of factories are sold or given away. The disposal of others is contracted to a private collector or to local governments. The wastes taken out of the factories are disposed of into rivers, lakes, the sea, land owned by the enterprise, public sewers, designated landfills, or public incineration facilities. A constant survey is necessary to avoid environmental pollution in the future. It is necessary also to have more trained personnel for carrying out this kind of survey. (Text in Japanese) (This document is retained in the SWIRS library.)
[23837]

73-4587

BERGER, A., H. ABEL, AND A. DEFLORIN. Process for finishing wool. Canadian Patent 922,860 owned by Ciba Limited, Basle, Switzerland. Issued Mar. 20, 1973.

A process for finishing wool, preferably for rendering wool nonfelting, is provided. The wool is treated with an aqueous preparation containing a reaction product of basic polyamides and polyfunctional compounds and afterwards dried. The process is carried out at 35 to 100 C and preferably according to the exhaustion method. The wool treated in this way is nonfelting. This finishing process advantageously can be combined with a dyeing process.
[23838]

73-4588

Beseitigung von Kunststoffabfaellen. [Disposal of plastic waste.] *Kunststofftechnik*, 12(3):66, 1973.

A plastic processing enterprise in the State of New York produces about 50 tons of solid waste, 30 cu m of waste liquids and about 1,000 cu m of flue gases every day. For the disposal of these waste substances a combustion plant has been constructed which will furnish about 70 tons of steam per hr and 2.5 million kilocalories per hr for heating purposes. Combustible flue gases are led into the flue gas combustion chamber. The combustion gas at a temperature of 980 C heats the boilers or serves as combustion air for the incineration of the solid refuse. A special combustion chamber has been constructed which burns only corrosive gases. The requirements of Federal Air Quality Standards and those of the State of New York are met so that an air purity of 96.3 percent is guaranteed. (Text in German)
[23839]

73-4589

DELANEY, J. F. Separation of sulfides. Canadian Patent 922,431 owned by the Anaconda Company, New York, New York. Issued Mar. 6, 1973.
This patent describes a method for separating molybdenum sulfide from a copper ore concentrate containing molybdenite. An aqueous pulp of the concentrate is subjected to froth flotation in the presence of a collector for molybdenum sulfide and a Nokes-type depressant (arsenic trioxide/sodium sulfide) for copper sulfide. The pulp is aerated with an inert gas to effect flotation of the molybdenum sulfide part of the pulp. The electromotive force of the pulp is maintained above minus 200 millivolts.
[23840]

73-4590

DUCELIER, G. Recovery of materials from the wastewater from wine distilleries by drying the mixture of solid and liquid wastes. *Water Research*, 7(4):595-598, Apr. 1973.
Until recently the effluent of wine dregs distillation was disposed of by lagooning or discharging to a waterway. Now that such practices are illegal, some form of treatment and/or utilization of this waste stream is essential. Spent wine is more difficult to purify than domestic sewage. Except by using expensive plants, impractical for the small rural wine growers of France, obtaining a satisfactory BOD reduction of this waste is impossible. The author has been experimenting for the last few years on ways in which these dregs can be utilized cheaply. He determined that to obtain a fertilizer with 50 percent moisture which can be stacked, only 1.85 tons of water can be evaporated to yield 1 ton of dry matter. Fuel consumption in this case would be only about 170 to 180 kg. If a moist wine waste mixture is dried with the waste heat from the rotating drum oven used to dry the pressed grapes, the dry product obtained thus may be kept for more than a year and can be used as a sheep-feed. Even open-air drying is practical for wine wastes in many climates.
[23841]

73-4591

GINGERICH, J. C. A whitewater and solids waste reduction program. *Paper Trade Journal*, 157(14):22-23, Apr. 2, 1973.
P. H. Glatfelter Co. is a fully integrated pulp and paper mill. Recently the company initiated a campaign to reduce whitewater and solids losses at the plant. To obtain an approximate dollar value for the wastes the effluent was divided into its major components of fiber, ash and water. Before the control program was started, the paper mill effluent contained waste solids equivalent to 4 to 5 percent of the paper machines' production. Value of the effluent during the previous year was estimated at about $2,700 a day. The interim goal for the waste control program is to reduce water and solids losses to about $1,500 per day. After losses were established, a careful inspection was made of all machines and operating procedures. Recommended repairs and system and equipment changes were listed for each paper machine. The aim is maximum whitewater reuse. The centrifugal cleaner system is operating efficiently and has so far permitted about 70 percent of the waste reduction to be met.
[23842]

73-4592

Gipsschwefelsaeure-anlage. [Gypsum sulphuric acid plant.] *Wasser, Luft und Betrieb*, 17(4):136, 1973.
A new plant has been constructed in South Africa in order to reuse waste gypsum which is a waste product from the production of phosphoric acid. At the time being the annual world production of waste gypsum amounts to 60 million tons. The plant in South Africa will produce about 350 short tons of cement clinker and 350 short tons of sulfuric acid. The cement clinker is processed into high quality Portland cement and the sulfuric acid is used for the production of phosphoric acid. The plaster-sulfuric acid plant consists of gypsum drying device, milling plant and rotary shaft furnace for the additives. (Text in German)
[23843]

73-4593

HENDRICKSON, E. R., J. E. ROBERSON, AND J. B. KOOGLER. Current industry investment and operating costs. *In* Control of atmospheric emissions in the wood pulping industry. v. 3. Springfield, Virginia, National Technical Information Service, Mar. 15, 1970. p. XII(1-16).

Past estimates of the expenditures made by the wood pulping industry for air quality control have indicated that substantial sums are involved, but the numbers vary widely. Because of congressional interest in the impact of the Federal air quality control program on all aspects of the economy, cost figures for the wood pulping industry would have to be obtained on a rational basis. Using the latest available data, estimates were made of the replacement cost and the annual operating cost of air quality control equipment in present operation in the industry. Sophisticated engineering cost estimates were prepared in three categories: total installed cost (replacement); total annual cost; and net annual cost, reflecting a credit for recovered materials. Estimates were prepared for a variety of controls on a number of sources. It should be noted that the cost analyses in this chapter are based on prices of chemicals and equipment as of January 1969. As these prices change, the whole balance changes. Total installed cost for kraft was in excess of $166 million and for sulfite about $900,000. Total annual cost for kraft was about $24 million and net annual cost about the same. Net annual costs for sulfite indicated a slight net return. (This document is retained in the SWIRS library.)
[23844]

73-4594

HENDRICKSON, E. R., J. E. ROBERSON, AND J. B. KOOGLER. Future industry investment and operating costs. *In* Control of atmospheric emissions in the wood pulping industry. v. 3. Springfield, Virginia, National Technical Information Service, Mar. 15, 1970. p. XIII(1-49).

This chapter reports the rationale for and development of a model which provides data which can be used to project the investment and operating costs for emission control in the kraft pulping industry through 1980. Data are not available to perform similar analyses for sulfite and neutral sulfite semichemical mills. A sensitivity analysis is also presented which suggests how the costs for emission control are influenced by emission standards, value of recoverable chemicals, and assumed rate of return. To assist with the analysis, multipath flow diagrams have been developed to indicate the various process alternatives which influence emissions. A simple program is presented to estimate total annual costs as a function of fixed and variable costs. A mathematical programming model was developed and is presented by which it is possible, for any specified mill, to determine the optimal way to satisfy specified emission standards. The objective function is to maximize net revenue from emission control. Constraining functions include continuity from source to control, continuity from control to recovery, performance standards, control bounds, implicity integer constraints, and nonnegativity restrictions. An example is analyzed with the model using 1969 Oregon regulations. (This document is retained in the SWIRS library.)
[23845]

73-4595

HENDRICKSON, E. R., J. E. ROBERSON, AND J. B. KOOGLER. On-going research related to reduction of emissions. *In* Control of atmospheric emissions in the wood pulping industry. v. 3. Springfield, Virginia, National Technical Information Service, Mar. 15, 1970. p. X(1-84).

A number of the problems facing the chemical wood pulping indsutry with respect to air quality improvement cannot be resolved until further research points the way. A search of the technical literature for the past 5 years was undertaken. With few exceptions, it was decided that work reported more than 5 years ago was currently incorporated into practice, was under further development, or was found unsuitable for practical application. The format selected for presentation was that of an annotated bibliography insofar as possible. Eight major categories were selected for presentation of the abstracts. They are: Emission Control Technology; Cost and Effectiveness of Emission Control; Sampling and Analytical Techniques; Control Equipment Development; Process Changes Affecting

Emissions; Chemistry of Pollutant Formation of Interactions; New Pulping Processes; and Control System Development. Within each major category the abstracts are arranged in subcategories by year of publication. (This document is retained in in the SWIRS library.)
[23846]

73-4596

HENDRICKSON, E. R., J. E. ROBERSON, AND J. B. KOOGLER. Research and development recommendations. *In* Control of atmospheric emissions in the wood pulping industry. v. 3. Springfield, Virginia, National Technical Information Service, Mar. 15, 1970. p. XI(1-12).

The investigations undertaken during the course of this study have led to the conclusion that existing technology, plus present technology in the experimental stage, still may result in emission levels which can be unacceptable to the public in some instances. Many gaps exist in our present knowledge which need to be filled by future research. The most pressing of these research needs follow: to develop and standardize methods and instruments for monitoring emissions and ambient air; to assess the effect of operating variable on emissions from the kraft pumping and recovery system to develop and standardize organoleptic techniques for determinations of process emissions and evaluation of ambient air quality; to investigate new pulping methods which eliminate the use of sulfur; to define the mechanisms, with emphasis on transport processes and emission interactions which will relate emission limitations to ambient air objectives; to evaluate emissions from sources in sulfite and neutral sulfite semichemical (NSSC) mills and determine operating variables which affect emissions; to investigate adsorption and absorption of odorous gasses and reuse of the collected materials in process; and to determine whether TRS is an effective measure of the acceptability of odorous emissions from kraft mills or must the compounds be identified more definitively. (This document is retained in the SWIRS library.)
[23847]

73-4597

HENDRICKSON, E. R., J. E. ROBERSON, AND J. B. KOOGLER. Sampling and analytical techniques. *In* Control of atmospheric emissions in the wood pulping industry. v. 3. Springfield, Virginia, National Technical Information Service, Mar. 15, 1970. p. IX(1-89).

This section of the document outlines problems and methods for source and ambient sampling of noxious and odorous emissions of wood pulping industry. Each of the main chemical processes is discussed separately0 kraft, sulfite and neutral sulfite semichemical. Source sampling for gasses, particulates, and nonsulfur contaminants are treated individually for each of the processes. Recommended ambient and source methods for gasses and each type of pollutant are given. There is an extensive list of references provided at the end of the chapter. (This document is retained in the SWIRS library.)
[23848]

73-4598

MARYNOWSKI, C. W. Description of the plastics industry. *In* Disposal of polymer solid wastes by primary polymer producers and plastics fabricators. Washington, U.S. Government Printing Office, 1972. p. 11-30.

Plastics constitute one of the fastest growing sectors of the chemical industry. U.S. production of all thermoplastic and thermosetting resins was 16 billion lb in 1968, up from 11.4 billion lb in 1965. The value of 1968 resin shipments was $3.9 billion, accounting for nearly 15 percent of the basic chemical industry's sales. The plastics industry is composed of three major sectors, with some overlap: producers of the basic resin; processors who convert the resin into some convenient standard shape or form; and fabricators who fashion the final product from the resin directly or from a processed form. Thermoplastic resins are primarily of three types: polyolefins (PO); polyvinyl chloride (PVC); and polystyrene (PS). Industry statistics for polyolefins include both high and low density polyethylene. PVC accounts for over 80 percent of total vinyl resins. The production of PO is concentrated in the Gulf Coast States, mostly Louisiana and Texas, while PVC and PS production is mostly in the

northeastern States. (This document is retained in the SWIRS library.)
[23849]

73-4599

MARYNOWSKI, C. W. Disposal of polymer solid wastes by primary polymer producers and plastics fabricators. Washington, U.S. Government Printing Office, 1972. 92 p.
This document discusses the plastics industry's contribution to the solid waste problem at the industrial level, before the waste is part of the municipal solid waste load. The processes and products of resin producers are described; the four major types are: polyethylene; polypropylene; polyvinyl chloride; and polystyrene. Fabrication processes for thermoplastic resins are also dealt with. The next section of the report concerns itself with a survey of the solid waste situation, generation sources, amounts, handling, and disposal of the unwanted residue from production. Special problems involved in disposal of such wastes are commented upon. An evaluation of alternative methods of treatment and disposal for plastics and polymer wastes is provided. In this context open dumping, dumping at sea, and sanitary landfill are compared. Biodegradation, chemical oxidation, incineration, and recycling are other techniques of waste handling applicable in the polymer industry. (This document is retained in the SWIRS library.)
[23850]

73-4600

MARYNOWSKI, C. W. Evaluation of alternative treatment and disposal techniques. *In* Disposal of polymer solid wastes by primary producers and plastics fabricators. Washington, U.S. Government Printing Office, 1972. p. 51-67.
Waste disposal techniques can be divided into three categories according to their objectives: removal from view; destruction; and utilization. Some disposal techniques serve all three functions, such as incineration for heat recovery. Methods based primarily on removal from view are: open dumping; ocean dumping; and sanitary landfill. The land disposal of plastic is not polluting unless the waste is allowed to scatter or to burn. Ocean dumping is not satisfactory for plastics due to their low density, causing them to float; this same quality makes them resistant to compaction, which is a disadvantage in a landfill. Methods based on destruction are: biodegradation; chemical oxidation; and incineration. Unless plastics are chemically or thermally treated first, they are resistant to biodegradation and are not suitable for composting. Chemical processing is very expensive, but is suitable for pretreating plastics to cause them to degrade more quickly. Incineration of plastics in large quantities encounters problems of high heat release, corrosion, and other difficulties. However, there are incinerators on the market capable of handling even 100 percent plastic waste feeds, and some of them are quoted to cost as little as $3 per ton to operate. Most such units are multiple chamber incinerators, although open pit and rotary kiln types have also been used for polymer wastes. Utilization of plastic usually involves either heat recovery or pyrolysis to produce charcoal, oil, and waxes. (This document is retained in the SWIRS library.)
[23851]

73-4601

MARYNOWSKI, C. W. Plastics industry survey. *In* Disposal of polymer solid wastes by primary producers and plastics fabricators. Washington, U.S. Government Printing Office, 1972. p. 35-50.
Seven primary resin producers were surveyed and found to generate waste at the rate of from 0.5 to 4 percent of total production of resin. On this basis, the average resin producer generated 7.7 tons of polymer waste per day per plant in 1969. Plastics processors and fabricators from 47 plants indicated that they generate waste at the rate of about 2.2 percent of total production. All resin producers realize that the price of plastic scrap can have a great impact on waste generation rates in the future, since the economics of reclamation of scrap will determine how much is reused. Some producers conceded that 30 to 40 percent of their present waste could be used, but not economically. Virtually no plant expected to produce less waste per ton of product in the future, although many anticipated waste burdens to lessen because of better reclamation techniques. The need for research and develop-

ment of better means of economically reclaiming was stressed by all plastics manufacturers. Four of the seven resin producers surveyed dumped their waste polymers; two used sanitary landfills, and one incinerated its waste. The vast majority of fabricators used landfill, but did not use their own land for this. In general, no processing was provided for the waste before disposal, although large containers are ground up for disposal by some fabricators. (This document is retained in the SWIRS library.)
[23852]

73-4602

MASAYUKI, Y., I. YAMAMOTO, AND N. YASUHIRA. Process for recovering uranium from uranium-bearing aqueous solution. Canadian Patent 922,900 owned by Kuraray Co., Ltd., Kurashiki, Japan. Issued Mar. 20, 1973.
This invention is a process for recovering uranium from a solution such as that which might result from smelting uranium ore or spent liquor in a nuclear furnace. Sea water also contains uranium. In this process the solution is brought into contact with a titanated polyvinyl alcohol. This causes adsorption of the uranium to the titanated polyvinyl alcohol. The uranium is then desorbed with an aqueous solution of sodium carbonate or ammonium carbonate.
[23853]

73-4603

NAKAYAMA, T., Y. AOYAMA, M. TANAKA. Newly developed process for disposal of effluent from anodizing plants. *Aluminium*, 49(3):218-223, 1973.
There is no question of toxicity with regard to pollution produced by the aluminum anodizing process. But the product formed by neutralizing the sulfuric acid effluent and the sodium hydroxide effluent is usually a sludge that contains at least 85 percent water. Since a sludge of this type is very difficult to deal with, studies have been conducted on how to dispose of these effluents. The neutralizing and pelletizing process proved to be very effective. The alkali etch effluent and sulphuric acid anodizing effluent are mixed and neutralized, adding a small amount of flocculation agent and led into the pelletizer. The aluminum hydroxide than agglomerates to a powder which is then filtered by means of a centrifuge or an oliver filter to a powder with a humidity of 20 to 30 percent. When the alkali used is stronger than the acid, about half the alkali can be recovered using the seeding process, draining the top part back into the etching bath and leading the remainder into the above mentioned process. The final wastewater which is comparatively clean can be used for washing purposes. The byproduct aluminum hydroxide can be used as a paper production reagent, for the production of fire-resistant bricks and for the fabrication of ceramics.
[23854]

73-4604

PINNER, R. The future of effluent treatment in metal finishing: Part II. *Metal Finishing Journal*, 19(218):82-84, Mar. 1973.
After the volume of plant effluent has been reduced to its economic minimum by intelligent management of waste streams, the next step in handling plating wastes is to recover metal values. Two types of recovery methods can be distinguished, extraction of the metal and direct reuse or conversion, and concentration of the rinse water to a level at which the solution can be returned to the plating tank. Extraction of metal can be accomplished by: chemical precipitation; electrolytic recovery; and ion exchange. Concentration of rinse water can be effected by evaporation or reverse osmosis. Although metal recovery offers an immediate economic incentive for its own sake, the secondary object of sludge avoidance has also gained in importance. It is an axiom that the most valuable metals are also the ones that are toxic and therefore unsuitable for many disposal techniques. Of the metals found in metal finishing effluents the two which are given the lowest priority for recovery are iron and aluminum. Nevertheless, even these metals present in large concentrations pose difficult problems of dewatering and disposal so that recovery in a form which avoids the need to handle watery sludge is a considerable benefit. Least progress has been made in recovery of nonmetals from metal finishing rinse waters. As the incentives increase, however, these wastes too will be reused more frequently.
[23855]

73-4605

Recycling and recovery of plastics. *Europlastics Monthly*, 46(3):66-68, 71, 73, Mar. 1973.
This feature article on plastic recycling is divided into three sections. The first is entitled reuse of plastics scrap and deals with the various kinds of inplant scrap and the ways in which they can be reground. Essential to onsite reclamation of scrap is separation of various types of plastics and colors; some types of plastics are more easily recycled than others, especially if the product to be made has to meet stringent specifications. The second section of the article is concerned with alternatives to recycling. It is pointed out that there seems to be no possibility of recycling plastics from household refuse economically. Therefore, either disposal or some type of energy or heat recovery would appear to be the most likely solution to the volume of plastics waste. Because of their nonbiodegradability plastics do not threaten air or water in a sanitary landfill and lend themselves particularly well to waste heat recovery from incineration due to their high calorific value. The last section discusses several in plant recovery systems suitable for waste plastics: the closed loop system; machine-side grinders; and others.
[23856]

73-4606

RIEGE, W. Schutteabfuhr in der giesserei. [Waste removal from foundries.] *Giesserei*, 59(12):392-394, June 1972.
Various possibilities of waste removal from foundries are reviewed. Foundry wastes are usually transported to municipal dumps by means of dump trucks, which requires both intermediate storage and transshipment. The use of large-capacity containers and open or dustproof boxes, shipped by lift-and-carry trucks represents a basic trend in foundry waste handling. Economical calculations regarding the use of different size containers and boxes and of own versus contracted transport show that the latter is generally less expensive. Such containers and boxes can be used to ship other goods as well. (Text in German)
[23857]

73-4607

RUECKEL, H. G. Beseitigung von sondermuell. [Disposal of special refuse.] *Abwassertechnik*, 23(Special Issue IFAT):38-39, 1972.
In 1969 a disposal plant for special industrial refuse was constructed at Schwabach, Germany. It consists of: a deposit site in a clay pit of 60,000 sq m where about 15 percent of the special refuse is deposited; a sludge dewatering plant where about 300 tons of sludges are detoxified, neutralized, and dewatered daily; and an emulsion separating plant which cleans up to 120 tons of oil-water mixtures daily. About 20 percent of the total quantity of special refuse which amounts to 50,000 tons annually can only be disposed of by thermal treatment. The incineration plant at Schwabach burns waste oils, refuse from the tar industry, chemical refuse, and waste varnishes and lacquers. It has a capacity of 10,000 tons annually, and has special equipment to control air pollution. (Text in German)
[23858]

73-4608

Sangyo haikibutsu shori kiki no kaihatsu doko0 kotai haikibutsu o chushin to shite. [On the development of disposer for industrial wastes0 in connection with solid waste.] *Kotai Haibutsu*, (8):116-119, Dec. 1972.
The recent trends in the development of the disposal systems for solid wastes are outlined concentrating, for the most part, on incinerating facilities and crushers. A rotary type crusher and a reciprocating type crushing and compression machine are cited. The Mitsubishi hammermill type crusher, for example, is a rotary crusher with a cutting bar system, in which two hammer-like bars are combined alternately, designed so that elastic wastes such as metal, plastic, and rubber can be easily crushed by a shearing force. The Mitsubishi Lindemann type is a reciprocating crusher, developed for the compaction of metal scraps. In this type bulky wastes are dumped on a feeding bed pushed forward, and cut. A high polymer specialty incinerator and a sludge specialty incinerator are cited. The Mitsubishi rotary kiln type incinerator is for high polymer wastes, in which a gasification and combustion process based on the fundamental

studies is adopted which performs an efficient combustion. Treating equipment for hydrochloric acid gas from polyvinyl chloride is also provided. The Mitsubishi multistage incinerator can serve as an incinerator for sludge and consists of a drying stage, combustion stage, and a cooling stage. Also, the Mitsubishi cellulose incinerator is suitable for the combustion of wood products and waste papers, and is available in capacities ranging from 300 to 900 tons per 24 hr. (Text in Japanese)
[23859]

73-4609

SPRUILL, E. L. Color removal and sludge recovery from total mill effluent. *Tappi*, 56(4):98-100, Apr. 1973.
A lime treatment color removal system, with recovery of lime and fibrous sludge integrated into the kraft lime processing system, has been constructed for treatment of total mill effluent. With about 1,000 ppm of lime, color reduction of 80 to 90 percent has been achieved in kraft effluent, with lower effectiveness on neutral sulfite chemical wastes. Good dewatering and lime kiln incineration of sludge have been recorded. Settling and thickening of color sludge have been excellent, but carbonation-stage settling has been more variable. This project was assisted by an Environmental Protection Agency demonstration grant.
[23860]

73-4610

TAKAHATA, T., AND H. ITO. Gosei kobunshi haikibutsu no shori hoho. [A method of treating synthetic high-density polymers.] Japanese Patent 47-34,474 owned by Kawasaki Heavy Industries Ltd., Kobe, Japan. Issued Aug. 30, 1973.
This invention provides for a method in which high density polymer wastes, such as polyvinyl chloride which give off poisonous gases such as hydrogen chloride, are heated at a temperature of 200 to 400 C at which high density polymers undergo dechlorination without burning, using sand, or other fire resistant inorganic materials as a heat medium. Then an intermediate product containing no groups such as chlorine is burnt out with the sand, whereupon the temperature of the heated sand is lowered to 300 to 800 C for the subsequent procedures of the preheating of combustion air and the reuse in the dechlorination reaction. The method under this invention is applicable not only to polyvinyl chloride, but also to a mixture of the chlorine-bearing high-density polymer wastes and the other synthetic high-density polymer wastes such as rubbers, plastics, fibers, and other composite plastic wastes or compounds. Furthermore, this method has an advantage that the operation is simple, inexpensive, continuous, highly efficient, and is capable of treating a large quantity of wastes. Also, compared with the former one-stage combustion method in which high-density polymer wastes are burned directly in the presence of oxygen, the amount of the exhaust gas from this process is considerably small, and therefore makes the treatment of the exhaust gas simpler. (Text in Japanese)
[23861]

73-4611

TAKEMOTO, Y. Purasuchikku sukurappu no shori hoho. [A method of treating plastic scrap.] Japanese Patent 47-35,142 owned by Komatsu Ltd., Tokyo, Japan. Issued Sept. 4, 1972.
This invention relates to a method of treating plastic wastes in which various high polymers are crushed and reclaimed as fuel. In the method under this invention, plastic wastes are sent through a hopper to a drying room in which the air is 90 to 100 C. The dry air charged into the drying room through the air inlet is discharged after it has heat exchanged with the plastic wastes. The dried plastic wastes are sent to a cooling chamber in which they are cooled to about minus 60 C to minus 100 C, and the cooled plastic wastes are then sent to a crusher and ground into powder, keeping them at a temperature of about minus 50 C. The ground plastic wastes are sent through a hopper to a blower continuously and are burned with a heavy oil, or directly burned by spouting from nozzles with compressed air or compressed oxygen. The plastic wastes of high ductility and viscosity at ordinary temperatures, which were cooled and ground into powder having a large surface area per volume, can be completely burned by a proper control of the amount of oxygen and the

condition of combustion. The heat energy produced then can also be utilized for other processes as a heat source. (Text in Japanese) [23862]

73-4612

Trickling filters used in treatment of McCain's french fried wastes. *Water and Pollution Control*, 110(5):23-24, May 1972.

The trickling filters utilized in treatment of wastes at the Grand Falls, New Brunswick, potato processing plant are described. The amount of waste increases during the season since stored potatoes demand more trimming for a quality product; there is also the problem of shock-loading in common with many processing operations. The plant produces frozen french fried potatoes and has a capacity of about 1 million lb daily. The waste solids are collected in a hopper from which they can be discharged into 20 cu yd dump trucks. The liquids from the separators are led by flume and pipe to a 175,000 gal, 65 ft-diameter Rex Chain Belt primary clarifier, where they are diffused by a rotating baffle plate. The clarified liquid rises to the surface and seeps into a weir extending around the surface of the tank. Fats collecting on the surface are swept by a surface skimmer into a collecting pan. McCain is developing a process which will allow the processing of these materials for animal feed. The primary system is designed to remove 94 to 96 percent of all solids from the water. BOD and COD content, however, is generally reduced by only 46 to 50 percent. For further waste removal, effluent from the primary clarifier is led to a secondary waste-treatment system, consisting basically of an 80 by 40-ft by 20-ft filter building in which carbohydrate effluent content is reduced by bacterial action. The McCain secondary waste treatment plant is the first in Canada to utilize the Flocor plastic trickling filter medium developed in England. [23863]

73-4613

WAGNER, T. Glue stock - raw material for organic manure. *ISWA (International Solid Wastes and Public Cleansing Assocation) Information Bulletin*, (6):75-80, Dec. 1971.

Investigations concerning the conversion of glue stock into compost are described. Glue stock represents malodorous tannery waste accounting for 15 to 30 percent of the raw material by weight, and is composed of 70 to 80 percent water, proteins, and fat. Mixtures of glue stock with fresh hop wastes, soil, stable manure, or humidified manure containing proteolytic and cellulolytic bacteria could not be composted satisfactorily as hop fibers required longer fermentation times than glue stock. Loose, humus-like compost with low moisture content, high nitrogen and phosphorus contents and well-balanced carbon:nitrogen ratio was obtained from a mixture of glue stock fermented together with decayed hop wastes over a few weeks. Similar compost product but with lower nutritive value was obtained by fermenting glue stock together with lower nutritive value was obtained by fermenting glue stock together with stable manure and soil at 35 C over 10 days. The compost, having a pH value of 7.89, was 14.34 percent moisture, 0.45 percent phosphorus, 0.09 percent potassium, 7.18 percent fat, and 3.34 percent nitrogen with a nitrogen:carbon ratio of 1:10. [23864]

73-4614

WALTHER, J. E., H. HAMBY, AND H. R. AMBERG. Conversion of calcium base pulping to magnesium base pulping with recovery. *Tappi*, 56(4):144-147, Apr. 1973.

In order to meet water quality regulations, the calcium base sulfite mill at Camas, Washington, was recently converted to a magnesium base system with recovery. Major areas of concern in accomplishing the changeover included spent liquor recovery, evaporation, burning liquor with chemical recovery, and digestor relief recovery. A pilot plant was built to determine the effect of the new pulp on existing paper grades and to provide design data and operating experience with the magnefite process. Corrosion problems detected in the pilot plant were corrected in the plant design. Operating and equipment problems during the first year included metal fatigue in the evaporator, scale formation in the venturi adsorption system, and sulfur dioxide and particulate emissions. In this paper, methods for controlling these problems are described, and

the pilot plant program and the startup procedure are discussed.
[23865]

73-4615

YOKOTA, K. Sangyo haikibutsu no shori no hoseika to kongo no tenbo. [Legislation for the disposal of industrial wastes and a view of the future.] *Kankyo Kenkyu*, (2):34-42, Dec. 1972.
In disposing of industrial wastes, a technical standard for the method of disposing of wastes as well as a general rule for the responsibility for the disposal of wastes should be set or provided. Since the industrial wastes discarded from various business activities often contain substances which affect our living environment and health, standards for disposing of wastes should be set strictly according to the kinds of industrial wastes. The usual disposal of wastes begins with collection and delivery and ends in final disposal after various processes with intermediate handling; for the final disposal, wastes are usually turned to reclaiming works, or thrown into the sea. However, as the wastes become diverse in quality and the amount is increased rapidly, the methods of disposing of wastes are more and more difficult technically. An increased tendency to secondary pollution in every respect occurs. To counter the problems, the promotion of self-treatment in every industry, the training of private waste specialty dealers, and the positive management of the waste-dealing business by local self-governing bodies are important. In the future, private enterprises should more positively dispose of wastes by themselves, private waste dealers should be more actively encouraged, and local public organizations should act more positively when it is difficult for private enterprises to dispose of wastes. (Text in Japanese)
[23866]

INSTITUTIONAL WASTES

73-4616

GOETTSCHING, H. Wohin mit den Abfaellen aus aerztlicher Taetigkeit? [What to do with the trash from medical activity?] *Oeffentliches Gesundheitswesen*, 35(2):108-110, 1973.
A polling of physicians revealed that waste from medical practice, such as vaccines and excess medicines, are for the most part thrown into the public refuse collection system without any prior separation or treatment. As private small incineration devices are not recommended owing to possible air pollution, there should be a possibility for separate collection, special pickup, and incineration of the medical waste. Medicine collection centers should be established and as a first measure of all wastes from medical work should be effected in closed plastic bags. (Text in German)
[23867]

LAW / REGULATIONS

73-4617

DENK, L. Folgerungen aus der neuen abfallgesetsbegung fuer geimeinden, gemeinderverbaende, industriebetriebe. [Consequences of the new refuse legislation for communities, municipal associations, industrial enterprises.] *Muell und Abfall*, 4(6):192-197, 1972.
The new refuse legislation states that the communities have to provide for the collection and transportation of domestic and commercial refuse, demolition wastes, sludges, hospital refuse, and slaughterhouse refuse. Refuse which owing to its special quality or quantity cannot be collected and transported together with domestic refuse has to be removed by the owner himself. Treatment, storing, and depositing of refuse will have to be effected by the different regions. In the future refuse removal plants need an official authorization before starting work. The new refuse removal act states that the Laender are obliged to provide for the building of disposal plants for special refuse. In the future also plants dealing with the treatment and storing of wrecked cars and old tires have to ask for an official authorization of the competent cleansing department. The new refuse removal legislation charges the Laender with the establishment of refuse removal plants under consideration of the special situation of the whole land. Certain industrial plants will have to inform the competent authorities about type, composition, and quantity of the refuse develop-

ing in their plants and in tbese cases refuse removal will be supervised by the authorities. (Text in German)
[23868]

73-4618

EWERT, G.-D. Abfallbeseitigung und abfallgesetzgebung in Hamburg. [Refuse disposal and refuse legislation in Hamburg.] *Muell und Abfall*, 4(6):201-203, 1972.
Since the year 1886 refuse collection and removal has been effected in Hamburg by the municipal authorities, and in 1895 the first refuse incineration plant in Europe started work there. The city of Hamburg has a sanitary landfill for special refuse and constructed an incineration plant for special refuse with a high heating value. The city of Hamburg also encourages private initiative to construct reclamation and disposal plants for special refuse by granting suitable areas at low costs. A central plant for detoxification and neutralization of toxic concentrates has been constructed by the city itself. In Hamburg an official authorization for the collection or transportation of refuse within the region of the city of Hamburg is required. The competent authorities in Hamburg are in possession of the refuse data of about 800 of the 4,000 refuse producing enterprises in Hamburg so that an effective planning of disposal and recycling plants will be possible. As a result of the new federal refuse legislation Hamburg and neighboring Laender Schleswig-Holstein and Niedersachsen agreed upon a mutual utilization of the existing sanitary landfills and plants for the treatment of special refuse. A new refuse incineration plant for about 500,000 inhabitants will be constructed together by Hamburg and Schleswig-Holstein. (Text in German)
[23869]

73-4619

KURIHARA, S. Seikatsukei kotai haikibutsu no seiji to sono shori no kosatsu. [Characteristics of domestic refuse and examination of treatment methods.] *Yosui to Haisui*, 14(9):1165-1169, Sept. 1972.
The main odor elements designed as pollutants by the Odor Control Law of May 17, 1972, their characteristics, and their sources are as follows: hydrogen sulfide (rotten egg odor) from kraft pulp mills, petroleum refineries, rayon manufacturing, cellophane manufacturing, chemical processing, starch manufacturing, and sewage treatment plants; methylmercaptan (rotten onion odor) from kraft pulp, petroleum refineries, pharmaceutical plants, chemical processing plants, feather processing plants, starch manufacturing plants, garbage treatment plants, and sewage treatment plants; methyl sulfide (rotten cabbage odor) from kraft pulp, petroleum refineries, and pharmaceutical manufacturing plants; ammonia (stinging odor), from chemical fertilizer plants, petroleum chemical plants, chemical processing plants, fishmeal processing and animal offal processing plants, chicken excreta drying plants, feather processing plants, garbage treatment plants, sewage treatment plants, and slaughterhouses; and toluymethylamine (rotten fish odor) from fishmeal plants, feather processing plants, fish product canneries, garbage treatment plants, stockyards, and slaughterhouses. The indexes for maximum allowable odor should be 3.5, which will be 5 ppm of ammonia, 0.01 ppm of methylmercaptan, 0.2 ppm of hydrogen sulfide, 0.2 ppm of methyl sulfide, and 0.07 ppm of toluymethylamine. Characteristics and significances of odors, physiological effects of odor, and odor measuring methods are briefly mentioned. (Text in Japanese)
[23870]

73-4620

MASSEY, D. T. Legal facets of county-wide solid waste management. *Public Works*, 104(3):81-82, Mar. 1973.
In order to take advantage of the many benefits of county-wide or other regional solid waste management plans, Wisconsin recently enacted legislation enabling counties to establish and operate solid waste disposal systems or to participate in such systems jointly with other counties, cities, or towns. Involvement is optional since the statute permits but does not require such cooperation. Municipalities having difficulty finding sanitary landfill sites due to restricted zoning are aided under the bill. Sites operated by governmental agencies in accordance with an approved county plan and meeting all State stan-

dards are exempt from local permits or authorization. Statutory provisions authorize county boards of supervisors to acquire land for and operate disposal sites, regulate their operation, and collect waste. Ordinances necessary to conduct these functions may be adopted and enforced by these boards. Counties are empowered to appropriate funds and levy taxes for capital and operating costs of solid waste handling systems. Persons using the services of county systems may be charged reasonable user fees commensurate with the costs of the services rendered. Counties may borrow funds and issue general obligation bonds to finance land acquisition or construction of solid waste handling facilities.
[23871]

73-4621

Poisonous waste disposal. *FMF Review*, 2, Sept. 1972.
The Deposit of Poisonous Waste Act 1972 is reviewed. The Act provides that no person shall deposit waste on land where the waste is of a kind which is poisonous, noxious, or polluting and its presence on the land is likely to give rise to an environmental hazard. The presence of waste on any land is regarded to give rise to an environmental hazard if the waste has been deposited in such a manner or in such a quantity as to subject persons or animals to material risk of death, injury, or impairment of health, or as to threaten the pollution or contamination of any water supply. The Act makes it a duty to notify the responsible local authority before waste is removed or deposited, and it makes provision for exceptions to this requirement to be made by means of further regulations. Food or any waste produced in the course of the preparation, processing, or distribution of food, vegetable matter, and animal carcasses, or parts thereof are exempt from notification.
[23872]

73-4622

SCHENKE, R., AND G. W. VON VELSEN. Zum problem des beseitigung von somdermuell. [The problem of industrial waste disposal.] *Chemie-Ingenieur-Technik*, 44(16):962-966, 1972.
The social, organization, and economic problems of industrial waste disposal are outlined in light of the legal situation. The possible ways of organizing the disposal of special waste0 that is, by the State, by private industry, by an alliance of the two--are compared and contrasted regarding advantages and disadvantages of each. Finally, a scheme is given for the region covered by the Siedlungsverband Ruhr kohlenbezirk (SVR) which is based on the construction of a large plant for disposal of special waste by industry with participation of the SVR. The newest laws on the various levels agree on two principles. Firstly, wastes should be forbidden entry into any receiving stream, air, or groundwater, and secondly, that the producer of the waste has to take care of its disposal. Private initiatives alone or with some aid from the State seem to be the fastest and most efficient approach to a satisfactory solution of industrial waste disposal. (Text in German)
[23873]

73-4623

SULJAK, N. D. Public policymaking and environmental quality; an annotated interdisciplinary bibliography. Environmental Quality Series No. 5. Davis, University of California, Institute of Governmental Affairs, 1971. 176 p.
This bibliography contains abstracts on many areas of public policy as related to the environment. It illustrates the attitude of the various branches of the government toward environmental questions. Following these abstracts there is an annotated list of reference sources on environmental questions including: bibliographies; abstracts; directories; journals; newsletters; encyclopedias; and statistics. (This document is retained in the SWIRS library.)
[23874]

73-4624

VON LERSNER, H. Das abfallgesetz des Bundes. [The Federal Refuse Removal Act.] *Muell und Abfall*, 4(6):179-184, 1972.
The Refuse Removal Act was the first important law approved by the Federal Government of Germany. It defines refuse as material which the owner wants to get rid of or the removal of

which is necessary for the public health and benefit. According to the 'Polluter-Pays Principle' costs for the removal of the refuse will have to be borne by the refuse owner which however does not mean that he himself will have to provide for the removal. In order to guarantee correct and hygienic refuse disposal the waste material will have to be removed by public authorities and removal costs will be covered by collecting a removal fee from the polluters. The proposal to pay the expenses for refuse disposal from tax proceeds has been rejected because this would reduce the initiative of the industrial polluters to reduce environment pollution. In the future enterprises dealing with wrecked cars will be regarded as refuse removal sites and are subject to an official authorization. For the time being car shredding plants can work economically owing to the high prices for shredded scrap but if prices go down the government will have to consider the introduction of a car shredding fee which will have to be paid when buying a new car. Public authorities are not obliged to remove special refuse. The owner of such special refuse must either provide for the necessary disposal himself or avoid the creation of special refuse. (Text in German)
[23875]

73-4625

WAHRENHOLZ, K-W. Das neue Abfallrecht. [The new waste disposal legislation.] *Wasser un Boden*, (10):304-307, Oct. 1972.
The new refuse removal act defines refuse as movable things which the proprietor wants to get rid of or which have to be removed in order to guarantee public health. Refuse has to be removed in such a manner that human health and animals are not endangered, that water and soil are not polluted, and that air pollution is avoided. Only 40 out of 2,700 deposit sites in Lower Saxonia will meet the mentioned requirements. In order to assure that in the future refuse removal plants will correspond to the requirements, deposit sites, incineration, and composting plants will be subject to an official control procedure. Modifications of removal plants which are already in operation will have to be effected in view of operation processes and plant installation if necessary. According to the new refuse removal act, an official authorization is required for collecting and transporting of refuse and for the importation of waste material. In case of violations of the refuse removal act, penalties up to 100,000 deutsche marks will be imposed. Costs for the removal of domestic refuse will have to be borne by the individual inhabitant by paying a certain collection fee, while in case of removal of special industrial refuse, costs will have to be borne by the polluter. (Text in German)
[23876]

73-4626

Waste disposal: a new framework proposed. *Surveyor--Local Government Technology*, 14(4,212):31-32, Mar. 2, 1973.
A four-point plant, outlining proposals for new waste disposal legislation, has been accepted by the Department of the Environment, Scottish Development Department and the Welsh Office. The main points of the plan are summarized in this article. The proposals involve new legislation to enforce waste disposal authorities to draw up a comprehensive 10-year plan. This would review and meet the waste disposal needs of their area. The legislation would also give the authorities licensing and sampling powers as well as authorization powers over the disposal of toxic or hazardous wastes. Further, the powers and duties of the refuse collection and disposal authorities will need to be reviewed and restated along the lines put forward in the consultation document as proposals for a new framework for waste disposal.
[23877]

MANAGEMENT

73-4627

CITY OF JACKSONVILLE, FLORIDA. Financial summary, 1972-73. 25 p.
This document outlines the income and expenditures of the City of Jacksonville, Florida. Included is a presentation of expenditures for solid waste management and street cleaning. This totals $3.1 million. There is also an extensive discussion of the new program for improving Jacksonville's sewage treatment facilities. (This document is retained in the SWIRS library.)

[23878]

73-4628

DREHER, J. Alles fuer die frischluft. [Everything for fresh air.] *Umwelt*, 3(1):39-41, 1973.

Stuttgart began early to protect its environment. In 1965 the city abandoned all dumps, of which it had 40. A large incinerator was put into operation in Stuttgart-Muenster. Larger containers with a volume of 110 liters and 1.1 cu m and entirely enclosed trash collection trucks were introduced. Part of the collected domestic refuse is composted. A planning committee has the task of estimating the future trash quantities from in-depth studies of the present trash quantities. (Text in German)

[23879]

73-4629

LENGYEL, W. Abfallordnung fuer den Kaerntner zentralraum. [Refuse system for the Kaernten region.] *Oesterreichische Wasserwirtschaft*, 24(9/10):211-220, 1972.

The refuse situation of the region of Kaernten with special regard to its importance as tourist attraction is discussed. Communities are classified according to the contingency of tourist beds offered and basing on these data refuse quantities of up to 100 percent are added to the normal refuse quantity of the inhabitants in order to get a correct refuse quantity forecast for the year 1980. At the time being only the big cities and some tourist places use a closed refuse collection system. In the other communities the refuse is collected in paper bags and transported in open trucks. The domestic refuse quantity amounts to 106,000 cu m per year, which means 21 liters per inhabitant and week. It is proposed to establish a regional refuse removal system, consisting of special refuse collection trucks which will empty the refuse either directly into the bins of refuse removal plants or will transport the waste material to transfer stations where the refuse is pressed into containers of 20 cu m. The central refuse removal plant will be situated at Klagenfurt consisting of an incineration plant, a flaying plant and a waste oil refinery. At Villach the collected refuse will be shredded and together with sewage sludge disposed of in a sanitary landfill. (Text in German)

[23881]

73-4630

RASCH, R. Behricht ueber die diskussion anlaesslich des 23 muelltech kolloquiems am 9 Oktober 1972. [Report on the discussion on the occasion of the 23rd refuse technical meeting on the 9th Oct., 1972, at Stuttgart.] *Muell und Abfall*, 4(6):198-201, 1972.

The central planning for refuse disposal must be effected by the individual region. This however does not mean that each region will have to set up a special department for refuse disposal. Special organizations whose work is not limited to one region only proved to do a very effective planning work and the setting up of adequate disposal plants. Fees for refuse collection and removal will not be generally fixed but left to the individual community, which may either calculate the amount according to the number of refuse bins or to the number of inhabitants. Fees should be calculated in a manner that investment costs for the removal plant will be covered. The storing of refuse in special containers is not subject to a special authorization but in general is regarded as part of the refuse collection and thus has to be effected by the community. For the transportation of special refuse a license is required in order to control the removal. Transportation and removal of special refuse must not be hampered by borders so that it can be transported from one land into the other as there are only one or two plants for the removal of special refuse in the Federal Republic. The definition of special refuse varies according to the different situation in communities and cities. In cities for example most of the special refuse can be removed together with the domestic refuse owing to the large capacities of the removal plants while small communities cannot accept refuse from industrial plants. (Text in German)

[23882]

73-4631

SHELEF, G., U. ALONI, AND A. MICHAELS. A national solid waste management plan for the state

of Israel. *ISWA (International Solid Wastes and Public Cleansing Association) Information Bulletin*, (7):12-21, June 1972.
A national solid waste management plan for Israel was elaborated by a committee made up of representatives of concerned ministries with the assistance of the World Health Organization. Extensive use of composting methods, protection of water resources, and a regionalized solid waste management system were the major concerns of the plant to be set up. The information necessary to develop the solid waste management plan were obtained from surveys of the present management practices, present and future disposal sites, disposal methods, and total compost needs, and from investigations of the refuse in major urban areas and of available technologies with regard to their applicability to the specific conditions in Israel. Criteria for the regionalization concept were determined; minimum population to be served in a region should be 250,000, each region should be capable of disposing of its own solid wastes within its own area over a period of 30 years, and a convenient network of roads should be available between the populated areas of each region. The plan is to be implemented in the summer of 1972. [23883]

73-4632

Solid wastes. *In* Environmental health planning. Public Health Service Publication No. 2120. Washington, U.S. Government Printing Office, 1971. p. 31-36.
This chapter discusses the steps necessary to plan for solid waste management on the State or regional level. It is necessary, first to define the nature and scope of the problem. The Federal government's conception of its mission is to assist local bodies with their disposal problems through research, grants for demonstration projects, and technical assistance. Many different Federal agencies are concerned with solid waste management. Generation of solid waste is discussed. It is necessary for a State or region to define its goals and problems in solid waste management. This could include: elimination of open dumps; elimination of health hazards; improvement of collection services; improvement of disposal facilities; and similar needs. Subsequently, it it necessary to draw up a plan for optimal solid waste handling procedures. This plan should include: suggested legislation; technical assistance for local areas; a public information system; a training program; and similar features depending on the needs of the individual State or area. The constraints of manpower, technology, money, and political concern should be considered and the plan should be implemented. It is necessary to evaluate the plan after it has been in effect and to include an evaluation mechanism in the plan itself. (This document is retained in the SWIRS library.) [23884]

73-4633

TAKAMATSU, T. Kankyo osen seigyo ni taisuru shisutemuzu apuroochi no kenkyo no doko. [Studies on the systematic approach to environmental pollution control.] *Gakujutsu Geppo*, 25(6):338-347, Sept. 1972.
To perform the plan and control of environment, it is necessary to know how the environment is affected by the change of meteorological or other conditions. Therefore, these conditions must be represented quantitatively and the change with time of the environmental condition must be forecast, but even with modern science it is difficult to foresee these conclusively and precisely because there are many unknown factors. For the material diffusion equation as to the atmosphere, the direction of wind and the speed of wind may, strictly speaking, be changed with time in the three dimensional space, and in our life space concerning pollution it may be said that it is in general difficult to calculate exactly on how the pollutional source would diffuse over a complicated geographical shape of the ground. However, it is too late to make pollutional counterplans after the analytical studies for these problems have been developed. For these reasons, it is significant to think of a method to make a reasonable plan and control for environment as far as possible on the basis of imperfect information. As a methodology for it, the predictive control may be cited, and in making the control system, there are the three important points: (1) the environmental system is primarily a mobile system; (2) the control policy must be set up in the presence of improbability; and (3)

the environmental control system must be treated as multivariables system. The present conditions of water pollution control study are given here. (Text in Japanese)
[23885]

OCEAN DISPOSAL

73-4634

Abfallbeseitigung 'in' und 'auf' see. [Waste disposal 'into' and 'on' the sea.] *Chemische Industrie*, 25:89-93, Feb. 1973.
The chemical industry will for some time longer be compelled to use the sea for the waste disposal mainly because some substances cause more severe direct or latent danger to the environment when disposed on land. The article gives a general review of the existing national and international regulations and laws, with definitions for terms such as 'dumping,' 'sinking,' 'sea,' and 'high sea,' and details of the rules on waste disposal into coastal waters and 'high seas.' The rulings are given of the London convention of 1972 of the 13 States of the North-East Atlantic Ocean, and of the Oslo convention, with definitions for the 'black list' and the 'gray list' of substances, including the contents of the 'Annex III' of both these conventions, not less important than the 'black' and the 'gray' lists, for it regulates the granting of permission for waste disposal into the sea. The present regulations on the application and permission procedures in the German Federal Republic are given separately. (Text in German)
[23887]

73-4635

Abfallbeseitigung der binnenschiffahrt. [Refuse removal for inland navigation.] *Staedtehygiene*, 24(3):74-75, 1973.
During the last environmental protection action 'Clean up the river Rhine' more than 4,300 cu m of refuse have been removed from the river Rhine which demonstrates the necessity of a regular refuse removal system for river ships. It has been proposed that the refuse shall be collected on board in sacks which can be deposited on shore whereever the ship moors. The owner of the berths has to provide for respective places from where the city cleaning department will have to remove the bags. The ship owner has to buy the bags and pay a special fee for the removal of the refuse. (Text in German)
[23886]

73-4636

ROSENTHAL, H., V. DETHLEFSEN, AND K. TIEWS. Rotschlamm in die Nordsee? [Red mud in the North Sea?] *Umschau*, 73(4):118-121, 1973.
Red mud, a waste product of aluminum production from bauxite, is increasingly difficult to dispose of on land because of a land shortage. A German plant at Stade on the lower Elbe is now starting production, with 800,000 tons of wet, red mud to be expected annually, and the intention of dumping it into the sea. In a large-scale experiment, with 15,000 tons of red mud was dumped during 20 days from a ship. The waste spread rapidly over an area of 250 sq km and disappeared in a few months to the bottom. Although no final conclusions on the injury to the bottom fauna can be made over the short time, fishes kept in cages in water nearby died in a few days. In laboratory experiments, herring eggs became glued over and a high mortality was observed, and in yet other investigations harm to plankton crawfish through swallowed floating red mud particles was shown, as well as to other animals. Though these observations are contrary to French experience, as well as that of other countries, it must be considered that the hydrological conditions and depth of the North Sea are different, thus it is certain that, here, harm is to be expected. It is possible to utilize red mud as raw material, such as in production of bricks, in cement, and in roadbuilding and thus, at least, to lessen the pollution of the sea. Dumping this chemically inert waste into depths over 3,000 m beyond the North Sea is also possible. (Text in German)
[23888]

PACKAGING WASTES

73-4637

AOKI, J. Kadai wa yahari haikibutsu shori. [The question is the disposal of wastes after all.] *Kinzoku*, 43(1):46-50, Jan. 1973.

The year of 1972 was a violently shocking year; particularly the wind blows hard against plastics. At the present time, the problem is gradually getting better, but remarkable improvement cannot be expected. The cause is complex and extends over a wide range, but due to the circumstance that extraordinary prosperity for the last several years stimulated the expansion of production facilities and led to the increase in plastic supply, the worldwide retreat of business reduces demands for them, and the counterplans to prevent pollution such as air pollution, water pollution, and so forth are putting pressure upon the enterprises. The time has come for the properties of plastics to be reviewed. Apart from the outside economic trend, there are many problems which the plastic industry must settle of its own accord. The largest focus on plastics as consumer products is the nontoxicity, nonpollution, and the ready treatability of the compounds. They are taking some measures against the regulations, but it seems they are still insufficient. In the case of polyvinyl chloride, many problems remain unsettled, such as the generation of harmful black smoke and combustion gases when a fire occurs. For the durable materials, such as polyester, epoxy, etc., since they tend to increase in production and in size, the amount of wastes to be treated may be considerably increased. For the present, either crushing or burning must be undertaken, but the development of crushers and incinerators should be hastened. (Text in Japanese)
[23889]

73-4638

Fotochemischer abbau von kunststoffen. [Photochemical decomposition of plastic material.] *Kunststoffetechnik*, 12(1-2):23, 1973.
In England at the present time about 100,000 tons of high pressure polyethylene are used for packaging purposes. The plastic wastes developing from the packaging materials can be disposed of by incineration, pyrolysis, or sanitary landfill. All of these, however, require high transportation costs. In this connection the biological decomposition of plastics has been discussed. It is possible to modify high polymers in a manner such that after degradation they can be decomposed by microorganisms. The degradation is effected by hydroperoxides resulting from a transformation of the polymers by means of oxygen. Other additives provide for the transformation of ultraviolet radiation into chemical energy which finally provides for the development of hydroperoxides. Tests conducted with polypropylene foils led to a complete degradation of the foils into a fine powder which was subsequently decomposed by microorganism. (Text in German)
[23890]

73-4639

Fuer die beseitigung von kunststoffpackmaterial. [Removal of plastic packaging material.] *Chemie-Ingenieur-Technik*, 45(1):A 17, Jan. 1973.
In 1970 the total quantity of refuse amounted to 17.5 million tons of which the plastic percentage was 3 percent, and which is expected to rise to 4 to 6 percent in 1980. According to investigations conducted by the Environmental Protection Agency, 90 percent of the total quantity of plastic packaging is made of polyethylene, polyvinyl chloride and polystyrene, three substances which cannot be attached by microorganisms. A firm in Japan lately succeeded in developing copolymers with a photosensitive agent which degrade within 2 weeks or in periods up to 6 months according to the quantity added of the substance. Another photodegradable polystyrene has been developed in the form of foam, the degradation of which is effected by activating the photosensitive agent by means of ultraviolet light and by an oxidation process. A polymer in the form of foil which can be easily penetrated by by oxygen and carbon dioxide becomes brittle when submitted to ultraviolet light. (Text in German)
[23891]

73-4640

HONDA, K., M. SENO, S. SHIRAISHI, AND K. NAKAMURA. Hikari hokaisei purasutikku. [Photodegradable plastics.] *Seisan Kenkyu*, 25(2):80-84, Feb. 1973.
As one method for disposal of plastic wastes, the development of photodegradable plastics is possible. In this report, the methods by which

photodegradation property can be conferred on plastics are described. For the photodecomposition of plastics, a copolymerization with the mononers having the photofunctional groups and a method of adding a photosensitizer to plastics may be considered. Particularly, polystyrene was used as a control plastic in this work, and the copolymerization with benzalacetone and benzalacetophenone in the case of the former and the addition of quinones in the case of the latter were reexamined, showing that all of them give good photodegradation. In the additive-addition method, for example, a 25 to 32 micron thick polystyrene film of a polymerization rate of about 1,600 to 1,800 was exposed to a 1 kw xenon-mercury lamp through a light condenser lens at a distance of 40 cm. In the copolymerization method, a polymer with carbonyl group directly linked on the main chain was synthesized by copolymerization of styrene with benzalacetophenone and benzalacetone without the independent polymerization property, and the photodecomposition properties of these were reexamined. (Text in Japanese)
[23893]

73-4641

Kunststoff als pruegelknabe-zu recht? [Blame on plastics-reasonable?] *Technica*, 22(6):442-444, 1973.

The percentage of plastics in residential refuse actually amounts to 3 percent and is expected to rise to 6 percent by 1980. Plastic waste can be deposited without any problems, as it can be compressed and shredded without difficulty. Plastic waste does not emit harmful substances into the soil or water. On the contrary, plastic material helps to protect the environment. Plastic foils lining the bottom of sanitary landfills prevent polluted water from seeping into the ground. Plastic flakes mixed with sewage sludge form an excellent soil improving agent. Plastic foils are used for lining sedimentation basins in sewage plants and aeration blades made of noncorrosive plastic provide for the intensive ventilation of wastewater. Research work is done throughout the world to develop plastic material which will be decomposed by microorganisms or ultraviolet light. Since plastic waste does not cause any problems in sanitary landfills or incineration plants, the technical input to solve the decomposition problem does not seem justified. (Text in German)
[23894]

73-4642

Lightweight take-home container for beer is easily disposable. *Australian Packaging*, 20(9):24, Sept. 1972.

This article discusses a new disposable container for carbonated beverages and beer. The trade name of the package is Merolite. The package consists of a pouch made from a polyethylene terephthalate tubular film coated with a vinylidene chloride copolymer barrier resin and a paper sleeve which reinforces the tube, so it can withstand the gas pressure from the beverage. The sleeve also protects the beverage from ultraviolet light and is used for identification. The use of the pack is described. The package can be crushed by hand and is easily disposable. It is burnable. The package holds 8.8 fluid ounces. The filling and storage of the container are also discussed.
[23895]

73-4643

New bottles make market impact. *Chemical Week*, 111(16):34, 36, Oct. 18, 1972.

This article outlines new materials and patterns in the soft-drink bottle industry. The major development is plastic-glass combination. In most cases this is a glass bottle with a protective coating of polystyrene or some other plastic. All plastic bottles are also being marketed. The bottles are recyclable because most of the plastics used will be consumed completely in the process of melting the glass. The bottles will also decrease the solid waste load because they are lighter and use less than all-glass bottles.
[23896]

73-4644

NOZAKI, Y. Pori-yoku kanryuho ni yoru hai purasu. [Waste plastic disposal by thermal degradation.] *Kogai Bosho Sangyo*, 3(1):68-75, Jan. 1973.

Both laboratory and pilot plant experiments were conducted using melted plastics such as

polyethylene, polystrene and polypropylene as medium for the degrading of plastic wastes. These plastics are almost completely degraded at around 400 C distillation and conduct heat to other waste plastics, decreasing difficulties encountered in the thermal degradation of waste plastics. By this method, the distillation furnace, the central equipment, can be made compact. Since degradation goes on at low temperature, heavy metals are collected in the residue, and are not scattered in waste gas and recovered salts, acids, and oils. Hydraulic acid of high concentration and oil, which is a fuel without causing pollution, can be recovered. As this process is different from combustion method, very little waste gas is emitted so that recovery equipment can be made compact also. It is easy to separate and remove residual matters. It is possible to dispose of a great deal of waste plastics and to produce a unit with 5 to 100 tons per day capacity. Since the charged waste plastics themselves act as a medium to conduct heat, there is no need for any supplementary medium. The residues can be continuously taken out of the furnace, so that the process is capable of continuous operation. Waste plastics to be fed need to be crushed to some extent, to prevent bulky waste plastics from staying on the bottom of the distillation furnace without being melted. (Text in Japanese)
[23897]

73-4645

PINTO, D. Beer and soft drink packaging. *In* How to make ecology work for you. New York, New York, Chain Store Publishing Corp., 1972. p. 30-47.

The problem of returnable versus non-returnable soft drink and beer containers has been debated frequently and there is abundant data available to support any possible conclusion. There is disagreement between ecology and business groups concerning the actual amount that these bottles do contribute to the solid waste stream. There are also conflicting reports about the extent to which consumers want, will buy, or will return returnable bottles. Retailers, obviously, feel that non-returnable bottles are more advantageous. If retailers want to avoid the passage of laws that require them to sell only returnable bottles and want to keep a good image on the issue they should press for tough anti-litter legislation. They should also financially support anti-litter advertising campaigns. In order to keep ecologists happy retailers can also: stock a small number of returnable bottles; point out to shoppers that soft drinks in returnable bottles are a better buy; sell larger bottles of soft-drinks; help with educational efforts aimed at making consumers committed to recycling every bottle, at a recycling center. The results of surveys on litter quantity and analysis, as well as consumer attitudes toward returnable bottles are listed. (This document is retained in the SWIRS library.)
[23898]

73-4646

PINTO, D. Packaging and private label. *In* How to make ecology work for you. New York, New York, Chain Store Publishing Corp., 1972. p. 48-55.

Packaging accounts for the majority of all municipal solid waste--360 million tons in 1972. Consequently, it has attracted the concern of environmentalists. The retailer can react to this concern through his use of his private label products. He should learn to avoid overpackaging that serves no purpose, except to make the product resemble a national brand. This should increase sales to the ecologically conscious shopper, rather than reduce them. Another approach is to make paper products available that are made from recycled materials. The retailer should point out to his customers that larger size packages use less packaging material proportionately. Recycled paper and other environmentally responsible materials should be used whenever possible for consumer containers, this, too, will probably lead to an increase in sales. The store can reduce overwrapping at the checkout counter and save money and gain friends. Any actions that the retailer takes toward making his private name label brands more economical than those of major brands should be advertised. (This document is retained in the SWIRS library.)
[23899]

73-4647

PINTO, D. Perishables packaging. *In* How to make ecology work for you. New York, New York, Chain Store Publishing Corp., 1972. p. 56-63.

This article discusses the question of the use of plastic as a packaging material for perishables, using the controversy over meat trays as an example. There is considerable dissension over the subject, in general, but the ecology question has added new dimensions. Opponents of plastic state that plastic does not burn cleanly when incinerated and does not decompose when placed in a sanitary landfill. As a result many retailers have made a well publicized switch back to paper. Others have spoken in defense of plastic asserting: plastics by their resistance to decomposition give stability to a sanitary landfill, and don't cause pollution from their decomposition products; and it is faulty incinerators, not plastics themselves, that produce incomplete burning and unpleasant combustion byproducts. Paper is made from a renewable resource and plastic is not, but in terms of disposal neither is clearly preferable. The author advocates that stores give their customers a choice of container materials. Polyvinyl chloride is discussed and found to be harmless. Recommendations are made on the best products for various materials, it is recommended that retailers not give up plastic recklessly. (This document is retained in the SWIRS library.)

[23900]

73-4648

Seven ways to reduce disposable waste in packaging. *Modern Materials Handling*, 27(12):52, 54-56, Dec. 1972.

Ecology consciousness can lead to savings in the area of reducing excess packaging. The use of returnable containers for packaging in industry can only be effective if a method is found to make it economical. Industries can often find uses in their own plants for the waste packaging materials from supplies they receive. Packaging materials can be designed so that they have another use for the end consumer. Re-design of packages with waste reduction in mind can lead to great savings. Of the consideration of the savings that can result from reduction in packaging lead a company to redesign its product slightly so that it will require less packaging. Another way to reduce packaging waste is to create a package that will be consumed in the course of using the packaging. Similarly, it is optimal to eliminate packaging altogether whenever possible. It is also important for the producer to design his packaging with recycling in mind. In addition if he recycles his own waste he will be able to do it efficiently, without the usual problems of contamination and separation.

[23901]

73-4649

The US glass container industry. *Glass*, 49(9):285-287, Sept. 1972.

This article details the work being taken undertaken by the glass container industry in the United States in response to the growing environmental consciousness. The article is a summary of material in Glass Containers0 1972, published by the Glass Container Manufacturers Institute Inc. The glass industry has set up 100 glass recycling stations around the United States and a total of 198,000 tons of recycled glass has been purchased by manufacturers since 1970. The glass industry is exploring new uses for waste glass in anticipation of the time that large-scale separation processes will come into being. In addition to reuse in new glass containers, waste glass may be used for paving materials, building insulation materials, building construction materials, and cellular material for absorbing oil spills and allowing them to burn without polluting the water. The present status of separation processes is examined. The glass industry is also taking steps to minimize any air or water pollution caused by glass manufacture.

[23903]

73-4650

Umwelt freundliche plastikflasche. [Easily disposable plastic bottle.] *Umschau*, 72(21):674, 1972.

A new plastic bottle has been developed which decomposes when it comes into contact with water. The bottle material consists of two chemically resistant foils of 0.1 mm thickness. A layer

of hydroxypropenyl cellulose is between the two foils. Before throwing away the bottle the outer foil is stripped off and the cellulose layer dissolves completely in water. (Text in German)
[23902]

73-4651

Waste disposal riddle must be solved soon. *Factory*, 5(10):4, Oct. 1972.
A report has been released by the Container: Paper Subcouncil of the Commerce Department's National Industrial Pollution Control Council. The report is entitled Paper and Wood Packaging in Solid Waste and it outlines the problem of disposal of paper from packaging. It states that by 1985, 100 million tons of waste paper will be generated each year in the United States. Of this, only 40 million tons are expected to be recycled. The document recommends that the government use economic and technological means to stimulate the increased recycling of paper.
[23904]

PROCESSING / REDUCTION

73-4652

A review of crushing-compaction systems--an introduction to various types of machinery.] *Kotai Haibutsu*, (7):80-94, Sept. 1972.
Various crushers and compactors are reviewed and the workings and scales are presented with illustrations and tables. Machines discussed include: Kyokuto (Far East) Tremasher garbage crusher by Kyokuto Development Co.; a waste crusher-selector by Kurimoto Ironworks Co.; the Tezuka compaction treatment system by Tezuka Kosan K.K., a scrap-shredder by Kikosha Co.; a KM cuttermill by Matsuzaka Trading Co.; a fritter for nonburnables, glasses, and jars by Nakayama Ironworks; the Nikki incombustible treatment system by Nikki Machinery Co.; the Odate crusher by Odate Precision Engineeri Co.; the Rad-Crusher by Horai Ironworks; the Eidal Crusher manufactured by Marubeni Co., Ltd.; the Kawasaki Hazemag crusher by Kawasaki Heavy Industries; the Mammosqueezer by Kawada Engineering Co.; Hitachi Ltd.'s pulverizer/fragmentizer for solid waste; and Mitsubishi-Hammermill's shredder, compactor, and shear by Mitsubishi Heavy Industries. (Text in Japanese)
[23921]

73-4653

DINGUS, G. W. Wet pelletizing process and apparatus. Canadian Patent 924,870 owned by Cabot Corp., Boston, Massachusetts. Issued Apr. 24, 1973.
The invention relates to the technique of wet pelletizing pulverulent materials, such as carbon black. More specifically, the invention describes a process in which caking of materials on the walls of the pelletizer with resulting obstruction of the pelleting zone is reduced to a minimum and perhaps even eliminated. The description of the invention extends to the apparatus used to carry out this process. Although wet pelletization has been a process practiced for more than 30 years commercially, no successful means have heretofore been devised to eliminate harmful consequences of wall cake in wet pelletizers. This invention intends to provide those means.
[23905]

73-4654

Great Falls, Montana to reclaim steel cans magnetically. *Waste Trade Journal*, 68(50):8, Dec. 16, 1972.
The Steel Producers News Bureau has announced that the City of Great Falls, Montana, has initiated a project to use magnetic separation to reclaim used cans. This system, scheduled to go into effect in 1973, will provide for the salvage of 30 million cans per year in the Great Falls area. Both municipal and industrial refuse will be separated using this method. In the United States there are now 33 other cities using or planning magnetic reclamation systems. Three billion cans are now being reclaimed annually in the United States. This system is economical and can operate on a large scale more easily than other reclamation schemes. Presently these magnetic systems are attached to disposal systems.
[23892]

73-4655

HAGIMORI, J., AND E. KITAJIMA. Kenkobutsu no hasai hoho. [A method of crushing hard objects.] Japanese Patent 48-2,150 owned by Tsukamoto Sogyo Co., Ltd., Tokyo, Japan. Issued Jan. 23, 1973.

This invention relates to a method of crushing hard objects such as bricks, concrete, rocks, and similar matters to a desired dimension without scattering small pieces. The crushing device under this invention consists of a gas bomb of liquified inert gas such as liquified carbonic acid gas, a heating water vessel provided with a heater in which the bomb is heated, and a gas tube connected with the bomb at the initial point and with the nozzles at the end and several other accessaries. At first, two holes are bored in a hard object to be crushed. Nozzles are inserted into each hole and tightly fastened with each other, then a high pressure of inert gas is injected into the holes to crush the hard object. At this time, the hard object is crushed along a line which connects the two holes. Thus, the hard object can be crushed in a desired direction if more than two holes are bored along a desired line. Using this method, the object is simply broken into two pieces instead of many small pieces, so that there is no risk that small fragments of hard objects are scattered. (Text in Japanese)
[23906]

73-4656

Haikibutsu shoriki raddo kurasha--R-600S gata. Rad crusher waste disposer--R-600S type.0 *Kotai Haibutsu*, (8):114-115, Dec. 1972.

This crusher is so designed that miscellaneous wastes0 including rubber products, such as tires, tubes, belts, hoses, and footwear with metallic inserts0 can be easily crushed and ground without any presorting. The Rad crusher developed for this purpose has a shearing structure in which the shearing takes place so gradually by rotation that no great momentary power is required and a comparatively small power can cut and crush any waste. The feature of this crusher is that any waste such as wire-inserted tires, empty cans, plastic and rubber wastes, wooden products, cloth, paper, glass, cuttings from lathes, and electric wire, can be crushed to pieces less than 15 cm long without damaging the blade of the crusher and without producing a great deal of heat. Also, less noise and vibration are made and the grain size of the crushed wastes can be regulated. Presorting and post treatment are not required. The capacity of the crusher is as follows: 1,100 to 1,300 pieces per hr for small car tires, 600 to 900 pieces per hr for common car tires; 2,100 to 2,500 pieces per hr for 18 liter empty cans; 2.500 to 3,500 kg per hr for wooden products, and 2,000 to 3,000 kg per hr for general city wastes. (Text in Japanese)
[23907]

73-4657

HARADA, T. Purasuchikku haikibutsu no shori gijutsu. [Disposal technology for plastic wastes.] *Kogai Boshi Sangyo*, 3(2):62-69, Feb. 1973.

Various types of crushers and shredders of plastics are discussed. It is better to dispose of waste plastics by shredding, than by crushing. Clearance, blade angle of hammer and effect of temperature, are also discussed. The plastic shredder, with a rotary blade, with 90 percent shredding rate, can be operated with continuous feeding of material. Shock-type shredders cannot be applied to plastic wastes, as they are meant for harder material, which does not stretch on impact. Jet crushing method is effective to a certain extent. Some models are a combination of high speed shock and powerful shredding. In order to avoid the generation of heat, plastics can be broken up at cold temperatures, but the means to lower the atmospheric temperature economically remains a problem. Crushing by jet stream has its limitations. A new method, using liquefied nitrogen gas, has not reached practical stage yet. Photo-degradation of plastics is briefly discussed. A study of this is being made at the Textile High Polymer Research Institute in Japan. At the Polymer Synthesis Research Institute, studies on model polymers are being made. (Text in Japanese)
[23908]

73-4658

HASEGAWA, R. Kokei haikibutsu asshuku konpoki--kuriin pakku. Solid waste compressed packer--clean pack.0 *Yuatsuka Sekkei*, 11(1):20-23, Jan. 1973.

This type of solid waste compactor is meant for department stores, supermarkets, and apartment houses. There are two models--D and M. Model D can dispose of 30 cu m of refuse per hr, with 21.5 tons of compression. The solid waste is reduced to one-fifth to one-sixth of its original bulk. The machine can be connected with a dust chute, and the hopper can be made larger, so that it can dispose of a great deal of waste at one time. The compressed waste is put into a bag automatically, so that it is clean and speedy. The package can be of the bulk and weight in keeping with the transportation means available. Maintenance cost is low; it is easy to operate and maintain. Electricity does not cost much and it is only the bags which must be replaced. Unless the waste bag is correctly set in the charging tube, the machine does not operate, even if the starting button is pushed. Once the bag is correctly set, the waste inside the hopper is compacted automatically. When stop button is pushed, the bag can be tied. Model M is similar to Model D, but in the case of Model M, when waste is thrown into hopper, the compactor automatically starts operating, because of photo cells action. The compressed waste is compacted, sterilized, and put into bags continuously and speedily. Inside the hopper there is a sprinkler so that it is safe from fire. Model M can dispose of 3 cu m an hr, with 17.2 tons of compression. (Text in Japanese)
[23909]

73-4659

INOUE, H. Asshuku konpo ni yoru gomi shori hoshiki to sono riron. [Waste disposal method and its theory using compressed packing.] *Yuatsuka Sekkei*, 11(1):8-12, 26, Jan. 1973.

Tezuka Kosan Co.'s compression method does not require thermal treatment, so that nonflammable, bulky, mixed wastes, and garbage, can all be compressed, wrapped in wire mesh, and the package can be asphalt-coated to be used for reclamation. It does not matter if the wastes contain plastic wastes with high calorific value or vinyl chloride, etc. There is no problem of smoke, or chloride gas issuing, so that there is no complaint about air pollution. Since the bulk is compressed to less than a quarter of the original bulk, transportation cost is lowered. It is more hygienic to reclaim with asphalt coated packages than untreated wastes, and subsidence is only 0.8 percent while untreated wastes' subsidence is over 30 to 50 percent. Results of studies on specific weight (weight/volume) of wastes in Tokyo showed the average was 0.26 tons per cu m (within the range of 0.2 tons to 0.4 tons per cu m). However, the specific weight of asphalt-coated packages is 1.1 tons per cu m. Dewatering is 7 to 10 percent of the weight. It is important to determine what the economic compression is, while assuring that the compressed package would not regain its original bulk. The compression plant is designed in such a way that 100 kg per cu cm to 200 kg per cu cm pressure is given. Those in operation at present have 100 tons per hr capacity, producing 1.5 ton blocks; 50 tons per 8 hr, 0.8 ton blocks; 50 tons per 8 hr, 0.5 ton blocks; 50 tons per 8 hr, 0.75 ton blocks; 50 tons per 8 hr, 0.75 ton blocks; 400 tons per 16 hr, 2 ton blocks; and 240 tons per 24 hr, 1 ton blocks. There are presses also in operation which are solely for decreasing weight and crushing wastes such as bottles, desks, cans, etc. (Text in Japanese)
[23913]

73-4660

JESCHE, H. Kisten, kanister kotfluegal. [Cases, canisters, fenders.] *U--das technische umweltmagazin.* (10):24-26, Oct. 1972.

Medium-sized businesses have special refuse storing and disposal problems, as they have to dispose of paper wastes, bottles, plastics, cases, and bulky refuse. Various devices have been developed by individual industries which are especially suitable for the type of refuse produced. Communities usually supply enterprises with movable refuse bins with a volume of 1,100 liters which are emptied by the competent municipal cleansing department. For greater refuse quantities special containers are offered which are transported by vehicles with a special charging device. In order to optimize the utilization of refuse bins special presses have been developed which press the refuse, mainly paper and cardboard, into bales of 40 to 100 kg weight. Larger press versions can be used for compacting production refuse. These have a throughput of 2,000 to 25,000 kg per day. Refuse bag presses compact the refuse to one-fifth of its original

volume and enclose it in a plastic bag. Refuse compactors consisting of a feeding funnel, pressing piston, and exchangeable container compress all types of refuse in a ratio of 1 to 8. For the disposal of bulky refuse and old tires a device has been developed equipped with cutting shafts working in opposite directions which shred about 30 to 60 cu m of refuse per hr at a volume reduction of 1 to 5 to 1 to 6. (Text in German)
[23914]

73-4661

KIMURA, K. Denkiroyo sukurappu puresu. [Scrap press for electric furnace.] *Yuatsuka Sekkei*, 11(1):13-17, Jan. 1973.
The original type of scrap press developed by the Nippon Kokan Co. in 1965 was designed for a 20-ton capacity electric furnace, but the newly developed ones are for 40-, 50-, 60-, and 70-ton capacity furnaces, rectifying the previously encountered problems. The press consists of four pillars, underneath which there is a bed and on top a cylinder frame. In the middle there is a slide frame which guides the piston rod. An oil tank is placed on the deck, and extended from cylinder frame. All the valves are placed on the side wall of the tank to simplify piping and maintenance. The slide frame has sufficient width, so that it can withstand uneven loading. Therefore, the piston is not unduly affected and there is no danger of oil leakage. Four cylinders, contrary to the one cylinder of conventional types, also avoid detrimental effects from uneven loading. The radial plunge pump is a simple, efficient, mechanism, makes less noise and vibration, and can withstand long use under severe conditions. The hydraulic system can be simply push-button operated. Although in the beginning, the compressed scrap was 1.8 to 2.2 specific gravity, this was changed to 1.2 to 1.4. Also, there is a 300 to 400 mm space between one side of the press and the compressed scrap, so that it can easily slip out. These new devices were made possible due to the fact that Nippon Kokan Co. not only manufactures steel, but also manufacturers the electric furnace. The new type of scrap press contributes to lowering the cost of steel making. (Text in Japanese)
[23915]

73-4662

KINOMOTO, Y., AND Y. SHIN. Haihin asshuku shoriki. [Refuse compaction device.] Japanese Patent Sho 47-25,498 owned by Sharp Corp., Osaka, Japan. Issued Aug. 8, 1972.
This invention concerns a compression mechanism, in which a rotary movement is changed to a reciprocating movement with reduced speeds, used in a compressive disposer for wastes such as food wastes, other common wastes, empty bottles, and empty cans. The disposer under this invention comprises a container with an opening on the top to house the household wastes or the general wastes, frameworks formed at the openings on the front and rear walls to surround the container, a pressing plate provided between the framework and the wall on the top of the container, and a compressive system mounted on the top of the main body in which the one end of rope from a pain of winding wheels connects with the rotary axis interlocking with an electric motor, and the other end of the said rope connects with the pulleys provided on both side walls of the frameworks through a pulley. By operation of the said compressive system, the winding wheel winds the top to cause the shuffling movement of the frameworks housing the compression container to take place, and thus wastes are compressed by the pressing plate within the container. (Text in Japanese)
[23916]

73-4663

KOBAYASHI, K. Kuren-shiki sukurappu puresuki. [Crane-type scrap compaction machine.] Japanese Patent Sho 48-3,033. Issued Jan. 29, 1973.
This invention concerns a scrap pressing machine on the upper part of which is mounted a strong electromagnet built-in compaction body in which a ram plate is provided. This invention is unique in that the installation of the compactor is on the top of a crane so that the said ram can be operated back and forth by oil pressure or gears. The purpose of this invention is to offer the equipment by which metal scrap can be pressed to a smaller volume by only one worker at the spot where scrap is discarded or piled up,

and the disposal and delivery of such bulky scraps can be easily performed by very few workers and in a very short time. (Text in Japanese)
[23917]

73-4664

Mitsubishi-Rindeman funsaiki. Mitsubishi–Lindemann crusher0 *Yuatsuka Sekkei*, 11(1):18-19, Jan. 1973.
The Mitsubishi-Lindeman crusher was developed with technical cooperation between Mitsubishi Heavy Industries, Ltd. and West Germany's Lindemann Kommandit Gesellshaft. Bulky wastes from industry, offices and homes are effectively crushed. Such pretreatment as preselection is not required. Since the crusher's feeder is very wide, bulky wastes can be charged into a crusher directly, without a feeding conveyer, which makes the crusher very compact. The blades, both vertical and horizontal, effectively cut wastes into pieces less than 60 cu cm in size. The machine can be operated either manually or automatically. Since the wastes are cut after crushing, it is easy to shred even bulky wastes of complicated shapes. It is economical and the operation rate is very high. (Text in Japanese)
[23918]

73-4665

MOZDZANOWSKI, J. Soil compacting machine. Canadian Patent owned by Bopparder Maschinenbaugesellschaft m.b.H., Boppard/Rhein, Germany. Issued Apr. 17, 1973.
Described is a soil-compacting machine with a frame carrying two soil compacting rollers mounted in tandem and at least two out-of-balance centrifugal force generators for vibrating the rollers as they roll the soil. At least one generator is mounted on the frame in front of the rollers. At least one other generator is mounted on the frame behind the rollers. Both generators are carried on shafts which extend longitudinally in the direction of the machine's travel. The generators are relatively short compared with the width of the frame and the axial length of the rollers. The aim of the invention is to arrange the unbalance centrifugal force generators in such a way that the cost of construction is reduced, and also to position the generators in such a way that the desired rocking movement is achieved.
[23919]

73-4666

NAKAZAKI, K., T. MORI, AND K. WAKAYAMA. Gomi shori sochi. [Waste disposer.] Japan Patent Sho 47-27,825 owned by Tokyo Shibaura Electric Co., Ltd., Kawasaki, Japan. Issued Aug. 23, 1972.
This invention concerns a disposer for household wastes in which wastes such as vegetable wastes, fish wastes, etc., which are perishable and tend to give off bad odors are packed in bags. The method under this invention is developed with the intent to exactly and easily perform the packing of these wastes into a bag by means of a piston. In this system, the water contained in wastes is first removed within the cylinder, the wastes are housed in a vinyl bag arranged below the cylinder and compressed by the piston, and then the top end of the bag is heat fused to closely pack the wastes. Accordingly the wastes can be packed into a bag, and because they are formed into compactly compressed light weight packings by compression after the removal of the water, the odors are completely eliminated and therefore the subsequent disposing work of wastes is easier. The disposer comprises a cylinder into which wastes are damped, a pressure container provided below the cylinder, a long cylindrical bag leading to the cylinder and attached foldably so as to be taken out from the lower part of the cylinder, a piston movable from the inside of the cylinder to the inside of the pressure container and to compress wastes in the bag, a cutting device to heat fuse the top end of the bag, rack bar connected with the piston, a feed wheel to move up and down the rack bar by an electric motor, a water-draining device to drain the water from wastes, and electric switch groups to achieve automatically all the operations between the changing time and the bag-cutting time. (Text in Japanese)
[23920]

73-4667

SHIBATA, R. Gomi shoriki. [Waste disposer.] Japanese Patent 47-25,497 owned by Matsushita

Seiko Co., Ltd., Osaka, Japan. Issued Aug. 8, 1972.
This invention concerns a waste disposer by which the wastes coming from general household can be disposed of sanitarily and compactly. It eliminates the defect which the former disposer possesses, such as a tendency of bulky wastes to fill up the waste contianer. The waste disposer consists of the body of the disposer, a box drawable from the body, a water-resistant paper bag detachable from inside the box, an electric motor, and a crank which can change the rotating motion of the motor into an up and down motion and then moves up and down the dead weight which compresses wastes. In short, in the system under this invention, wastes are compressed compactly into a paper bag by the up and down movement of the dead weight driven by the crank with the aid of an electric motor. A great quantity of wastes can be disposed of easily, sanitarily, and speedily without wastes being scattered about, and it also facilitates the subsequent disposal of the compressed wastes. (Text in Japanese)
[23922]

73-4668

SHIGAKI, M. Hasaiki o sonaeta shokyaku purasuchikki-rui sokyuki. [Feeder with crusher for plastic wastes to be burned.] Japanese Patent 48-10,739 owned by Takuma Co., Ltd., Osaka, Japan. Issued Apr. 6, 1973.
This invention relates to a feeder for plastic wastes to be burned in a combustion furnace in which plastic wastes are first crushed. The crushed plastics are fed into a combustion furnace continuously. The amount of air corresponding to the quantity of the feed is sent into the furnace avoiding the inclusion of unnecessary air. Thus, explosive firing of the plastic particles during the feeding operation is completely prevented. This feeder consists of many slanted fixed blades aligned in a V shape at intervals inside a hopper and many mobile shearing blades provided side by side so that they can fit between each space of the slanted, fixed blades. The upper parts of these are connected with the top of the piston rod of an oil-pressure cylinder. A pusher which makes a dragging movement back and forth is provided at the lower part of the hopper and connected with the piston rod of the oil-pressure cylinder, and a cylindrical top feeder into which the pusher can enter. In such a furnace, plastic wastes are quantitatively fed into the combustion furnace, and are completely burned out with no smoke and with sufficient air from several nozzles provided at proper places in the furnace. (Text in Japanese)
[23923]

73-4669

SHIN, Y. Haibutsu asshuku sochi. [Compaction equipment for refuse.] Japanese Patent 47-25,495 owned by Sharp Corporation, Osaka, Japan. Issued Aug. 8, 1972. 3 p.
This invention concerns a ventilating method for the waste compression equipment in which the refuse is compacted. This equipment consists of a container housing household wastes or general trash, a compression system to press and dispose of the wastes within the container, and the main body housing the said container and compression system which is provided with an electric blower which can operate at the time of operation of the compression system, or at definite intervals, to ventilate, during which fresh air comes in from plural inlet openings on the wall of the main body and dirty air goes out of the outlet pipe by the blower. (Text in Japanese)
[23927]

73-4670

SHIN, Y. Haibutsu asshukuki. [A compressor for wastes.] Japanese Patent 47-35,144 owned by Sharp Corp., Osaka, Japan. Issued Sept. 4, 1972.
This invention describes a waste compressor designed to compress and house domestic trash, especially vegetable waste, empty bottles, empty cans, and so forth. Trash from kitchens and general wastes have so far been simply thrown into a trash basket. The trash basket was very inconvenient for the reason that it is rapidly filled with bulky cooking wastes; the wastes are very unsanitary because they are usually left as they are. The compressor is intended to remove such deficts and consists of a main body comprising a rectangular form of frame elements and outside plates with a door at the central lower

part in the front, supporting frame elements at the central part of the main body, a machine room above it, and the waste-housing room provided with a compressing vessel below the supporting frame elements. The cooking trash is compressed in the compressing vessel into a small volume, and the compressed trash is housed in a paper bag within the compressing vessel so that it is easily and sanitarily taken out and handled after being compressed. (Text in Japanese)
[23926]

73-4671

SHIN, Y. Haihin asshuku shoriki. [A compressor for trash.] Japanese Patent 47-35,145 owned by Sharp Corp., Osaka, Japan. Issued Sept. 4, 1972.
This invention concerns a compressor designed to compress everyday trash, empty bottles, empty cans, and so forth, from houses and to house them in paper bags, or similar containers, for making the disposal of the compressed trash easy. The compressor consists of a compressing container in which trash is charged, a plate at the bottom of the compressing container which can open and close by motor, a rotary screw shaft mounted on the side wall of the compressing container, a compressing chamber comprising the push plate which makes an advance and retreat movement through the screw shaft by a motor in the compressing container, a tray which receives the water pressed out on compression, a container, in which a paper bag is housed, arranged under the compressing container, a take-out opening for the container, a control switch which senses the completion of the compressing operation, a control switch which senses the completion of the compressing operation, a control switch which senses the reach of the push plate at the fixed places at both ends of the compressing container, and a switch which senses the opening and closing of the receiving plate. Moreover, the compressing process and the process to house the compressed trash in the container are automatically operated. (Text in Japanese)
[23925]

73-4672

SHIN, Y. Haihin asshuku shoriki. [Refuse compactor.] Japanese Patent 47-25,499 owned by Sharp Corporation, Osaka, Japan. Issued Aug. 8, 1972.
This invention concerns a supporting structure for a compression container in which wastes are housed and compacted, used in a compressive disposer to compress wastes such as food wastes, other usual wastes, empty bottles, and empty cans. When the wastes in the compactor are compressed under a comparatively great pressure, the container itself must withstand great stress, and thus a strongly built container is needed. The feature is that the disposer consists of the compression container, a compression system to compress the wastes within the compression container freely removable from the door of the disposer, and freely mobile wheels mounted on both bottom sides of the compression container, and the compression container is supported by the supporting angle where the wheels are present and at the time of compressing operation is supported by the receiving angle located at the lowest part of the bottom wall of the container. (Text in Japanese)
[23924]

73-4673

STUCHENKO, G. Can crusher. Canadian Patent 924,959. Issued Apr. 24, 1973.
The device describes a can crusher. An hydraulic piston and cylinder carries an upper disc. A lower disc is situated below. Both discs have concentric grooves and receive the rims of popular-sized cans. The grooves also prevent slippage when crushing. Part of the apparatus is a four-way valve which routes the hydraulic fluid to either side of the piston. A relieve valve bypasses fluid when the valve is off. The invention is particularly adapted for use in service stations which use such cans for oil, antifreeze, soft drinks, and the like. Three claims are made for this invention.
[23928]

73-4674

The implications of applying high pressure to solid wastes for rail haul and solid waste

disposal: compaction equipment performance specifications. *In* High-pressure compaction and baling of solid waste. Washington, U.S. Environmental Protection Agency, 1972. p. 154-155.
The specifications discussed in this report deal with the functional performance required from the compaction equipment as a unit. They do not address themselves to equipment design needed to perform the task specified. The information given throughout this report indicates that several sets of such press performance specifications can and should be developed. The sets of specifications should be determined primarily by the materials to be compacted, press design, and operation considerations, and local solid waste disposal condition. It was only feasible to develop one example of very general performance specifications for a compaction press. This example provides for: the compaction of residential/commercial solid waste in heterogeneous mixtures which behave like semi-elastics; a press capacity of about 250 tons per 6 hr or about 33 tons per full 8 hr shift; applied pressure of 2,000 lb per sq in.; an overall volume reduction capacity of 18 to 1; a total cycle time of 1 minute; a service life of 2.9 million cycles; and a bale size of 25.7 to 27.7 in. in the compaction chamber. (This document is retained in the SWIRS library.)
[23912]

73-4675

The implications of applying high pressure to solid wastes for rail-haul and solid waste disposal: compaction equipment cost. *In* High-pressure compaction and baling of solid waste. Washington, U.S. Environmental Protection Agency, 1972. p. 155-160.
The compaction equipment cost data presented in this report include depreciation of the purchase price and power and maintenance. They do not include interest and other financing charges, return on investment, and personnel. The depreciation is calculated on a 20-year write-off period although the service life of similar presses has been found to be 10 or 15 years longer. An analysis of prices and cost/performance parameters for existing hydraulic presses, which in case of need, are suitable for the high-pressure compaction of solid wastes, indicates that depreciation and power amount to about $0.50 per ton in a 7 hr, 5 day-per-week operation. An additional 7-hr shift would reduce these costs by about $0.15 to $0.25 per ton. However, none of the existing presses was specifically designed for the compaction of solid wastes; consequently, the cost data reflect the price of using substitute equipment. Thus, these analyses suggest that the high-pressure compaction of solid waste might cost less than $0.40 per ton including all charges but excluding financing costs, labor, and return on investment. A higher press utilization factor than was used in this analysis could significantly improve this cost/performance ratio. Cost estimates made for a lightweight frame solid waste compaction press indicate that the basic investment cost may be reduced substantially, perhaps as much as 50 to 60 percent. (This document is retained in the SWIRS library.)
[23911]

73-4676

The implications of applying high-pressure to solid wastes for rail-haul and solid waste disposal. *In* High-pressure compaction and baling of solid waste. Washington, U.S. Environmental Protection Agency, 1972. p. 160-163.
The implications of high-pressure compaction for the rail haul of solid wastes is discussed to some extent in this report; however, there are plants to cover them in more detail in a separate publication being prepared on Rail Transport of Solid Wastes by the American Public Works Association. Concerning transfer stations, the rail haul link, and the ultimate disposal of the bales by the sanitary landfill method, the information shows that high-pressure compaction of solid waste is highly applicable to hail haul, and that the combination of high-pressure compaction and rail haul results in environmental control benefits comparable to those available in the currently acceptable method of processing solid wastes. High-pressure compaction of wastes could also increase the utilization of sanitary landfill space. (This document is retained in the SWIRS library.)
[23910]

73-4677

TSUKUBE, Y. Kanpekopuresu. [Waste disposal press.] *Yuatsuka Sekkei*, 11(1):24-26, Jan. 1973.
'Kanpeko' press was developed in order to reutilize waste cans as raw material for steel-making and to save labor. About 4 percent of all wastes is metal goods, which, when burnt in an incinerator together with other wastes, would shorten the life of the incinerator. By push button operation, compact presses (capacity ranges from 3,000 to 60,000 kg) can compress bulky wastes by oil pressure. They can be handled by inexperienced workers even, at department stores, forwarders, governmental offices, etc. Two smaller types are movable. The cycle type ranges from 30 seconds (14 seconds up, 16 seconds down) to 180 seconds. Capacity ranges from 1 kg for one operation, 110 kg in an hr to 60 kg in one operation (about 1,000 juice cans), 1,000 kg in an hr (about 17,000 juice cans). The presses are equipped with an antiexplosion device, and the biggest type can be attached to a conveyor and magnet separator, and is capable of continuous operation. (Text in Japanese)
[23929]

73-4678

WADA, M. Gomi shori sochi. [Waste disposer.] Japanese Patent 47-25,494. Issued Aug. 8, 1972. 3 p.
This invention provides for a disposer in which a cylinder, inserted at the lowest part with a vinyl bag which houses wastes, is brought down to the bottom of the waste-stored box, then the wastes housed in the cylinder are compressed by raising the pressing plate, and lastly the wastes thus compressed are removed from the cylinder for transfer to another handling place. For these reasons, the disposer under this invention will serve as a unique means for the disposal of wastes for reasons of sanitation and economy, in addition to the advantages possessed by the equipment that the structure is simple, and its operation is very easy. (Text in Japanese)
[23930]

RECYCLING

73-4679

[Construction plates made of composted refuse of common interest.] *Staedtehygiene*, 23(12):VII, Dec. 1972.
A new method has been developed to use composted domestic refuse for the production of construction plates. A one-floor plant processes the new raw material into plates which are nearly fire-proof and offer a sound protection which corresponds to that of a brick wall of 17.5 cm width. (Text in German)
[23934]

73-4680

BARGMANN, R. D. Kein bedarf. [No demand.] *Umwelt*, 3(1):54-57, 1973.
Some people have proposed recycling of solid wastes mainly to get around the shortage of disposal sites. Los Angeles produces 4.2 million tons of solid waste annually. The potentially salvageable materials in residential solid waste, e.g. glass, aluminum, iron, are among the most abundant in the earth's crust. In most cases, the materials and energy needed to collect and process such materials exceed those needed to mine and process the materials from natural resources. On the other hand those materials in short supply, e.g. copper, tin, lead, are not present in large amounts in household refuse. If all salvageable material in residential solid waste were removed, recovered materials would amount to only 0.44 million tons, which is 10 percent of the total. Thus if a shortage of sanitary landfill sites develops in the future, recycling of solid wastes will not solve the problem: recycling simply leaves most materials in the waste stream. A more fundamental solution is needed. (Text in German)
[23931]

73-4681

BELTING, K. W. Aufbereitung von phosphorgips zu anhydrit fuer das gipsschwefelsauereverfahren. [Processing of phosphogypsum to anhydrite for the gypsum/sulphuric acid process.] *Zement-Kalk-Gips*, 25(8):387-390, 1972.
In the conversion of phosphate with sulfuric acid for the production of phosphoric acid, synthetic gypsum is obtained as a byproduct. Until

recently this gypsum was considered to be worthless and was dumped. Experiments are now being carried out to find the best method for utilizing it. Two methods are described in this article for the conversion of this filter-moist phosphogypsum to anhydrite. One method uses a turbine calcinator. In the other, drying is done in a flow drier and dry return materials are added. The separation of crystal water makes it possible to add sulphuric acid to the dried material and thus to reduce any excessive fluorine content in the phosphogypsum to an acceptable level. (Text in German)
[23932]

73-4682

Beseitigung von kunststoff-muell in Japan. [Disposal of plastic wastes in Japan.] *Kunststoffe*, 63(2):93, 1973.
By 1975 plastic production in Japan will amount to 7 million tons annually and about half of this quantity will have to be disposed of as refuse. Therefore efforts have been made to develop new disposal methods for plastic wastes. Methods have been developed to suspend milled plastic refuse as dispersion which can be used for paving the streets. In a small town near Tokyo plastic refuse from households is collected separately and reformed into a granulate which is 40 percent of high pressure polyethylene, 15 percent of polyvinyl chloride and polystyrene, 10 percent, each, low pressure polyethylene and polypropylene, and 8 percent duroplasts and other plastic material. Due to the low tearing strength of this granulate it can only be used for the production of flower pots, but by adding chlorinated polyethylene or other substances the quality might be optimized. Other methods use plastic wastes for the production of artificial sand, bricks, and chipboard. (Text in German)
[23933]

73-4683

DAHL, E. Q. Method of recovering fluorine from carbonaceous waste material. Canadian Patent 922,486 owned by Elektrokemisk A/S, Oslo, Norway. Issued Mar. 13, 1973.
The invention deals with a method for recovery by pyrohydrolysis of fluorine from particles of solid carbonaceous waste material containing fluorine. The particles are obtained from furnace linings and bottoms, soots, scums, and dusts from the melt electrolytic production of aluminum. These particles are suspended at a temperature of at least 1,000 C in a stream comprising steam for purposes of establishing a fluidized bed. As an example of the utility of recovering fluorine, it is pointed out an aluminum plant producing 100,000 tons of aluminum per year has a waste of about 6,000 tons of used furnace bottoms and linings per year, and approximately 1,000 tons of scum and cyclone dust per year. Thus it is of great economic importance to be able to recover the fluorine in such a way that it can be returned to the electrolytic furnace.
[23935]

73-4684

DEVILLE, W. B., M. STOLL, AND S. FERGUSON. Recovery and reuse of solid wastes; a search of recent report literature. Bloomington, Indiana, Environmental Systems Applications Center, Oct. 1971. 65 p.
This report was prepared for Public Technology Inc. as part of a plan to set up an Urban Technology Clearinghouse. It contains abstracts of articles written from 1967 on that were compiled from a computer and manual search of a number of data bases. These articles are a fairly limited review of the literature in resource recovery. Areas reviewed include: economics; technology problems; governmental attitudes; municipal recycling programs; citizen recycling programs; separation; metals; paper; glass; plastics; organic materials; energy; incinerator residues and fly ash; pyrolysis; slags; automobile tires; composting; and land reclamation. (This document is retained in the SWIRS library.)
[23936]

73-4685

FICKER, S. Ein neues Gummi-Regenerierverfahren nach dem System Lurgi-ficker. [A new rubber recycling procedure according to the Lurgi-ficker system.] *Kautschuk und Gummi*, 25(10):481-485, Oct. 1972.
A new method has been developed for the recycling of waste rubber. The material to be

recycled is first preshredded in a roll crusher and then milled in a pulverizing mill. In a mixing device a plasticizer is added and sprayed onto the milled rubber waste. By means of a feeding device, the material is transported into a recycling worm, consisting of a hollow worm heat exchanger and the high temperature heating plant. The heat exchanger consists of a trough which is closed except for the feeding inlet and outlet. In the trough two worms are assembled which clean themselves mutually because of the special thread. A heat carrier liquid flows without pressure through the trough and the worms. The rubber material is transported by the worms from the inlet to the outlet of the trough without any compression and any kneading and is at the same time homogeneously heated up to the recycling temperature. The temperature of the heat carrier is between 200 and 260 C while that of the rubber material is about 30 C below the indicated temperatures. The heat exchanger has a weight of 3 tons, a heat exchange surface of 16 sq m and has a throughput of 250 to 300 kg per hr. After a detention time of 15 minutes in the recycling worm the recycled material leaves the worm and falls into a special cooling device. Further treatment of the recycled material is effected in refining devices. The recycled material has a high quality and a good processability. (Text in German)
[23937]

73-4686

GOEBEL, K. Enwicklungstendenzen im altpapierhandel. [Tendencies in the waste paper industry.] *Das Papier*, 27(3):98-99, 1973.
In 1971 45.5 percent of the material used for the production of paper consisted of waste paper and it is expected that this number will rise by 5 percent in 1972. However, owing to increasing salaries and investment costs, the waste paper industry can no longer provide for a classification of the waste paper so that this task has to be done by the producer of the new paper. Because of the difficult economic situation of the waste paper industry, various enterprises ask for a special fee for the removal of waste paper so that in many regions it is more economic for the households to let the waste paper be removed by the city cleansing service. Therefore sometimes waste paper dealers also provide for the removal of other refuse. In the long run waste paper dealers and governmental authorities together will have to inform the population about the importance of waste paper as raw material resource for the paper production. The removal of the waste paper through a specialized dealer contributes considerably to effective environmental protection. (Text in German)
[23938]

73-4687

GOODE, A. H., M. E. TYRRELL, AND I. L. FELD. Glass wool from waste glass. Bureau of Mines Report of Investigations 7708. Washington, U.S. Department of the Interior, 1972. 16 p.
Glass wool meeting requirements for commercial use was made from glassy fractions of urban solid wastes by the Bureau of Mines. This research was a part of the Bureau's program to develop building products and other usable materials from reclaimed urban waste materials. Mixes of molten glass were fiberized into glass wool during laboratory studies by impingement of a jet of compressed air on a stream of the molten glass. The principal test variable studied was composition of the melt; this was varied by adding dolomite and alumina to obtain molten glass with the handling characteristics required for producing final wool products of the desired composition and physical characteristics. When no charge is made for the waste glass and approximately $75 per ton can be obtained for the wool product, an interest rate of return on investment after taxes of about 12 percent can be obtained. If a charge of $5 per ton is required for the waste glass, a selling price of about $78 per ton would be necessary to obtain a 12-percent-interest rate of return on investment after taxes. (This document is retained in the SWIRS library.)
[23939]

73-4688

GOTSHALL, W. W. Reinforcing agent from scrap rubber char. Canadian Patent 922,857 owned by Marathon Oil Company, Findlay, Ohio. Issued Mar. 20, 1973.

Scrap rubber, for example, scrap tires, is destructively distilled to produce a carbonaceous char which is then ground to particles having an average particle size of less than about 2.5 microns with at least 99 percent by weight less than 5 microns. The grinding is accomplished under a nonoxidizing atmosphere and the particles are protected from oxygenation of their surfaces until they have been coated with an organic liquid. The resulting coated carbon particles are useful in the production of reinforced elastomeric compositions, for example, natural rubber, butyl or chlorbutyl components.
[23940]

73-4689

HAAKE, R. Die Schmieroelregeneration in der Bundesrepublik Deutschland. [The regeneration of lubricating oils in the Federal Republic of Germany,] *Erdoel und Kohle-Erdgas-Petrochemie*, 25(6):360-362, June 1972.
The article describes a method for treatment of used oils as presently used in Germany and other countries for purposes of recovering high quality lubricating oils. A special feature of the process is the ability to stop and start in short periods of time. For example, 60 minutes are required to begin the regeneration plant, and 30 minutes are needed to stop the process. The installation is heated by cycled hot oil. A special improved vaporizer ensures that oil quality does not decrease as the plant is being started or stopped. The installation has been designed so that not only oils from internal combustion engines can be treated, but also industrial oils containing up to 20 percent by weight of other substances. Consumption of acid has been largely reduced by using the patented 'Fiscalin system' for mixing mineral oils with sulfuric acid. (Text in German)
[23941]

73-4690

Haidenchi no kaishu shori. [Recovery of used batteries.] *Namari to Aen*, 10(1):24-32, Jan. 1973.
This report is part of the study made for a project ocncerning electric automobiles commissioned by the Agency for Industrial Science and Technology, Ministry for International Trade and Industry. The distribution route of used batteries is complicated; some are sold to rag pickers; and some to battery dealers, and then to used copper wholesalers, lead scrap recovery dealers, and smelters. Separation of electrode, separator, and the outer case is done mostly by hand. If lead batteries are to be used for electric motor cars from now on, the life and cycle time of batteries must be studied, and the recycling route must be simplified and improved. It is necessary to safely dispose of waste sulfuric acid and to prevent lead pollution of soil. There is no standard method of disposing of used batteries. Waste sulfuric acid can be utilized for making gypsum, but there are unsolved problems. A method for mechanical separation of components of batteries, such as electrode, separator and case, must be devised. New technology for disposing of plastic battery cases must be established. Bigger smelters must be established, to handle used lead from batteries, since bigger smelters can cope with the problem of pollution accompanying smeltering better than the smaller establishments. The example of Stollberger Zinc Co., West Germany, is cited. (Text in Japanese)
[23942]

73-4691

HORNER AND SHIFRIN, INC. Energy recovery from waste. Environmental Protection Publication No. SW-36d.i. Washington, U.S. Government Printing Office, 1972. 15 p.
This article describes the progress of the St. Louis demonstration project on the burning of shredded municipal waste as a fuel for boiler furnaces. In this process, solid waste is collected from residential areas of the city and ground in a hammermill. Magnetic metals and the remaining refuse is fired into boilers of the Union Electric Company for production of electricity. Glass and other inert materials are not removed. The solid waste accounts only for about 10 percent of the fuel used by the boilers, but this percentage may increase. The processing plant is able to handle 300 tons of refuse per 8 hr day. The firing for the balers system is pneumatic and the air velocity of the refuse particles is 50 to 70 miles per hr. The boilers will use about 12.5 tons of refuse an hr, 24 hr a day, 5 days a week. No difficulty is expected from the use of all coal on weekends when

solid waste is not collected. Possible problems that are being studied include: slagging; corrosion; incomplete burnout; and impaired electrostatic precipitator performance. The economics and the applicability on a larger scale of this process are discussed briefly. There are diagrams showing the operation of this system. The composition of municipal solid waste and coal are compared on a table. (This document is retained in the SWIRS library.)
[23943]

73-4692

JACQUELIN, G. Method of and apparatus for continuous extraction of liquid from a pasty suspension. Canadian Patent 924,958 owned by Centre Technique de l'Industrie des Papiers, Cartons et Celluloses, Grenoble-Gare, Isere, France. Issued Apr. 24, 1973.
The patent describes a method for continuous extraction of a liquid from a pasty suspension arranged on a layer on a support strip comprising elastically-deformable permeable zones separated by impermeable zones. The permeable zones with two faces of the strip in contact are each subjected to progressive contraction moving from the face in contact with the suspensions towards the free face of the support. Compression pressure is obtained by passing the suspension-strip combination between press cylinder. One claim is made for the invention.
239440

73-4693

Kommt die totale abfallfabrik? [Will there be a refuse plant for the joint treatment of all wastes?0 *Umschau*, 73(4):122-123, 1973.
Human society produces wastes. Many industrial wastes are already recycled for economic reasons. Most of the urban refuse in the Federal Republic of Germany neither is recycled nor disposed of in sanitary landfills. A recycling plant for the joint treatment of urban refuse and junk cars would solve the problem of separating the different materials contained in the refuse. The plan for such a plant provides that the refuse which is transported to the plant by means of collecting vehicles or pipelines is shredded in hammermill and iron parts are sorted out by a magnet. By means of a ballistic separator the refuse is divided into a light component (dust, paper, plastics) and a heavy component (glass, bones, nonferrous metals). Various substances of the light component like paper and plastics are sorted out in a high voltage separator. The paper is used in the board production while the plastic substances can be reused in the plastic processing industry. By means of flotation or electrolysis nonferrous metal are separated from the heavy component and then recycled. The residue which consists of dust, sand and ash is burnt or mixed with sewage sludge and then composted and used for fertilizing purposes. In a shredding device which is part of the recycling plant, junk cars are shredded into small pieces which are separated into scrap and nonferrous parts. Such recycling plants could be realised in the near future as a consequence of the new refuse legislation in the Federal Republic of Germany. (Text in German)
239450

73-4694

KUXMANN, U., AND H. WEBER. Untersuchungen zur elektrolytischen aufarb aufar beitung von kupfer-silber-legierungsabfaellen. [Investigations into electrolytic processing of copper-silver-alloys.] *Metall*, 27(1):19-27, Jan. 1973.
Copper-silver-alloy scrap with up to 70 percent silver content, coming from coin material and various applications such as old metal, is usually processed by melting it with the use of lead-containing fluxes into silver-containing lead and lead-copper matte. In this process considerable quantities of silver and copper are wasted. Processing by electrolysis is an alternative to this. Experiments were carried out in laboratory apparauts, with anodes prepared from copper-silver scrap. In this process, copper dissolved in the solution, while silver remained almost entirely in the rest of the anode, and thus the two metals are separated. A reaction model has been developed. The necessity to continually reduce the potential during the process and to prepare electrodes from the copper silver scrap are the drawbacks of the method studied. (Text in German)
[23946]

73-4695

MOKLEBUST, O. Regenerating HCL from iron chloride solutions. Canadian Patent 924,869 owned by N L Industries, Inc., New York, New York. Issued Apr. 24, 1973.

Described is a process for regenerating hydrogen chloride from aqueous iron chloride solutions derived from leaching or pickling processes. Iron chloride filtrate is divided into two portions so that one portion contains the same amount of iron chloride as was present in the original hydrogen chloride-iron chloride solution. This portion is sent to an absorber. The other portion is roasted to recover iron values as solid particulate matter and the chlorine as gaseous hydrogen chloride which is sent to the absorber. In this way a large proportion of the water present in the iron chloride filtrate is used in the absorber for condensing gaseous hydrogen chloride. Heating costs are reduced in this process. Also, since the capacity of the roaster is dependent on the volume of liquid to be roasted, a small roaster is more feasible as the volume decreases. As the concentration of iron chloride in the original solution increases, smaller amounts of water are needed to be evaporated in the roaster, thus contributing to savings in heating and capital costs.

[23947]

73-4696

PINTO, D. Can you win? *In* How to make ecology work for you. New York, New York, Chain Store Publishing Corporation, 1972. p. 90-100.

The merchandiser is in a difficult position; environmentalists portray him as the villain, but consumers do not cooperate with him in buying more ecologically responsible products. The government threatens to pass laws that will hurt his profits while it is doing little itself for the environment and itself legislates against recycled products. The store owner must work around these obstacles in order to carry out his environmental commitment. One important ally that he has is the National Center for Resource Recovery. This organization is made up of representatives from business and industry. The center also intends to establish a demonstration project that would demonstrate the profitability and possibility of a National Resource Recovery Network. Several facilities will be established soon which will receive, and process refuse selling recyclable products and using the rest to generate power. (This document is retained in the SWIRS library.)

[23948]

73-4697

Renaissance eines verfahrens: zementklinker aus abfallgips. [Renaissance of a procedure: Cement clinker brick from Waste gypsum.] *VDI-Nachrichten*, 27(3):38, Jan. 1973.

A new plant has been constructed in South Africa in order to reuse waste phosphate which is a waste product from the production of phosphoric acid. With coke as reduction agent and by adding clay and sand, the waste plaster is processed to cement clinker and sulfuric acid. The plant in South Africa is laid out to process 215,000 tons of waste gypsum annually into 105,000 tons of cement clinker and the developing 330 million cu m into 105,000 tons of sulfuric acid. By this procedure 90 percent of the sulfuric acid used for the production of phosphoric acid can be recycled. The phosphate-sulfuric acid plant consists of gypsum drying device, milling plant and rotary shaft furnace for the additives. (Text in German)

[23949]

73-4698

SCHUBERT, G. Gewinnung von Eisenkonzentraten aus Verbrennungsrueckstaenden. [The extraction of iron concentrates from combustion residues.] *Freiberger Forschungshefte, Reihe A*, (506):1-108, 1972.

The combustion of solid fuel in power plants produces slag and ashes whose disposal is beset with considerable difficulties and costs. Treatment of this residual matter so that it can be reused is of great importance to the crude iron producing industry of the German Democratic republic. For an improvement of the concentrate quality and better extraction of the iron, it was indispensable to study the mineral composition of the combustion residues. The studies concentrated on slag and ash samples taken in the power plants of Luebbenau and Schwarze

Pumpe (both East Germany). Through the study of the samples taken on the two last dates, the influence of ballast material in the coal on the mineral composition of the combustion residues should be determined. The grain size analyses were performed with a sieve. The intergrowth conditions were determined with a polarization microscope. Moreover, qualitative radiographic phase analyses and quantitative phase analyses of the iron mineral phases were performed. With increasing distance from the combustion chamber the grain size distribution of the combustion residues became smaller. The iron content of the combustion residues was influenced by the ash content of the coal. Within the combustion residues a marked dependence of the chemical composition on the grain size existed. With decreasing grain size the iron-concentration rise steadily. A clear maximum of iron concentration was found in the grain size range between 25 and 40 microns. Only the iron oxides hematite and magnetites were found in the combustion residues. The grain size class containing particles larger than 1 mm contained more hematite than magnetite. Between 0.1 and 1.0 mm the magnetite concentration was higher than the hematite one. The most favorable results are achieved by magnetic separation of the iron mineral phases. However, even here only 30 to 40 percent of the iron content can be extracted from a concentrate with about 50 percent iron. (Text in German)
[23950]

73-4699

SHIMODA, T., T. WATANABE, S. YUDA, Y. TAKESUE, AND T. IKEMURA. Poriechiren no netsubunkai ni yoru gasorin no seisei. [Formation of gasoline by thermal decomposition of polyethylene.] Presented at the 28th Spring Meeting, Japan Chemical Society, April 1-5, 1973. 1 p.

Thermal decomposition of polyethylene was carried out using a 300 ml stainless steel autoclave with an agitator. The reaction conditions and the effect of additives were investigated. The analysis of the liquid product was performed by means of gas chromatography with a temperature raising device which uses an SE-30 column. Optimum conditions were obtained when the temperature was 340 to 360 C, the time was 15 minutes, the initial gas pressure was 0 to 3 kg per sq cm, and the speed of rotation was 100 rpm. Main products were n-paraffins and n-olefins; their isomers were barely observable regardless of the reaction conditions. The ratio of n-paraffins and n-olefins to common carbon number was approximately 2. The effects of the construction materials and additives were also investigated. Proper use of additives such as sea sand, iron powder, and steel bead resulted in a good liquefaction rate at lower temperature. The decomposition was also accelerated when agitation speed was reduced. On the contrary, it was depressed at a high speed of rotation, since dissipation of heat is easier at that rate. (Text in Japanese) (This document is retained in the SWIRS library.)
[23951]

73-4700

UESHITA, K., C. KUWAYAMA, AND S. SAITA. Haikibutsu to umetate shobun. [Waste and its disposition by reclamation.] *Doboku Gakkaishi*, 58(2):39-44, Feb. 1973.

In Aichi Prefecture, a Wastes Policy Committee has been set up in order to plan rational disposal of wastes, consisting of specialists in medical, chemical, civil engineering, and economics fields engaged in overall and systematic studies of the problem. In most reclaimed land, wastes are disposed just as they are, and in order to prevent secondary pollution, earth is laid on top of them. In the case of Nagoya City, in the low flat land along the River Shonai, there are many filled areas, which are utilized as housing areas, uplands, playing grounds, or land for public use. Buildings which cannot tolerate any subsidence cannot be built. Sludge, after sewerage treatment, would make soft ground. Mixture of materials, used for reclamation, up to the degree that such useful materials as earth, sand, gravel, etc., would not be diluted too much, must take place, or they should be used in sandwich layers. However, so far, the dominant aim was to dispose of wastes. From now on, it should be shifted to raising the ground level. Big concrete pieces would make pile-driving difficult. Sludge from sewage treatment alone cannot make good reclaimed land. The ash from combustion city

wastes, from general households, etc., would make useful material for landfill and also for road construction. From some reclaimed land, methane gas issued, and when the covering earth layer was only 50 cm deep, trees planted could not grow, but died. (Text in Japanese)
[23952]

73-4701

UPDEGRAFF, D. M. Degradation of waste paper to protein: research in microbial fermentations. A Solid Waste Management Open-file Report (SW-16rg.of). Washington, U.S. Environmental Protection Agency, 1971. 100 p.
The early stages of this work concentrated on efforts to isolate pure cultures which would utilize both cellulose and hydrocarbons. From more than 70 different inocula of soils, compost, sewage sludge and forest litter, 367 pure cultures were isolated on n-hexadecane media; 28 of these were found to be capable of attacking sodium carboxymethyl cellulose and lowering its viscosity. Only one proved to be capable of attacking purified cellulose, ball-milled newspaper, or newsprint. This culture is a fungus which grows well up to 45 C, identified as Aspergillus fumigatus. More than 300 enrichment cultures were also developed on cellulosic substrates (purified cellulose, ball-milled newsprint, without ink, or ball-milled newspaper) from similar inocula. These were tested in shake flask fermentations for ability to produce protein and utilize the cellulosic substrates listed above. Only 10 enrichment cultures yielded greater than 0.2 mg or protein per ml in 5 days. These also utilized appreciable amounts of cellulose. From the active enrichment cultures, 5 cellulolytic cultures were isolated. All of these were fungi. All gave considerably higher protein yields and cellulose organisms Trichoderma viride or Cellulomonas sp. These organisms were studied in shake flask fermentors in an effort to achieve optimum rates of cellulose utilization and protein synthesis. Two of the cultures were Myrothecium verrucaria, two were Aspergillus fumigatus and one was Trichoderma lignorum. (This document is retained in the SWIRS library.)
[23953]

73-4702

Waermeausnutzung bei Muellverbrennungsanlagen. [Utilization of heat in incineration plants.] *Sanitaer- und Heizungstechnik*, (10):698, 1972.
A new system to remove refuse and sewage sludge together has been developed which is suitable also for small towns with less than 10,000 inhabitants. The solid waste is burnt in a grate furnace. The waste heat is transformed into vapour in a subsequent boiler. The flue gases are cooled down to a temperature of 250 to 300 C and are then dedusted so that they can be emitted through the chimney without exceeding the emission tolerances. The vapour is used for dewatering fresh sludge with a water content of about 96 percent. The dewatered sludge is then burnt together with the refuse in the combustion chamber of the incineration plant. This system offers the advantage that the refuse heat can be entirely utilized and costs for the sludge removal can be considerably reduced. (Text in German)
[23954]

73-4703

WARGALLA, G. Einsatz von Rotschlamm bei der zement-und blaehtonherstellung. [Application of red sludge in the cement expanded clay production.] *Erzmetall*, 26(1):18-20, Jan. 1973.
Red sludge has proved to be an excellent sintering auxiliary agent in the cement and expanded clay producing industry. In the cement production the main substances of the red sludge are acting as regulators for the fabrication of the hydraulic crystal phases. By adding red sludge it is possible to reduce the sintering temperature which is necessary to obtain the required melting contents, thus saving energy. In the expanded clay production the pyroplastic behaviour of the clay mixture during the baking process is improved by adding red sludge mixed in a ratio of 1:1 with flue dust. Another method to dispose of red sludge is the production of concrete additives. The wet red sludge is treated together with flue dust in a mixer, drier, and then in a rotary shaft furnace. The final product, added to concrete, furnishes a concrete strength of more than 450 kilopounds per cu cm at a bulk weight of 700 kg per cu m. (Text in German)
[23955]

73-4704

WESTWOOD-BOOTH, I., AND J. B. FERGUSON, JR. Waste material treatment plant. Canadian Patent 918,826 owned by Federated Waste and Pollution Control Corporation, Hoboken, New Jersey. Issued Jan. 9, 1973.

The invention pertains to treatment of waste material by means of a plant with the facility to handle large volumes of organic and inorganic wastes and produce a useful end product. This end product should be sanitary, odorless, and substantially inert, but organic and inorganic wastes require different considerations in treatment in order to produce this desired product. The aim of this invention is to produce such a product. Initially the waste is reduced in size. Part of this reduced waste is deposited into the uppermost of vertically arranged waste material treatment courses. Means are provided for gradually moving the waste to the lowest course; during this movement, organic wastes are broken down and metallic wastes oxidized. Individual treatment sections may be insulated from each other so that such things as plastic, paper, or metals can be uniquely treated. After the waste has left the lowermost course it may be subjected to final grinding or milling; the product may then be formed into a thin particle stream which is passed through a high-energy irradiation zone, destroying pathogenic bacteria. Ten detailed figures at the end of the paper are examined in detail. They are concerned with the construction, arrangement, and manner of operation of the treatment plant. The product produced by the plant can be used as a constituent in a sanitary landfill, or, with the addition of binders and compression, in the manufacture of building blocks, roadbed foundations, or insulated acoustic paneling. The patent has 14 claims.

[23956]

73-4705

YAMATODA, K., K. UCHIYAMA, AND H. ISHIKAWA. Josuijo haidei no riyoho. [Utilization of the sludge from water plants.] *Yosui to Haisui*, 15(3):202-207, Feb. 1973.

Sludge cake from water plants had better be utilized for specially molded construction material, since it is alkaline, with pH of 10 to 11, rather than be used for landfill, thus interfering with the growth of plants and vegetables. For solidifying sludge, there are many materials used, such as portland cement, water, glass, gypsum, polymers, their emulsions, sand, etc. Vinyl acetate emulsion proved to be effective for giving compression and warping strength to the solid blocks made. To 100 g of sludge powder, 35 g cement, 15 g vinyl acetate emulsion, 0.05 g lignin, 0.3 g vesicatory, and 95 g water were added. After 4-7 days natural drying, the molded block has a good finish, is porous, light, heat-proof, sound-proof, and although it absorbs water, when dry it regains its original state. Dry molding eliminates the shortcomings of wet molding blocks. Plastic, used as binder, is pulverized to less than 16 mesh, mixed with sludge powder, and the mixture, in a mold, is heated and pressed to become about 1/3 powder material. Optimum mixture is 60:40, so that about 65 percent binder is required, calling for cheap material, such as polypropylene byproduct. The blocks, after heating at 160 to 180 C, are water-proof, fire-proof, can withstand pressure and shock well, and are suitable as construction material. However, the sludge to be mixed must be dried in dry molding. Cheaper acquisition methods for sludge, methods of utilizing untreated sludge, etc., must be studied. (Text in Japanese)

[23957]

73-4706

ZEPLICHAL, F. Die verwertung von altreiten. [Re-utilization of used tires.] *ISWA (International Solid Wastes and Public Cleansing Association) Information Bulletin*, 6:(105-111), Dec. 1971.

A pyrolytic process for the conversion of old tires into valuable components is described. The patented process starts with the grinding of the old tires into grains of 2 to 8 mm. The particles are then laid in loose layers about 40 to 50 mm thick on hurdles and heated under high vacuum, e.g. 10 Torr, at about 500 C until the organic components of the elastomer are disintegrated without total decomposition of the elastomer macromolecules. The gaseous products are immediately removed from the reactor, and are condensed by cooling. Gases, water, and losses

account for about 12 percent of the original volume, the pyrolyzate for 52 percent, and soot and zinc oxide for another 36 percent. The liquid pyrolyzate consists of naphthenic or aromatic oils which were added to the rubber during polymerization, and of depolymerization products of the elastomer. The gaseous product is composed of hydrogen and light hydrocarbons which can be used for heating purposes after desulfurization. The residue contains almost no volatile components as it consists of loose, porous, and dry grains, resembling the granulated soot utilized in the production of rubber. The pyrolyzate obtained can be used as an additive to road asphalt or epoxy, and the soot as active filler for rubber, or as printing ink pigment. (Text in German)
[23958]

RESEARCH

73-4707

ASTM studies recycled plastics. *Materials Research and Standards*, 37-40, June 1972.
The American Society for Testing and Materials (ASTM) Committee D-20 on Plastics will investigate its current standards to determine if an unnecessary premium is put on virgin raw materials. During the March Committee Week Meeting at Shoreham Hotel in Washington, D.C., an ad-hoc committee and working groups were created. ASTM Annual Book of Standards is available on Visual Search Microfilm (VSMF). Tests are conducted towards production of 'childproof' container caps to prevent poisoning. Standards are also needed for earthquake-resistant structures achieved by by constructing less strong and more flexible concrete. The committee on leather is concerned with developing methods for testing the chemical and physical properties of leathers. Since establishing the ASTM-ACA Committee, the group has developed 33 ASTM standards. Improvement of methods information generated by the committee is necessary. As a form of incentive, the ASTM Committee awarded experts who have been instrumental in developing standards for different processing methods.
[23959]

73-4708

MAHLOCK, J. L. conclusions. *In* An investigation of the microbiology of aerobic decomposition of refuse. Ph.D. Thesis. Lawrence0, University of Kansas, Dec. 1970. p. 147-149. The article summarizes the results of an investigation into the microbiology of aerobic decomposition of refuse. A number of conclusions are offered. Rapid microbial degradation of certain solid waste components can occur by using an aerobic microbial system. Chemical composition of solid waste is the most critical factor in decomposition. Moisture is important for rapid metabolism. Temperature was a simple parameter useful in tracing the rate of microbial decomposition. The pH of the solid waste-soil mixture affected metabolism initially and as the metabolism proceeded; mixed refuse showed an increasing pH while paper wastes showed a decreasing pH. Grinding and good mixing with soil is essential for rapid decomposition. Sampling techniques are critical in evaluating microbial degradation; homogeneity is of prime concern. A definite pattern of succession of bacteria and fungi occurred during metabolism of wastes with bacteria starting metabolism. Predominant fungi in the three solid waste systems included Trichoderma, Geotrichum, Rhizopus, Penicillium, Aspergillus, and Clasdosporium. Use of rose bengal was satisfactory for a quantitative evaluation of fungi; a yeast extract-soil extract medium was satisfactory for enumeration of bacteria. No method was available for readily distinguishing between living microbial cells and spore forms during the latter stages of metabolism. (This document is retained in the SWIRS library.)
[23965

73-4709

EIPELTAUER, E. Verwertung von phosphorsaeure-gipsschlamm. [Utilization of phosphoric acid-gypsum-sludge.] *Tonindustrie-Zeitung*, 97(1):4-8, 1973.
In many phosphoric acid industries, the gypsum sludge from wet process is as before going to the dump or into the waters, thus causing pollution of the environment. The intensive efforts made all over the world to utilize this sludge have not

yet brought success, because of the processes being too costly, or the products not satisfactory. The difficulties are due to a considerable degree to the openness of the gypsum lattice and the easy penetration of metal ions into it during its formation. The results of studies in this matter are reviewed. The important difficulties that have to be eliminated are: the phosphate content, fluorine content, organic impurities, sodium oxide content, and neutralization. The radioactivity is an important factor as well. A technically feasible way is shown how to produce high-grade plaster of Paris by single-time calcination, with sludge drying and final calcination in same machinery. (Text in German)
[23960]

73-4710

Forschungsauftrag zur loesung des muell problems. [Research work to solve the refuse problem.] *VDI-Nachrichten*, 27(1):6, 1973.
The Federal Minister for Education and Science charged the Batelle Institute at Frankfort with research work concerning the negative influences of one-way plastic packaging on the environment. The study shall show the utility of one-way plastic packagings in relation to the harmful effects which are caused by these packings in the environment. This study is to establish exact data as to the quantity of packings which are thrown away and which material is used for them. These investigations shall contribute to answer the question whether it is necessary to develop a plastic material which can be biologically decomposed and how this project can be realized economically. (Text in German)
[23961]

73-4711

KEHR, W. Q. Cellulolytic activity in municipal composting. *In* Microbial degradation of urban and agricultural wastes. [Cincinnati, U.S. Environmental Protection Agency, Office of Solid Waste Management Programs, 1972. Reprint.] p. 186-187.
Compost from the Johnson City Tennessee Composting Plant was used to study the microorganisms capable of cellulolytic activity in composted municipal wastes. Three cellulolytic flora were isolated by plating appropriate dilutions of compost homogenates on cellulose agar. A thermophilic fungus was found to clear the cellulose agar after incubation for 4 or 5 days at 40 to 45 C. This was Aspergillus fumigatus. A Gram-varible, spore forming rod, was isolated early in the composting process. It was capable of clearing the plate after 1 to 2 weeks. This organism flourishes at temperatures of 35 to 40 C and will not live above 45 C. The organism was tentatively identified as a member of the genus Bacillus. Another organism studied was the Thermoactinomycetes of the Actinobifida group. This organism grew well in the range of 55 C. Five to 6 days were required for this organism to clear areas of cellulose. The clarified extracts of compost were able to hydrolyze carboxymethyl cellulose at temperatures of 65 C. This temperature is common in municipal waste. The optimal pH for the cellulolytic activity of compost was extracts was 6.0. Other research on the same subject is discussed. (This document is retained in the SWIRS library.)
[23962]

73-4712

KEHR, W. Q. Conversion of organic solid wastes into yeast. *In* Microbial degradation of urban and agricultural wastes. [Cincinnati, U.S. Environmental Protection Agency, Office of Solid Waste Management Programs, 1972. Reprint.] p. 188-189.
This article concerns research into the economic feasibility of converting solid waste to edible protein through a two stage process of hydrolysis and fermentation. Waste paper and bagasse were used in for research because of the easy availability of economic data and the isolated supply. This research was based on work done on hydrolysis at the Forest Products Laboratory of the U.S. Department of Agriculture in Madison, Wisconsin. The work there used wood for the process, but the method used was the same and the data were conservatively relevant. Fermentation followed the regular methods methods for the aerobic propagation of cells. Economic considerations were based on the production of protein that is similar to torula yeast. Marketing projections were made. Bagasse and waste paper

were only examples--any organic refuse can be used and this process seems to hold promise for extensive utilization of waste. (This document is retained in the SWIRS library.)
[23963]

73-4713

KEHR, W. Q. Feasibility study on the disposal of polyethylene plastic waste. *In* Microbial degradation of urban and agricultural wastes. [Cincinnati, U.S. Environmental Protection Agency, Office of Solid Waste Management Programs, 1972. Reprint.] p. 187-188.
Vinyl plastics are particularly sensitive to some microorganisms, but since these polymers are used in a plasticized state it is possible to consider using the plasticizer to provide nutrients for the microorganisms. Plasticizers are usually attractive to fungi since microorganisms can more readily use glycol derivatives than phthalic acidderivatives. Experiments have shown that polyvinyl chloride left in the ground for 5 years showed marked decomposition. Both the polymer and the plasticizer were attacked. The inertness of polyethylene makes its disposal by chemical and biological means difficult. However, chemical treatment of this plastic can alter its properties so as to make it more easily disposable. More research on this subject is necessary. (This document is retained in the SWIRS library.)
239640

73-4714

MAHLOCH, J. L. Experimental methods. Sampling. Physical-chemical tests. *In* An investigation of the microbiology of aerobic decomposition of refuse. Ph.D. Thesis. [Lawrence], University of Kansas, Dec. 1970. p. 35-41.
Sampling of substrates from the test boxes was performed with a trowel. Various amounts of the substrate were tested for determining pH, microbiological analysis, volatile solids, and COD. Temperature was tested using two thermometers at different locations within the substrate. Results of relative humidity studies are: there was no significant difference in equilibrium moisture contents of samples taken at different times; and there was likewise no difference between different relative humidities of incubation. Soil alone was used as a control for COD testing. Findings suggest that COD in the soil was invariant with time, and that this COD made up a small portion (5 percent) of the substrate COD. (This document is retained in the SWIRS library.)
[23967]

73-4715

MAHLOCH, J. L. Experimental methods. *In* An investigation of the microbiology of aerobic decomposition of refuse. Ph.D. Thesis. [Lawrence], University of Kansas, Dec. 1970. p. 30-34.
The document previously demonstrated the fundamental interrelationship existing between microflora and environmental factors when discussing biological transformations of refuse. A larger problem is to expand current knowledge related to such biological decomposition. In order to do this, great care must be taken to design the experiment properly. The design must incorporate a balance between the minimum amount of data needed to make satisfactory conclusions and the maximum amount of data that can realistically be collected. For this reason, environmental factors of temperature, moisture, pH, volatile solids, and COD were measured. An attempt was made to relate relative humidity to moisture content. Counts were taken on various samples for bacteria and fungi; isolations were obtained at various points. The experiment was limited to the aerobic phase of biological activity. Refuse was placed into boxes which were insulated to minimize heat losses. Aeration rate to each box was maintained at between one to three cu ft of air per hr. Refuse was mixed with soil in all but one experiment. The three phases of the experiment were a trial run to test experimental methods, using paper wastes plus soil and mixed refuse plus soil for substrates, and using grass and leaves plus soil and mixed refuse plus an old refuse-soil mixture for substrates. Refuse was shredded prior to being placed in the boxes. The experiment was conducted for 48 days with sampling every 2 days. (This document is retained in the SWIRS library.)
[23966]

73-4716

MAHLOCH, J. L. Fungal populations in the substrates. *In* An investigation of the microbiology of aerobic decomposition of refuse. Ph.D. Thesis. [Lawrence], University of Kansas, Dec. 1970. p. 121-131.

An attempt was made to show succession of the various types of fungi in the substrates. The mixed refuse substrate in phase one had a definite succession of fungi from Mucor, Geotrichum, and Rhizopus to a final predominance of Trichoderma. Paper wastes had the same predominance with a succession of three Penicillia species throughout the incubation period. The grass and leaves substrate in phase two had Trichoderma as the main isolate. Trichoderma was the major fungus isolated from mixed refuse in phase two. Types of fungi isolated agree with those previously isolated from refuse samples. With the exception of the paper wastes substrate, mycelia were observed in the substrates during the course of incubation. A general succession of fungi involved first, the terrestrial phycomycetes, second, the ascomycetes, and finally the basidiomycetes. Fungal isolates were checked for cellulolytic activity. Aspergillus and Trichoderma species were reported as fungi which possess the capability to degrade cellulose. It should be stressed that both qualitative and quantitative data are needed for an evaluation of fungal activity in a substrate. The presence of Trichoderma in all substrates as well as the increasing counts over time throw doubt on the validity of the counts as indicators of fungal activity. Presence of mycelia in the substrate was probably the best indicator of fungal activity in the research. (This document is retained in the SWIRS library.)
[23968]

73-4717

MAHLOCH, J. L. Results. Microbiological tests. *In* An investigation of the microbiology of aerobic decomposition of refuse. Ph.D. Thesis. [Lawrence], University of Kansas, Dec. 1970. p. 101-120.

Results of microbiological tests concerning aerobic decomposition of refuse are presented. The graphs show an initial increase in numbers of organisms due to the food available to the microorgansims in the substrate. In general, the numbers of bacteria increased to a peak value and remained fairly stable. Numbers of fungi also showed an increase to a peak during the initial period but the counts were variable throughout the remainder of the experimental method. One reason for this variability may lie in the 'half-life' concept, which is characterized by a high rate of metabolic activity and a concomitant high rate of reproduction, but a rapid decline in numbers due to substrate availability. Other reasons based on research are provided. Results of grouping the bacterial isolates are presented in tables. At least 80 percent of the isolates obtained were run through tests described earlier in the thesis. Experimental work provided insufficient data for detailing the types of groups present (genera and species) or to state the interrelationship between the groups in the various substrates. However, the results did show that there was a definite pattern of succession of bacterial populations within the substrates. (This document is retained in the SWIRS library.)
[23969]

73-4718

MAHLOCH, J. L. Results. Moisture content. Volatile solids and COD. *In* An investigation of the microbiology of aerobic decomposition of refuse. Ph.D. Thesis. [Lawrence,] University of Kansas, Dec. 1970. p. 77-100.

Graphs of percentage moisture versus time, with the exception of the grass and leaves substrate, show a linear decrease in moisture. However, in the second phase of the experiment, the relationships between moisture content and time differed from those in phase one. It is evident that the moisture holding capacity of a substrate was related to its composition. Paper wastes and mixed refuse were subject to loss of moisture. The grass and leaves substrate did not undergo a significant moisture loss. Probably the main process for moisture loss was through aeration. It is also apparent that this process was temperature dependent. Both volatile solids and the COD of refuse are indicators of the amount of biologically available substrate. In all but two cases tested, both volatile solids and COD were found to be significantly decreasing with time.

The plot of volatile solids versus time for paper wastes substrate followed an arc, increasing to a peak at about 20 days and then decreasing. This may be explained by a weight gain of the substrate due to hydrolysis of the cellulose. The plots of COD versus time reveal smoothed curves for all substrates, showing evidence of decomposition. It is difficult to ascertain any kinetic data for the overall reaction from volatile solids and COD curves. In general, the rates in the initial states of decomposition appear to be linear in nature. (This document is retained in the SWIRS library.)
[23970]

73-4719

MAHLOCH, J. L. Results. Physical-chemical tests. *In* An investigation of the microbiology of aerobic decomposition of refuse. Ph.D. Thesis. [Lawrence], University of Kansas, Dec. 1970. p. 64-76.
Experimental results of the investigation into the microbiology of aerobic decomposition of refuse are presented. The results can be divided into two sections, one for physical-chemical tests and the other for microbiological. The common denominator was time. Temperature results show one common characteristic, a sharp initial temperature peak followed by a decline to a semistable temperature. Indications are that activity was at a minimum in paper wastes and at a maximum in mixed refuse of the Second Phase (described earlier). Differences in temperature curves between these results and those in the literature may be due to dissimilar heat retention properties of the two systems and a difference in time intervals over which temperature was measured. Effect of aeration on the temperature curves could not be evaluated. The graphs of pH versus time demonstrated fundamental differences between the three types of substrates used in the research. Curves for both mixed refuse substrates show a linear trend upward. Curves for grass and leaves, and paper wastes, show a much different result, however. The graph for paper wastes started at slightly acidic pH, dropped to a pH of 3.9, and remained fairly constant. The pH of grass and leaves started at a slightly acidic pH, rose to a pH of 8.3, and remained fairly constant. (This document is retained in the SWIRS library.)
[23971]

73-4720

MUKAI, O. Suijoki funiki deno puraschiku no gasuka. [Gasification of plastics in a wet atmosphere.] *In* Proceedings; 28th Spring meeting, Japan Chemical Society, Tokyo, Japan, Apr. 1-5, 1973. p. 748.
Several plastics such as polyethylene (PE), polypropylene (PP), polystyrene (PS), and polyvinyl chloride (PVC) were thermally decomposed, and their thermal characteristics and thermal decomposition rate according to Kofatad's method were examined by means of differential thermal analysis. Next, PE and PP were subject to pyrolysis at 700 to 900 C with and without addition of water vapor, passing through a quartz tube pyrolyzer, and their decomposed product composition, gasification rate, and carbon yield were examined. In case of PE, hydrogen, ethylene, ethane, propylene, propane, and carbon were formed. The addition of water vapor gave use to carbon monoxide and carbon dioxide, bringing about the decrease in carbon formation and also the increase in gasification rate. The same tendency was observed for PP. (Text in Japanese) (This document is retained in the SWIRS library.)
[23972]

73-4721

MUTO, G., AND M. SENO. Toshi haikibutsu taisaku no kaihatsu kenkyo gaiyo. [A review of research on refuse disposal.] *Seisan Kenkyu*, 25(2):73-75, Feb. 1973.
To proceed with the effective disposal of municipal plastic wastes, wide basic studies by the heat decomposition study group, photo-decomposition study group, field investigation group, and the disposal system investigation group have been undertaken. These include a study on the development of an analytical method for the metallic components in plastics and on the forecast of pollution by heavy metals after disposal, in which a pulse polarographic analysis was carried out for cadmium, lead, chromium, etc., contained in polyvinyl chloride. It is possible to analyze cadmium to 1 parts per billion and for lead and chromium to 1 to 10 parts per billion. A

study on an inorganic filler for plastics was made, with a result that adding an inorganic filler in large amounts lowers the heat of combustion and also aids burn out of polyolefin plastic. A study on the photochemical decomposition of plastic including aromatic carbonyl azide and quinone diazide, in which Eosine as a sensitizer for the formation of oxygen and cyclohexane as a reacting substance are subjected to light exposure in a solution of methanol, a developmental study on highpolymers which are liable to photodecomposition in which a carbonyl-containing polymer is synthesized, a co-polymerization of benzal acetone (BA) and benzal acetophenone (BAph) with stylene (St), and a catalytic decomposition of plastic and a study on the effective use of plastic waste are underway. (Text in Japanese)
[23973]

SANITARY LANDFILL

73-4722

HEITFELD, K.-H., AND U. SCHOETTLER. Versickert wohin? [Seeping, where?] *Umwelt*, 3(1):57-58, 1973.
Tests have been conducted in Western Germany as to the pollution of the groundwater near dumping sites and sanitary landfills. Special attention has been paid to the presence of mercury, lead, cadmium, copper, and zinc which accumulates in the human body and may cause cancer. Six hundred samples have been drawn during 2 years and it was found that near municipal refuse dumping sites the concentration of copper and cadmium ions was especially high. Metal ions decompose incompletely in the underground. According to the soil properties the accumulation and cleaning capacity of the ground differs. It was found that soil containing much clay has the best cleaning capacity while sandy soil showed the worst results. (Text in German)
[23975]

73-4723

KEHR, W. Q. Special studies of a sanitary landfill. *In* Microbial degradation of urban and agricultural wastes. [Cincinnati, U.S. Environmental Protection Agency, Office of Solid Waste Management Programs, 1972. Reprint.] p. 189-190.
This report outlines the conclusions drawn from a study of test cells constructed at the Los Angeles County Sanitation District landfill. A number of conclusions were reached. The initial in-place density of a landfill can be increased by adding water or increasing the height of the fill. An aerobically constructed landfill can maintain an active composting environment. However, the high temperatures that result can create a fire hazard. In an aerobic landfills gasses generated consisted mainly of oxides of carbon and nitrogen. Methane quantities depend on the amount of water added. Aerobic landfills produced oxygen and nitrogen during aeration and carbon dioxide and nitrogen at other times. Gas production takes place chiefly between the 230th and 600th days. The gasses produced in a landfill diffuse into the soil, as well as into the air. (This document is retained in the SWIRS library.)
[23976]

73-4724

KUTSUMA, J. Gomi no umetate ni yoru haikibutsu no niji kogai0 gomi senso, sono chosa hokoku. [Secondary pollution from sanitary landfills0 a report on the investigation of the 'Battle of the Refuse.'] *Sangyo Kogai*, 8(10):20-28, Oct. 1972.
The quarries in the Tama River Valley, where sand pebbles are mined have been used for a city refuse landfill during the last several years. Recently, inhabitants of Musashi-Murayama City complained of secondary pollution caused by methane obviously leaking from such landfill sites. Investigations were made to determine the extent of pollution by methane and carbon monoxide, and whether this has been the cause of the blight of chestnut trees in the area. Methane gas was sampled by 5 cc injection needles and analyzed by gas chromatography. Carbon monoxide was sampled by a Mylar bag and was analyzed by the non-dispersion infrared absorption method. The methane concentration ranged between 100 and 30,000 ppm. The maximum concentration at a height of 1.5 m from the ground was 69.6 ppm and the maximum at 5 m was 38.5 ppm. There were possibilities of

methane infiltrating into cesspools of households in the area, which might have caused an explosion in the kitchens and bathhouses by leaking through the drainage systems. Carbon monoxide was detected in the range between 3 and 20 ppm. The highest concentration was found in the cesspools. The methane content in the soil of the blighted chestnut groves was relatively high, the maximum concentration being 239 ppm. (Text in Japanese)
[23977]

73-4725

NOVAK, B. Vorschlag einer einheitlichen probenahmeeinrichtung fuer die ueberwachung der auslaugungsvorgaenge in abfalldeponien. [Proposal for a standard sampling device for the control of leachate in sanitary landfills.] *ISWA (International Solid Wastes and Public Cleansing Association) Information Bulletin*, (6):81-89, Dec. 1971
A sampling device of very simple construction and acceptable price for taking water samples from landfills is proposed. The sampling surface, of optional shape and a minimum area of 4 sq m, is made of plastic or galvanized plate, and is placed on a compacted gravel or sand layer at a slope angle of 2 to 5 degrees so as to enable the water sample to flow off into a collecting tank of 7 to 10 liter-volume. While the sampling surface is being filled with waste a sampling pipe is inserted, and this pipe can be successively extended as the dump grows. A hand pump coupled with a suction cylinder is used to extract samples from the collecting vessel. This sampling device is suitable for standardization, and can make comparative measurements at different dumps possible. (Text in German)
[23978]

73-4726

SCHENKEL, W. Aspects of water and air pollution control and landscape architecture at the tipping site 'Emscherbruch'. *ISWA (International Solid Wastes and Public Cleansing Association) Information Bulletin*, (6):90-91, Dec. 1971.
The operation of a sanitary landfill established on the premises of an abandoned marshy mine is described with regard to the water and air pollution control measures adopted. The landfill, to be filled up to a height of 80 m, will accomodate some 30 million cu m of primarily domestic refuse. Geological investigations revealed 5 to 11 m thick layers of fine and coarse sand interspersed with boggy deposits, and an underlying marl layer of some 300 m thickness. Slow water flow in these layers, and sulfate content higher than 900 mg per liter were observed. Surface waters contain 6,100 mg of chlorides, 1,500 mg of sulfates and 560 mg of nitrates per liter. The investigations ruled out the possibility of water contamination due to the landfill. To prevent air pollution, dust and light pieces of wastes are fixed by means of mine rubble, asbestos cement slick, or synthetic suspensions. Waste is dumped in layers of up to 2 m, followed by compaction. Except for the edges of the landfill, the surface is not covered up with soil as this would prevent the trucks from negotiating the landfill site particularly in rainy weather. The maximum possible dumping capacity is not exhausted, and efforts are made to integrate the site of the landfill into the surrounding landscape by recultivating its gentle slopes after filling up.
[23979]

73-4727

THE URBAN LAND INSTITUTE. Environment and the land developer. Washington, 1971. 28 p.
The Urban Land Institute (ULI) has issued a position paper of its Task Force on Environmental Quality which summarizes potentials and recommendations for improving the environment through better land use. The Task Force's deliberations were based on these premises: urbanization will increase; population will increase; environmental problems will increase concomitantly with the above; urban and economic expansion and environmental improvement are not irreconcilable. Sections of the paper are devoted to general conservation practices, open space, water, air, aesthetics, noise, pollution during construction, and governmental policies and practices. In the section devoted to water pollution, the authors point out that where sanitary sewage is posed of on site or where effluents from treatment facilities discharge into open streams, water supply systems must be

adequately separated from disposal sites. Chemicals and bacterial pollutants should be removed on site rather than being transported by water. If toxic chemicals cannot be disposed of on site, their use should be prohibited. The quality of land and urban environments can be effected by governmental policies and regulations most broadly through land use controls, pollution, and subsidized housing. The position paper concludes its discussion by analyzing each of the above areas and recommending improvements in existing policies. (This document is retained in the SWIRS library.)
[23974]

73-4728

VAN DER LEEDEN, F., COMP. Ground water; a selected bibliography. Port Washington, New York, Water Information Center, 1971. 116 p.
This book is a compilation of publications on the subject of ground water resources. The book reviews what the compiler feels are the most important papers in hydrogeology. For the most part documents of general applicability, rather than ones detailing local conditions are emphasized. The citations are not annotated. (This document is retained in the SWIRS library.)
[23980]

73-4729

ZAPOROZEC, A., AND D. A. STEPHENSON. Hydrogeological aspects of solid waste disposal. *ISWA (International Solid Wastes and Public Cleansing Association) Information Bulletin*, (7):3-11, June 1972.
General and hydrogeological aspects of landfilling are outlined. The economic considerations include: location of community and area to be served; the amount of waste; location and accessibility of disposal site and its distance from the community; present land use and zoning regulations; source of cover material and its distance; and costs of land, hauling, and labor. The physical criteria for selecting landfill site are: climate, especially precipitation which controls the rate of leachate production; topography; surface water conditions; soil conditions; and geological parameters such as depth to bedrock, character of surficial and bedrock layers. In addition, grain size distribution, stratification, and facies changes influence hydrological properties such as filtering effectiveness. While irregular topography is usually favorable for landfilling, highly porous or fractured bedrock is not suitable. Soil depths over 40 inches, silt, silt loam, or loam, good to moderately good drainage, moderate infiltration (0.63 to 2.0 in. per hr), slopes of 2 to 25 percent, and upland location are the ideal soil conditions for landfilling. The study of small, local flow systems which are controlled by the configuration of terrain but modified in flow direction and flow rate by the soil-rock conditions prevailing along individual flow paths, is of prime interest in solid waste disposal problems. The basic factors to be considered in the evaluation of ground-water pollution potential in a given area are the nature of leachates, their access to and distribution within aquifiers, and the location of the landfill relative to the point of water use. Chemical pollutants are more persistent and travel more extensively than biological pollutants. Chlorides, hardness, specific conductance, sodium and nitrates levels are the best indicators of ground-water quality. Leaching is most active in areas where the landfill intercepts with the ground-water table.
[23981]

SEPARATION

73-4730

JAVET, A. F. Separating apparatus. Canadian Patent 923,864 owned by The Battelle Development Corporation, Columbus, Ohio. Issued Apr. 3, 1973.
This invention describes an apparatus for separating a suspension into at least two fractions of different densities. This apparatus comprises one or more cyclones mounted for rotation about an axis spaced transversely to the cyclones. Each cyclone has an inlet adapted to communicate with a source discharging the lighter of two fractions and the second for discharging the heavier of the two fractions, which is more distant from the axis than the first.
[23982]

73-4731

KURIHARA, S. Toshi gomi chu no hai purasuchikku wa bunri suru koto ga dekiruka? [Can waste plastics be separated from city wastes?] *Kotai Haibutsu*, (8):2-14, Dec. 1972.

A survey was conducted on citizens' consciousness concerning plastic wastes by a private research agency. A total of 3000 housekols were surveyed0 1500 in Tokyo, 1000 in Osaka and 500 in Nagoya. More than 90 percent realized that plastic wastes present a problem. Tokyo citizens were more keenly conscious of this problem than those in the two other cities. Residents of Tokyo's central part realized that plastic wastes are harmful, while only 25.2 percent in rural areas of Tokyo, 21.6 percent in Osaka and 20.6 percent in Nagoya realized it was harmful. Another survey was conducted on 1500 households in Tokyo to see how cooperative they would be in dividing their wastes into three categories0 bulky wastes, combustible wastes and nonflammables such as plastics and iron scraps0 as it is scheduled to start garbage collection according to these three categories in 1975. A total of 72 percent responded and 90 percent expressed willingness to cooperate as far as possible. An actual experiment with this type of collection was conducted on about 100,000 households in Oji area Tokyo from May 1, 1971 to May 31, 1972. Hard plastics such as electrical equipment and buckets showed good results being more than 60 percent separated from other garbages. However, about 77 percent of the softer type of plastics, such as wrapping film and bags from food, were not separated. One lactic acid drink manufacturer, whose plastic empties are to be recovered, separately after delivery, found only around 60 percent can be recovered. Of the remaining 40 percent, 70 percent are found in the garbage, 30 percent, cannot be traced. Even if waste plastics can be usefully recycled, unless there is an effective measure for separation of plastic wastes, there is no true solution. (Text in Japanese)
[23983]

SLUDGE

73-4732

ANDERSON, D. Disposal of sludge solids from food industry waste treatment. *Critical Reviews in Food Technology*, 3(1):27-87, Apr. 1972.

Disposal of sludge solids from food industry waste treatment as part of industrial wastes management is discussed. The following aspects are presented: source and nature of wastes produced; liquid-solid separation process; assessing the filterability industrial sludges; chemical and thermal conditioning of sludge; separation equipment; typical plant capital cost analysis; incineration; disposal of particulate solids; marine disposal of trade wastes; engineering design criteria; and material recovery. Equipment selection must be done by laboratory evaluations which consider cake dryness, and filtrate clarity. The cost analysis requirements are appraised considering basic requirements; optional requirements are appraised considering basic requirements; optional requirements and running cost of equipment and processing methods. Rotary-hearth and fluidized-bed furnaces are described, and the corrosion problem is discussed. The disposal of particulate solids includes the following aspects: transportation dewatering and incineration of spent grounds; as well as land disposal and composting. The engineering design criteria concern bulk-handling of solids, the fluid rate of flow, slurry pipeline design criteria from materials available (spun iron, wrought iron, aluminum, plsatic, concrete, and steel). Reclamation may be applied in the following fields: malt distillery effluent; potato starch effluent; and fruit industry effluent.
[23984]

73-4733

BYE-JOERGENSEN, J. S., AND G. H. LARSEN. Sludge centrifuge. Canadian Patent 918,121 owned by I. Krueger A/S, Copenhagen, Denmark. Issued Jan. 2, 1973.

This invention describes a sludge centrifuge with a rotating drum containing a separating chamber for liquids and solids. A worm placed outside the chamber removes solids and is arranged to rotate at a speed differing from the rotating speed of the drum. Many sludge centrifuges have a worm conveyor with a relative

rotation relative to the drum itself; the conveyor is placed inside the centrifuge drum. However, under this system, liquids and solids move in countercurrent, thus giving rise to high turbulence so that separation is usually unsatisfactory, since part of the solids return to the liquid. Using this technique in biological water-purification plants, it may be found that the centrifuged liquid still contains 20-40 percent solids so finely dispersed as to make further precipitation or centrifugation difficult. Thus the necessity for the proposed invention, which describes how the inlet for sludge is situated at the opposite end of the separation chamber through openings in a feed worm placed coaxially to the centrifuge drum and running in a chamber outside the separation chamber. This arrangement gives an extraordinarily pure liquid discharge. A detailed examination of the patent follows. Three claims are made.
[23985]

73-4734

HOVER, H. K., D. T. A. HUIBERS, AND L. J. SERKANIC, JR. System for treatment of secondary sewage. Canadian Patent 919,319 owned by Airco, Inc., New York, New York. Issued Jan. 16, 1973.

The invention is a system for treatment of secondary sewage, in which sewage effluent from a primary treatment plant is pumped to a vacuum deaerator for removal of dissolved air. The stream is then joined with a stream of recycled activated sludge and oxygen sufficient to meet the BOD of the combined effluent and recycled activated sludge. The confluence is subjected to a static mixer for enhancing contact between oxygen, aerobic bacteria, and organic pollutants. Reactor stream BOD is reduced to the required level at the reactor outlet. A clarifier separates the reactor activated sludge from treated waste water. Clear waste effluent from the clarifier is sent to tertiary treatment units or to receiving water. A short history of previous efforts at treatment of primary sewage efflent is provided. The claimed advantage of the invention herein described is that it improves the activated sludge treatment system, allowing the economic utilization of oxygen for more-or-less complete reduction of organic inpurities in industrial or municipal waste water. Six figures are used to illustrate the system conceptually. It is envisioned that the invention may be applied also to treatment of other liquid wastes, such as machine cutting oils, paints, glycols, alcohols, and ketones. This should be more economical than with present methods because of the pipeline reactor of the invention. The invention has 21 claims.
[23986]

73-4735

Klaerschlammtrocknung im heissgasstrom. [Sewage sludge drying in hot gas.] *Umwelt*, 3(6):59-60, 1972.

Very often the water content of sewage sludge is too high for using it in composting plants so that a mechanical thermal drying of the sludge is recommendable. A new selection drier has been developed for this purpose consisting of a feeding inlet, a device producing the hot gas and three telescoped tubes. The sludge is fed into the tubes and dried by the hot gas which is flowing in the same direction as the sludge. Sludge which is not sufficiently dried in the first run returns into the gas stream. The dry substance falls into a cyclone separator where it is finally dried. The high velocity of gas and sludge and the continuous vorticity of the particles to be dried provide for an intensive drying within a short time. A drying system combined with a refuse incineration plant dewaters the sludge in two phases. The first mechanical dewatering takes place in a screen belt press where the sludge which has been mixed with flocculation agents is dewatered from 92 percent to 70 percent water contents. From there the pre-dried sludge goes to a double paddle mixer where it is mixed with dry substance so that the water contents amounts to only 40 percent. In a subsequent special mill the sludge is mixed with hot gas which is aspirated from the combustion chamber of the refuse incineration plant, so that the final water contents is 20 percent. In a cyclone the dried sludge is divided into two currents of which one returns into the paddle mixer and the other is burnt together with the refuse in the incineration plant. (Text in German)
[23987]

73-4736

MUDRACK, K. Kriterien fuer den grad der aeroben und anaeroben schlammstabilisierung. [Criteria for the degree of aerobic and anaerobic sludge stabilization.] *ISWA (International Solid Wastes and Public Cleansing Association) Information Bulletin*, (7):28-33, June 1972.

Criteria for the degree of the aerobic or anaerobic sludge stabilization are reviewed. The basic goal in sludge stabilization is the maximum possible reduction of the biodegradable organic content in the sludge, the degree of which constitutes a criterion for the degree of stabilization. The changes occurring in the volume of the digested sludge, in the solid content and in the organic (volatile) content are appropriate criteria for the sludge digestion. However, variations in the volatile content give no reliable information on the degree of aerobic sludge stabilization. Determinations of the gas formation during anaerobic post-digestion and of the respiration rate (oxygen demand) give relevant information on the anaerobically degradable and the aerobically degradable contents, respectively, while the liquid content is a measure of the organic fraction. Sufficient degree of stabilization is reached when the oxygen demand lies below 0.1 kg of oxygen per kg of dry matter, and when the liquid content is less than 65 mg per g of dry matter. As the reductions in both the volume and the solid matter in aerobic stabilization depend on the process applied these reductions cannot be used as criteria. Pathogenic germs, unlike worm eggs, are reduced during aerobic stabilization. (Text in German)
[23988]

73-4737

NELSON, R. D., AND E. VEY. Treatment and reutilization of solid waste from water treatment process. Chicago, Illinois, IIT Research Institute Technology Center, Feb. 23, 1970. 108 p.

A program was conducted to study methods for dewatering a water softening sludge from the Village of Park Forest, Illinois and to evaluate uses for the dewatered sludge or ways in which it can be disposed of. The initial concentration of the sludge is between 3.6 and 3.9 percent solids by weight. The sludge solids contain about 84 percent calcium carbonate, 11 percent magnesium hydroxide, and 5 percent miscellaneous and have 90 percent of the particles in the 1.5 to 30 micron range. The sludge is suitable for use as a mineral filler in paints, floor covering, caulking compounds, and bituminous products. It can be mixed with sands, clays, and organic solids to improve their workability and strength characteristics. It can also be used as an agricultural liming material to improve workability and fertility of solids. If required, it can be used as filler in concrete without adversely affecting strength and shrinkage characteristics. Almost all of these uses would require the sludge to be in a dry powder or almost dry condition. The best method of dewatering the sludge is vacuum filtration after gravity thickening. In addition to being the most economical of the methods considered to be employed at Park Forest (vacuum filtration, centrifuging, lagooning, and sand bed drying), the air passages induced in the filter cake induce further drying. This would further improve the handling characteristics and enhance the utilization possibility. This dewatering method will produce a filter cake of about 45 percent solids and an almost clear filtrate which can be returned to the plant. (This document is retained in the SWIRS library.)
[23989]

73-4738

Neuartige verfahrenseinheit zur trocknung von klaerschlamm. [New equipment for drying sewage sludge.] *Wasser, Luft und Betrieb*, 16(11):404, 1972.

A drier for the sludge from sewage purification is described. It consists of three pipes. The wet sludge is passed toward a flow of hot gas which is produced in a combustion chamber. The wet material is carried along by the hot gas flow and deflected. The dried part is separated in a cyclone and the wet fraction is returned to the feeder and the hot gas flow. With very fine-grained dry material a filter is attached to the cyclone. Otherwise the waste gas is discharged into the open air, but it can also be returned to the drying process. Digested sludge with a water content of more than 90 percent is mixed with flocculants and pumped to a press for preliminary dehydration. The filter cake with a water con-

tent of 70 to 75 percent is conveyed to a sluice above the feeder. The feeder is essentially a heated reciprocating plate feeder which transports the material into the vertically rising hot gas flow. Through impaction and friction in the flow the material is comminuted. After separation of the dry material the waste gas flow is passed to a wet cyclone by a radial blower. The dust is collected in a bin below the cyclone. It can be returned to the drying process. The cleaned gas goes to a deodorizing station comprising a scrubber followed by a wet cyclone. (Text in German)
[23990]

73-4739

Neue Faulungs-Technologic. [New rotting technology.] *Wasserwirtschaft*, 62(11):355-356, Nov. 1972.
A new rotting system has been developed which prevents the formation of swim sludge layers and the sedimentation of sand and other heavy particles. Instead of mechanical pumps which have to provide for a continuous turbulence in the rotting tank, pumps working with compressed sewer gas are used. The pipe lines of the pumps are equipped with a jacket in which hot water is circulating in order to provide for a constant rotting temperature in the tank. The rotting tank itself is cylindrical and made of steel or concrete. The addition of fresh sludge can be effected either continuously or in single charges. The fresh sludge is immediately thoroughly mixed with the activated sludge so that a high decomposition intensity is guaranteed. The smallest plant disposes of a rotting tank of 400 cu m and one 'Heatamix' aggregate and the largest plant consists of 16 rotting tanks of 85,000 cu m and 60 'Heatamix' aggregates. (Text in German)
[23991]

73-4740

NEUSPIEL, P. J. Sewage treatment process and apparatus. Canadian Patent 922,432 owned by FMC Corporation, San Jose, California. Issued Mar. 6, 1973.
Elimination of the biochemical oxygen demand (BOD) from aqueous sewage suspensions requires a supply of microorganisms and enough oxygen to support their activites. This invention helps remove BOD by agitating a mixed liquor (one which contains recycled sludge) with a surface aerator. This device mixes air into the liquor with its blades and induces mingling of influent sewage and recylced microorganisms. Sludge being returned from a settling zone is delivered to a holding area. From there it flows to an outlet positioned next to the inlet of the surface aerator. The outlet for the influent sewage line is adjacent to this sludge return and mixing of the liquors is accompolished immediately after the introduction into the tank. The apparatus comprises an aeration tank, a surface aerator, a settling tank, a sludge removal means, a holding tank to receive sludge discharged form the holding tank, and a conduit for transfer of the sludge from the holding tank to the rotor intake. The holding tank is elevationally positioned so that the flow of sludge through the conduit is at least in part due to gravity.
[23992]

73-4741

OBRIST, W. Treatment of sewage sludge through pasteurization or radiation. *ISWA (International Solid Wastes and Public Cleansing Association) Information Bulletin*, (6):96-97, Dec. 1971.
Recent investigations on the hygienic and other effects of the application of sewage sludge disinfection methods such as pasteurization and gamma irradiation are reviewed. The usual sludge treatment proved to be insufficient for disinfection. However, pasteurization at 70 C over 30 minutes is highly effective showing a reduction in the enterovacteria count by 4 to 9 powers. Gamma irradiation is also effective; with a minimum dose of 200,000 rads causing death rates of 1,000 - 1,000,000. In addition, surviving germs are damaged, and eggs of parasites are killed. Pasteurizing units at sewage treatment plants are usually automatic in operation. Units using superheated steam have been in use for years, and also heat exchangers are available recently. Gamma irradiation techniques will be available for practical purposes before long. Both pasteurization and irradiation by means of accelerator are preferred to Cobalt-60 and fission products which have known disadvantages.

Irradiated sludge examined in pot tests proved to be more productive than pasteurized or untreated sludge. Increase in the sedimentation capacity of raw sludge, and increase in the filtration capacity of digested sludge due to gamma irradiation were observed. (Text in German)
[23993]

73-4742

Odei no shisshiki sanka shori sochi--zimpro hoshili. A wet oxidizing treatment equipment for sludge--the Zimpro System.] *Kotai Haibutsu*, (8):108-111, Dec. 1972.
This equipment is used for process in which organic sludge is heated with air at a certain temperature in a closed vessel where the atmospheric oxygen reacts with the organic sludge, decomposing it into gas and water, and a small quantity of oxidized ash is left. A considerable amount of heat is produced which promotes the combustion of the wet sludge permitting a continuous combustion of wastes in a short time without dewatering and application of heat from outside. The waste from a factory is stored in a reservoir after being ground as finely as possible with a coarse crusher and fine crusher making solids in the sludge oxidizable. The necessary air for oxidation is introduced and mixed with the sludge in a highly pressurized system, and the mixed sludge goes to a reactor through a heat exchanger tube. There a wet oxidizing reaction takes places and the temperature is raised gradually by the oxidation heat. Then, the oxidized sludge liquid enters a gas-liquid separator. The separated gas and liquid are subjected to final treatment. The available equipment of this type has a capacity of 2 to 20 tons a day for sewage sludge or industrial waste liquid, and 59 to 600 Kl a day for night soil. (Text in Japanese)
[23994]

73-4743

Putting industrial sludges in place. *Environmental Science and Technology*, 6(10):874-875, Oct. 1972.
This article discusses a nonleachable, sanitary structural material that may be an innovative answer to the sludge disposal problem. It is a mixture of fly ash, industrial byproduct sludge, and hydrated lime. The process encapsulates the sludge. The encapsulated waste material is put to good use as roadbed material, construction material, or construction aggregate. This encapsulation technology has been used in several field projects which are described in the article.
[23995]

73-4744

SAWYER, R. D., AND J. D. TINSLEY. Sewage treatment. Canadian Patent 923,231 owned by Nalco Chemical Co., Chicago, Illinois. Issued May 20, 1973.
Soluble phosphates are removed from a sewage effluent by controlled additions of sodium aluminate introduced prior to discharging the effluent to a receiving body of water, thereby reducing considerably the amount of phosphates responsible for proliferation of primitive aquatic plant life deemed ecologically harmful.
[23996]

73-4745

SUPERSPERG, H. Landwirtschaftliche schlammverwertung. [Agricultural sludge utilization.] *Osterreichische Wasserwirtschaft*, 24(9/10):192-199, 1972.
Tests have been conducted concerning the consequences on the crop when using wet sludge as manure on agricultural areas. It was found that an area of 25 hectares must be available if the sludge of 10,000 inhabitants shall be used as fertilizer. The reaction of the soil and the plants depend on the composition and the storage time of the sludge. In any case it is necessary to provide for an additional fertilizing with potash owing to the low percentage contained in the sludge. A comparison of the crops from fields treated with commerical fertilizer and those with sludge has been conducted by the city of Vienna It was found that the quantity of the crop from fields treated with sludge was superior to that from fields treated with commercial fertilizer while the quality suffered slightly. In any case it can be recommended to use sludge as fertilizer. The sludge should be ploughed into the fields and the quantity of the sludge should not exceed 600 cu m per hectare. However, attention should be paid that before using sludge it is treated suffi-

ciently in sewage plants and on the fields it is well mixed with soil so that harmful effects on the health of men and animals are avoided. (Text in German)
[23997]

73-4746

VAN FASSEN, J. Federal assistance speeds sewage treatment system recovery after flood. *Water and Sewage Works*, 120(3):62-65, Mar. 1973.
Under the Disaster Relief Act of 1970, the Federal government is charged with wide responsibility in assisting both individuals and municipalities to recover from major natural disasters, such as floods. The Army Corps of Engineers and the Office of Emergency Preparedness are of particular interest to public works officials. The aftermath of Hurricane Agnes, which ravaged large sections of the Northeast in the summer of 1972, left the city of Harrisburg with thousands of homes destroyed and the sewage treatment plant ruined. This treatment plant is a regional primary facility. The pumping stations, central treatment plant, lagoons, sludge incinerator rooms, and transformers were damaged and inoperable. The Corps of Engineers commissioned a local engineering firm to estimate what work would have to been done, how long it would take and what it would cost. The estimated time needed to put the treatment plant at full efficiency was about 6 months. However, because of the massive effort of the Federal government and the funds made available the plant was 100 percent operational only 7 weeks after the flood. To date the repair costs have been nearly $50,000 less than estimated.
[23998]

STREET CLEANING

73-4747

ORTH, H. Staedtereinigung. [City cleaning.] *VDI-Z*, 114(9):635,640, June 1972.
General problems and trends in municipal waste collection and city cleaning are outlined. Domestic waste contains 2-4 percent plastics, 8-10 percent glass, 49 percent paper, 10 percent wood, 4 percent metal and 31 percent organic matter. The share of packaging materials may reach up to 35 percent. Collection costs can make up 40-45 percent of the total cost of municipal waste disposal. Rational collection methods, and bin and can sizes are reviewed. The use of plastic or paper bags as well as of garbage compactors is preferable. Manual sidewalk cleaning is increasingly replaced by mechanized operations, e.g., by means of sweepers, combined or not with manual cleaning. High-pressure water jet scavenging, even of large-diameter sewers, is used increasingly, mostly in combination with suction tank trucks. The specific problem of the cleaning of gasoline and sand separators is reviewed. Snow removal, as difficulties in the use of ice warning systems are described. The salt expenditure should not exceed 40 g per sq m. (Text in German)
[23999]

73-4748

ROBERTS, E. E. Snow and ice removal system. Canadian Patent, 921,785 owned by Gloria E. Smith and Ralph G. Smith. Issued Feb. 27, 1973.
Snow and ice are removed from a paved surface by moving an air chamber with a downwardly extending opening along the paved surface having a layer of ice or snow thereon, producing high intensity heat in the chamber and directing the heat downwardly against the paved surface as the chamber is moved along such surface to melt the ice and snow, wiping the paved surface immediately after exposure to the heat of the chamber to direct the melted ice and snow laterally of the direction of movement of the chamber along the paved surface, controlling the amount of heat and the speed of movement of the chamber such that the ice or snow is melted and the paved surface is heated so that the heat of the paved surface and atmospheric conditions leave the wiped surface essentially free of traffic-endangering moisture.
[24000]

TRAINING, EDUCATION, AND PUBLIC RELATIONS

73-4749

PINTO, D. Ecology, the physical plant, and public relations. *In* How to make ecology work for you. New York, New York, Chain Store Publishing Corporation, 1972. p. 80-89.

If a retailer is going to be popular with ecology-minded shoppers he must make sure that his physical plant takes the steps necessary to avoid environmental pollution. This would include air pollution control equipment for incinerators; substitution of baling and recycling for incineration of waste paper and corrugated; effluent treatment at food processing plants; and control of vehicle emissions. In addition an ecology-oriented public relations campaign is important. This advertising should present the store's environmentally responsible activities, and advise and educate the consumer on various environmental issues. (This document is retained in the SWIRS library.)

[24001]

73-4750

PINTO, D. How to make ecology work for you. New York, Chain Store Publishing Corporation, 1972. 148 p.

This book is published for retailers in order to provide them with a knowledge of ecological issues and to help them devise a response to them that will be responsible without harming business. In fact ecological consciousness is shown to help business if properly handled. There are ways for the business man to respond to the complaints of ecologists without endangering his profits. A well run public relations compaign coupled with minimal changes in products and operations can improve sales to the ecologically conscious public. Some of the issues discussed include: detergents; recycling; beverage bottles; packaging; and the scope of the problem. There are appendices showing; a model anti-litter law; solid waste statistics; and key environmental organizations. There is also a glossary of solid waste terms. (This document is retained in the SWIRS library.)

[24002]

73-4751

PINTO, D. Recycling. *In* How to make ecology work for you. New York, New York, Chain Store Publishing Corporation, 1972. p. 64-79.

This article discusses the recycling of paper, glass, and metal and what retailer's role in the process can and should be. Possible actions include: baling and recyling in-store waste paper and corrugated instead of incinerating it; placing bins in parking lots for collection of newspapers, bottles, and aluminum cans from the public; using recycled paper for packaging store brands; selling products made from recycled materials; and making returnable bottles available in private label beverages. The retailer should, however, keep the profit motive in hand. It is expensive for store personnel to supervise reclamation facilities on store premises. Most recycling activities are not profitable. The baling and sale of corrugated and the collection of aluminum cans are exceptions. Nevertheless, recycling activities and their advertisement build community goodwill and bring in customers and profits. (This document is retained in the SWIRS library.)

[24003]

73-4752

STEFANELLI, L. Americans travel to Soviet Union in first industry technical exchange. *Solid Wastes Management/Refuse Removal Journal*, 15(11):12-14, 70, 72, Nov. 1972.

This article describes a trip to Leningrad taken by members of the solid waste management industry from Northern California. The Americans were shown the equipment used in the Russian city under demonstration conditions rather than in actual work. The snowplowing equipment was most impressive; that for street-cleaning was similar to that in the United States, but smaller. The collection system is containerized. Pickup is daily. The vehicles have a fairly small capacity and must travel 20 miles to a landfill so the city must operate 1200 vehicles to service the city. A special rollable container and truck have been designed to facilitate removal from areas which the large trucks cannot reach. There is only one composting plant in the Soviet Union; it has a four ton per day capacity.

[24004]

TRANSPORT

73-4753

HERRMANN, R. H. New concepts of material handling. *Foundry*, 101(3):58,64, Mar. 1973.

The article stresses the importance of efficient methods of materials handling in foundries. The primary goal is seen to be minimization of handling. It is important to have systems that process used molds and separate the sand used for reuse or disposal. Other aspects of materials handling not related to solid waste are discussed. [24005]

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AGRICULTURAL WASTE

73-4754

BOND, R. G., AND C. P. STRAUB. Agricultural solid wastes. *In* Handbook of environmental control. v. 2. Solid waste. Cleveland, Ohio, CRC Press, 1973. p. 78-92.

This paper discusses agricultural solid wastes. Data are provided on the following subjects: principal agricultural waste components (household, refuse, crop residue, and animal and poultry manure); average amount and type of trash in seed cotton harvested by various methods; production of wastes by livestock, United States, 1965; farm and animal population of the United States, 1966; per capita consumption of meat, 1966; waste generation potential of U.S. animal population, 1960; population equivalents of animal wastes; per capita animal contribution of indicator microorganisms; frequency of occurrence of various salmonella types; animal waste defecation; characteristics of animal manures; nutrients in animal wastes; properties of fresh manure particles; number and capacity of cattle feedlots; distribution of beef production; dairy cows and cultivated land; cattle waste generation rates; seasonal variation of hog manure characteristics; equivalent population of animals, 1960; and poultry waste characteristics. Detailed source material is provided for the data given. (This document is retained in the SWIRS library.)
[24006]

73-4755

BOND, R. G., AND C. P. STRAUB. Agricultural waste management. *In* Handbook of environmental control. v. 2. Solid waste. Cleveland, Ohio, CRC Press, 1973. p. 551-560.

This paper presents data on agricultural waste management. The topics presented follow: possible schemes for animal waste treatment; materials handling and labor studies in a dairy and forage farm; land requirements for utilization of manures in an integrated land-livestock system; compilation of bedding requirements; possible treatment units for livestock wastes; economic evaluation of liquid manure disposal from confined hog operations; annual costs of a liquid manure system; design recommendations for in-building oxidation ditches; performance of anaerobic lagoons; effluent quality of anaerobic lagoons treating livestock waste; characteristics of mixed liquid0 anaerobic digestion of animal wastes; pyrolysis of livestock wastes; average price margin of cattle feeding system; and methods and costs of trash disposal at cotton gins. Source material is provided for the data presented. (This document is retained in the SWIRS library.)
[24007]

73-4756

RIEMANN, U. Nutztierhaltung und Umweltschutz. [Mass stock keeping and environmental protection.] *Landtechnik*, 28(5):149-153, Mar. 1973.

The treatment of animal excrement serves the purpose of destroying pathogenic germs, reduc-

ing the volume of feces, and preventing the development of bad odors. Animal excrement can be decomposed by anaerobic and aerobic biological treatment. Owing to the development of bad odors, anaerobic decomposition methods like rotting towers or lagoons cannot be recommended. Aerobic methods are based on the decomposition of the excrement by means of microorganisms under oxygen consumption. The most effective aerobic decomposition method is the oxidation trench under a grate floor in the stable. A ventilator provides for a good aeration of the dung. The most intensive form of aerobic decomposition is reached in oxidation towers where gyroscopes blow compressed air into the dung. Another system used to dispose of the dung is the composting method where the dung is mixed with turf, lime, straw, plastic flakes, or residential refuse, matter which provides for the aeration of the dung. The compost is odorless and does not cause any problems with regard to hygienic requirements. (Text in German)
[24008]

ANALYSIS OF SOLID WASTE

73-4757

BEACH, M. I., AND J. S. BEACH, JR. A new technique for industrial waste sampling. *Industrial Wastes*, 19(1):28-32, Jan./Feb. 1973.
Collecting representative samples is essential to any pollution study or control program. The generally recognized types of samples are the 'grab' or discrete sample, the simple composite, and the flow-proportioned composite. The new sample type described is the sequential composite. The sequential composite is in effect a series of frequently collected samples, collected and retained in individual containers, each of which represents a subperiod within the overall sampling period. It broadens the statistical base of the final samples, and it minimizes the change of missing a significant event of short duration. The sequential samples provide data which can be used to reduce waste or to determine which wastes might be better segregated or even used to neutralize one another.
[24009]

73-4758

BOND, R. G., AND C. P. STRAUB. Effects of solid wastes. *In* Handbook of environmental control. v. 2. Solid waste. Cleveland, Ohio, CRC Press, 1973. p. 131-176.
This paper provides data on the effects of solid wastes. Flow charts are included on chemical waste/human disease pathways, human fecal waste/human disease pathways, animal fecal waste/disease relationship, and solid waste/plague pathways. Information on storage limits for solid wastes are also included. Public health evaluations of domestic wastes are presented in tabular form and cover metals, cloth and fibers, plastics, leather, rubber, glass, wood, garbage, and paper. Evaluations of industrial wastes cover the following areas: textile mills; leather products; petrochemicals; chemicals; energy; metal production; oil refineries; wood; stone, clay, and glass; printing and publishing; manure; crop residues; canning; animal carcasses; dairy; brewery and winery; sugar refinery; laundry and dry cleaning; hospitals; demolition and construction debris; junk automobiles; and sewage sludge. Data are also provided on the efficacy of incinerator operations in the destruction of microflora, and the polluting effect of leachate from household refuse tipped into a gravel pit. (This document is retained in the SWIRS library.)
[24010]

73-4759

BOND, R. G., AND C. P. STRAUB. Handbook of environmental control. v. 2. Solid waste. Cleveland, Ohio, CRC Press, 1973. 580 p.
This document provides extensive data, diagrams, and graphs on the technical aspects of solid waste. The following topics are covered in detail: urban solid wastes; physical composition and properties; chemical composition; generation rates; packaging wastes; agricultural solid wastes; industrial solid wastes; manufacturing industries; mining industries; solid wastes analysis methods; effects of solid wastes; legal aspects; municipal solid waste controls; collection and hauling; size reduction, separation, and compaction; recycling and recovery; landfill; incineration; composting; pyrolysis; marine

disposal and water tipping; wet-air oxidation; industrial and commercial waste disposal; and agricultural waste management. Conversion factors are provided as are detailed source materials. (This document is retained in the SWIRS library.)
[24011]

73-4760

BOND, R. G., AND C. P. STRAUB. Refuse analysis methods. *In* Handbook of environmental control. v. 2. Solid waste. Cleveland, Ohio, CRC Press, 1973. p. 109-130.
This paper outlines proposed methods for the examination of solid and semisolid wastes, domestic refuse in particular. Ten separation categories are discussed, the methods used for analyzing the samples are described and illustrated, and equations are provided. The following tests are discussed in detail: moisture0 water (oven drying method, infrared method, toluene distillation method); volatile solids and ash; lipids0 ether extract; liquids; crude fiber; sugars; starch (anthrone-sulfuric acid method and direct acid hydrolysis method); carbon; nitrogen0 organic and ammoniacal; protein; carbon-nitrogen ratio; phosphorus; potassium; hydrogen-ion concentration (pH); gross calorific value; net calorific value; sulfur; and hydrogen and carbon. Source material is provided for the information given. (This document is retained in the SWIRS library.)
[24012]

73-4761

BOND, R. G., AND C. P. STRAUB. Solid wastes--sources and composition. *In* Handbook of environmental control. v. 2. Solid waste. Cleveland, Ohio, CRC Press, 1973. p. 3-5.
This paper defines solid waste in chemical, economic, and reclamation terms. Market conditions affecting salvage are also discussed. Solid wastes are also classified by point of origin as follows: residential; private institutions; offices and public facilities; health services, commercial and service establishments, construction and demolition; agricultural; extractive industry; food processing; tobacco industry; ordnance and accessories; textiles and apparel; lumber and wood products; furniture and fixtures; paper and allied products; printing, publishing, and allied; chemicals and allied products; petroleum refining; rubber and plastic products; leather and allied; stone, clay, and glass; primary metals; fabricated metals; nonelectrical machinery; electrical machinery; transportation equipment; professional and scientific instruments; and miscellaneous manufacturing. Detailed source material is provided for the information given. (This document is retained in the SWIRS library.)
[24013]

73-4762

BOND, R. G., AND C. P. STRAUB. Urban solid wastes--chemical composition. *In* Handbook of environmental control. v. 2. Solid waste. Cleveland, Ohio, CRC Press, 1973. p. 26-45.
This paper discusses the chemical composition of urban solid wastes. Chemical analyses of solid refuse are provided for Hempstead, New York, and Berkeley, California. Data are also provided on the following: ultimate analyses of typical municipal refuse components; the approximate composition of rural wastes; composition and analysis of average municipal refuse; organic analysis of composite refuse; refuse composition used in refuse variability computer program; refuse analyses of inorganic constituents, organic constituents, wood, paper products, plants, foods, plastics, leather, rags, paints, oils, removers, rubber, dirt, glass and ceramics, and metals; chemical composition of food wastes; chemical properties and combustion data for paper, wood, and garbage; chemical composition of pathological waste and combustion data; analysis of packaging waste; aluminum packaging alloys; solders; steel packaging materials; and fuel properties of solid waste materials. Detailed source material is provided for the data given. (This document is retained in the SWIRS library.)
[24014]

73-4763

BOND, R. G., AND C. P. STRAUB. Urban solid wastes--physical composition and properties. Part 1. *In* Handbook of environmental control. v. 2. Solid waste. Cleveland, Ohio, CRC Press, 1973. p. 6-15.

This paper discusses the physical composition and properties of urban solid wastes. Data are provided on urban solid waste constituents in terms of source, type of waste, composition, and means of treatment or disposal. The composition of refuse is listed in terms of components, composition, and estimated municipal and residential averages from 1965 to 1971. Data are also provided for the composition of waste in eight U.S. cities. The component categories are paper products, food waste, plastics, rubber, leather, dirt, paints, wood, glass, metals, plants and grasses, textiles, ashes, furniture, organics, and construction waste. Tables also provide data on the following: physical characteristics of refuse at recreational areas; composition of camping and recreation residence solid waste compared with urban residence values; composition of Central European municipal refuse; litter found along a 1-mile stretch of a two-lane highway in Kansas; components of litter by proportion of total items littered; a summary of international refuse composition, 15 countries; composition of household garbage in six countries; and a refuse breakdown by physical components for seven European cities and three in the United States. Detailed source material is provided for the data given. (This document is retained in the SWIRS library.)
[24015]

73-4764

BOND, R. G., AND C. P. STRAUB. Urban solid wastes--physical composition and properties. Part 2. *In* Handbook of environmental control. v. 2. Solid waste. Cleveland, Ohio, CRC Press, 1973. p. 16-25.
This paper discusses the physical composition and properties of urban solid wastes. An analysis of household rubbish in the District of Columbia is provided for 1914 and 1915. Monthly distributions of physical components of combined refuse are given for New York City and Chicago for 1939, and 1956 to 1958. The composition of Berkeley refuse is shown in tables for a 15-year period. The following data are also provided in tables: properties of combined refuse from the United States, England, France, Germany, Scotland, and Sweden; the characteristics of bulky wastes, residential and commercial; the typical characteristics of refuse; typical refuse analysis in three municipalities; the density of solid packaging materials; the density of various classes of refuse; and refuse density patterns. Detailed source material is provided for the data given. (This document is retained in the SWIRS library.)
[24016]

AUTOMOBILE

73-4765

REGAN, W. J., R. W. JAMES, AND T. J. MCLEER. The auto wrecking industry. *In* Identification of opportunities for increased recycling of ferrous solid waste. Washington, U.S. Environmental Protection Agency, 1972. p. 232-238.
This paper discusses the auto wrecking industry as the major source of obsolescent scrap for the scrap processor. The industry comprises about 15,600 companies, with 98,500 employees, and has annual sales of salvaged parts and scrap metal in excess of $5 billion. The wrecker has three basic choices in preparation of the hulks for shipment to scrap processors: find a processor who will take the material as is; burn the hulk to clean it; or strip the vehicle of the objectionable residue. Problems facing the auto wrecker include: prohibitive stripping and incineration costs; high costs of transportation to the scrap processor; disposal of unmarketable waste from operations; and the lack of sufficient economic inducement to move hulks from the wrecker's yard to the scrap processor. Extensive tabular material is included. (This document is retained in the SWIRS library.)
[24017]

BULKY WASTES

73-4766

Sperrmuellprobleme. [Bulk refuse problems.] *Staedtehygiene*, 24(4):97, Apr. 1973.
The city of Hamburg was the first city in Germany which started a monthly bulky refuse collection service. The bulky refuse quantity at Hamburg was 112,000 cu m in 1962. It rose to 573,900 cu m in 1971. A further increase of the bulky refuse quantity is very likely. At the

present time, the city cleansing department of Hamburg has to employ 115 workers and 45 vehicles daily only for the bulky refuse removal. (Text in German)
[24018]

COLLECTION

73-4767

BOND, R. G., AND C. P. STRAUB. Collection and hauling. *In* Handbook of environmental control. v. 2. Solid waste. Cleveland, Ohio, CRC Press, 1973. p. 243-301.

This paper presents data and graphs on collection and hauling of waste. The topics covered follow: cost of refuse collection; types of collection agencies used; range in per capita costs for refuse collection; staff and service units for refuse collection and disposal agencies; New Orleans Sanitation Department employment experience; Civil Service status of refuse collection employees; basic work week for refuse collection crews; hourly wage rates for refuse collection employees; contract refuse collection0 advantages and disadvantages. methods used to finance refuse collection; refuse collection fee per month; residential rates for refuse collection; commercial refuse collection; regulations concerning size, use, weight, and type of refuse containers; nomographs used for study of refuse collection operation; collection truck data; data from transfer stations; economic evaluation of refuse compacted by a high compression system; and truck collection and pipeline system costs. Detailed source material is provided for the information given. (This document is retained in the SWIRS library.)
[24019]

73-4768

BOND, R. G., AND C. P. STRAUB. Generation rates. *In* Handbook of environmental control. v. 2. Solid waste. Cleveland, Ohio, CRC Press, 1973. p. 46-65.

This paper discusses generation rates for solid wastes in the United States and part of Europe. Data are provided for the following: refuse output0 domestic and commercial, 1959 to 1961, for the United States, England, France, Germany, Scotland, and Sweden; annual quantities of raw refuse per capita; paper and paperboard consumption; household refuse collected; residential and commercial solid waste generation in nine cities; average solid waste collected0 urban, rural, and national; residential solid wastes generation; solid wastes collected in the United States, 1970; pound of refuse collected per capita, 1966; trends in total refuse per capita, 1955 to 1968; solid wastes collected from nine U.S. cities, 1957-1958 and 1967; regional generation rates for solid wastes, 1968; daily production of hospital wastes, 1955; combined refuse from recreation areas; and waste generation rates for recreation sites. Graphs are also included. Detailed source material is provided for the data given. (This document is retained in the SWIRS library.)
[24020]

73-4769

Muellsammel- und Umladeanlage in Witten. [Refuse collection and transfer station at Witten.0 *Staedtehygiene*, Apr., 1973.

As the transport of refuse for long distances in small collection vehicles is not economical, the city of Witten constructed a refuse collection and transfer station with a daily capacity of 1,500 tons and storage space of 400 cu m. The refuse is emptied into a steel trough 30 m long, the bottom of which is a steel plate line which transports the refuse to a 70 ton press and from there into container trucks with a net load of 20 to 25 tons. The container trucks transport the refuse to the central sanitary landfill where the refuse is pushed out of the container by means of a hydraulic pressing plate. (Text in German)
[24021]

73-4770

Ressources et collecte. 5. Discussion. [Resources and collection. Part 5: Discussion.] *Revue A.T.I.P.*, 26(5):403-406, 1972.

General problems of waste paper collection are discussed. The State income derived from the tax imposed on paper should be used to subsidize waste paper recycling. The cost of paper incineration in waste incinerator plants is generally much higher than that of recycling (50 francs per ton), and collection is especially ex-

pensive, showing the need for cutting the cost of waste collection. Suction type vacuum systems, tentatively introduced in some cities in Europe, require separate collection of bulky objects and do not usually permit separation of paper wastes. Another experiment in which inhabitants are requested to place paper wastes beside refuse bins on collection days may become a successful system of separate paper collection. (Text in French)
[24024]

73-4771

ROUGIER, J. La collecte pneumatique des ordures menageres dans la ville neuve de Grenoble. [The pneumatic collection of household refuse in the new town of Grenoble.] *Techniques et Sciences*, 67(11):421-429, Nov. 1972.
A pneumatic refuse collection installation built in Grenoble by the Societe Eau et Assainissement, licencee of the Swedish Company Societe AB Centralsug has been put in operation in April 1972. The installation serves 2,300 households and will eventually serve 4,500. The refuse is transported by the force of a flow of air induced by underpressure in a network of ducts with the help of valves opened and closed by remote control. At a central collection station, the refuse is compacted in containers which are then taken away for incineration or dumping by Roll-On trucks. The chutes in individual households have a diameter of 400 mm; the subterranean steel transport ducts have a diameter of 500 mm. Transport velocity is 25 to 35 m per second. At Grenoble the duct is 540 m long, the aggregate length of the feeder branches is 1,700 m. At the central collection station the refuse is released from the air flow in a 3 m wide, 7 m high cyclone by centrifugal effect. The containers have a volume of from 8 to 30 cu m depending on the size of the installation. The installation is activated three times daily (after the three meal times) and operated and maintained by a crew of two. Such installations can be built to service a circular area 3 km in diameter or about 300 hectares. (Text in French)
[24025]

73-4772

STRUMANNE, J. Ressources et collecte. 2. Le point de vue des maires et de leurs services techniques. [Resources and collection. Part 2: Opinions of mayors and municipal technical services.] *Revue A.T.I.P.*, 26(5):389-391, 1972.
General problems of the collection and sorting of packaging wastes made of paper and cardboard as viewed by mayors of major cities and municipal sanitation services in France are expounded. Paper and cardboard wastes presently made up some 13 percent of the combined tonnage of municipal waste collected. While the per capita waste output has stabilized around 800 gal per day, the specific weight of the municipal waste has decreased from 400 to 150 kg per cu m over the past decade, which is due to the increasing proportion within municipal waste of paper and cardboard packaging. The highly increased waste volume to be collected requires expensive enlargement of collection capacities and manpower. Also storage bin capacities have to be increased, and additional storage facilities are necessary. While collection and sorting of paper and cardboard wastes in family homes is unrealistic and far from rewarding, such problems could be resolved in large apartment houses, shopping centers, and marketplaces by the use of compacting presses. At present, waste paper recovery in waste treatment and disposal seem most appropriate. (Text in French)
[24026]

73-4773

TUCKER, H. L. Personal communication. District of Columbia, Solid Waste Management Administration, to Solid Waste Information Retrieval System, May 1, 1973.
This letter, in answer to a request for information for a user of the SWIRS system, includes information about the city's collection system. Refuse is collected by the city from single family homes and apartment units up to four units. The cost of this collection is approximately $45.00 per household, but it is included in the city's tax structure. A private company now has the contract to service public buildings, including schools. This represents a savings for the city since the private company conducts this opera-

tion more economically than the city could. Total expenditures for collection in Fiscal Years 1969 to 1972 are listed. The costs per ton for disposal are also shown. (This document is retained in the SWIRS library.)
[24023]

COMPOST / COMPOSTING

73-4774

BOND, R. G., AND C. P. STRAUB. Composting. *In* Handbook of environmental control. v. 2. Solid waste. Cleveland, Ohio, CRC Press, 1973. p. 490-518.
This paper presents data, diagrams, graphs, and equations on composting. The topics covered follow: general principles of composting as related to treatment of town wastes; typical composting processes, 1960 to 1969; municipal solid waste composting plants; European and Middle Eastern municipal refuse composting plants; data on composting plants in Germany; typical relationship obtained between oxygen uptake and bacterial count; time-temperatures required for organism destruction; analyses and weight changes in laboratory composting of refuse; reliability of tests to determine degree of composting of ground, separated garbage; enhancement of the composting process; calculation of area required for a Windrow composting plant; equipment required for composting; costs of processing raw refuse utilizing different compost systems; production and sale of compost; estimated costs to own and operate digester plants; commercial venture compost plant; and soil characteristics in a compost ripeness experiment. Detailed source material is provided for the data given. (This document is retained in the SWIRS library.)
[24027]

73-4775

Procede pour produire un engrais granulaire ne liberant que lentement de l'azote et produit ainsi obtenu. [Process for the manufacture of granular slow-release nitrogen fertilizer.] French Patent 2,074,766 owned by J. N. Karnemaat. Issued Oct. 10, 1971. 01
A procedure for the manufacture of fertilizer from organic compost with uniform chemical and granulometric composition, which slowly liberates nitrogen, phosphorus, and potassium, is described. The respective proportions of nitrogen, phosphorus, and potassium compounds insoluble in cold water are at least 15 percent and 25 percent in the dry, practically dust-free fertilizer. Waste organic compost is dehydrated to a residual water content of about 3 percent after which it is granulated into fine particles. The granulous material thus obtained is subsequently mixed with dibasic ammonium phosphate, potassium chloride, and urea to obtain a mixture of uniform chemical and granulometric composition. The resulting mixture is mixed with anaqueous solution of urea and formaldehyde, in which excess formaldehyde is present so that a formaldehyde urea polymer has been formed, to form a damp mass of uniform chemical composition by adding phosphoric acid of 20 to 75 percent concentration. The broth obtained is stirred vigorously, and finally dewatered. (Text in French)
[24028]

DISPOSAL

73-4776

BAUD, E. Les schemas departementaux de collecte et de traitement des ordures menageres. [Departmental plans for the collection and treatment of household refuse.] *Techniques et Sciences*, 67(12):451-457, Dec. 1972.
The Collection and treatment of household refuse in the Departement de Swine which is governed by a law of Apr. 23, 1933 employs 4,500 workers. Two million tons of refuse are collected and disposed of in four large incinerators yearly. Half of this volume stems from the city of Paris. Because of the growing problem of waste disposal, the interdepartmental circular of Nov. 27, 1969, was conceived asking for the submission of Departmental plans for the collection and treatment of refuse by Departments of France excepting that of the Paris region. information was sought on existing services and installations, on respective city ordinances and rural regulations, on costs and income from steam, electrici-

ty, and outlets for compost. Plans submitted reveal that 75 percent of the population is being served by waste disposal services. This includes 90 percent of urban communities and 45 percent of rural communities. Only several large cities have incinerators. Thirty seven thousand or half of all French communities dispose of solid waste on dumps. Collection route distances vary from 5 to 20 km with a minimal population from 10 to 20,000. In sparsely populated regions garbage is collected periodically, in densely populated areas a twice weekly collection schedule seems to be the rule. (Text in French)
[24029]

73-4777

MOTTS, W. S. Environmental impact of alternative waste disposal methods. *In* Proceedings; Regionalized Solid Waste Management Conference, Newton, Massachusetts, June 1-2, 1972. University of Massachusetts at Amherst and Massachusetts Department of Community Affairs. p. 24-57.
This paper discusses various waste disposal methods. The topics covered under sanitary landfills, landfills, and refuse dumps follow: environmental effects from a single landfill site; landfill impact on New England geology; long-term effects of the landfill alternative; till deposits and bedrock; lake-bottom deposits; sand and gravel deposits; examples of improperly located landfill sites; and integrated, regional land-use studies. A discussion of the environmental effects from methods other than sanitary landfill covered recycling, composting, and high-temperature incineration. Data are presented on hydrogeologic conditions producing pollution of groundwater supplies by leachate from a landfill; the relation of a refuse dump to a town well, and the increase of mineralization leading to abandonment of the well; collection and treatment of leachate at a site through hydraulic isolation of landfill by an impermeable membrane; and management of leachate by allowing its discharge into groundwater, then collecting and treating it in a down-gradient direction. (This document is retained in the SWIRS library.)
[24030]

73-4778

SIERIG, G. Moderne Abfallbeseitigung in Berlin. [Modern refuse disposal in Berlin.] *Staedtehygiene*, 24(4):84-86, Apr. 1973.
Total refuse quantity in Berlin rose from 2.209 million cu m in 1960 to 4.239 million cu m in 1970. Residential refuse quantity amounted to 3.080 million cu m in 1970 of more than half was burnt in the incineration plant at Ruhleben0 producing steam for a nearby power generating plant and pumice which is used in road construction. About 1 million cu m of industrial waste as well as liquids and sludges from industry are deposited in three sanitary landfills. Three rammer foot compactors and various bulldozers operating on these sites provide for rapid compressing and shredding, especially of bulky refuse, which amounts to 450,000 cu m annually. The disposal of liquids, sludges, and chemicals is subject to a written authorization and a special control procedure. Refuse containers of 6, 12, 18, and 24 cu m have been given to industrial and commercial enterprises and are regularly transported to the sanitary landfills by the city cleansing department of Berlin. (Text in German)
[24031]

73-4779

SPITZER, E. F. How European solid-waste practices are changing. *American City*, 87(10):115-116, Oct. 1972.
This article reports on the International Solid Waste Conference held in Prague, Czechoslovakia, from June 26 to July 2, 1972. The Conference subjects were limited to refuse collection and disposal and street cleaning. The discussions were very general in nature, with only eight papers presented in 4 days of sessions. Approximately 75 firms displayed equipment and materials, and there were about 1,500 participants. European sanitation equipment is getting bigger, more sophisticated, and more expensive. Manufacturers are changing equipment designs in order to meet changing conditions. In the area of refuse disposal, firms manufacturing incinerators predominated. A few companies exhibited composting machinery.
[24032]

73-4780

STRUMANNE, J., AND P. FOURMENT. Les plastiques dans les ordures menageres. IV--Influence des matieres plastiques sur la mise en decharge des ordures menageres. [Plastic materials in domestic waste. IV--The influence of plastic materials on the disposal of domestic wastes.] *Techniques et Sciences Municipales*, 67(11):405-414, Nov. 1972.

Disposal and utilization of domestic wastes as affected by the presence in them of plastic materials are outlined. Neither waste disposal operations nor anaerobic decomposition of domestic wastes is adversely influenced by plastic materials in deep layers of sanitary landfills. However, plastic wastes may retain moisture in the soil. While plastics are generally believed not to be degradable, a few observations indicate slow degradation of plastics, especially of polyethylene. The recultivation of filled-up sanitary landfills may be hindered by the presence of plastic materials which interfere with gas and moisture exchange processes, and with the growth of roots. Plastic materials in sanitary landfills constitute no additional fire hazard. The presence in compost of polyvinyl chloride and polyethylene usually causes no problems and does not lessen the value of the compost, while large, rigid pieces of polyethylene, and especially nylon, which is highly resistant to fermentation, should not be present in composts. (Text in French)

[24033]

73-4781

SUTIN, G. L. A systems approach to refuse disposal on a regional scale. *In* Proceedings; Regionalized Solid Waste Management Conference, Newton, Massachusetts, June 1-2, 1972. University of Massachusetts at Amherst and Massachusettes Department of Community Affairs. p. 5-23.

This paper presents a system of refuse disposal which will eliminate the present undesirable features usually related to the methods now in use for solid waste disposal in the United States. The topics covered include the importance of cleanliness to avoid the spread of disease, a recognition of sewage as a prime source of disease, sources of pollution, industrial wastes, pollution control, criteria for new landfill sites, costs, regulations, and the incinerator as the major disposal facility. It is recommended that a study be conducted in each region to determine the extent of present and future refuse disposal requirements. (This document is retained in the SWIRS library.)

[24034]

ECONOMICS

73-4782

Aspects economiques. 4. Discussion. [Economic aspects. Part 4: Discussion.] *Revue A.T.I.P.*, 26(5):301-305, 1972.

Economic aspects of the collection, selection, and utilization of waste paper in France and in other European countries are reviewed. The fast development of waste paper recycling in France is primarily due to the increased percentage of corrugated cardboard amounting to 35 to 36 percent. Some 640,000 tons of waste paper are incinerated yearly together with municipal refuse in the Paris region, which represents a proportion of 34 percent in the total waste volume. Waste paper in a price bracket of 50 to 100 frances, not exceeding the price of pulp, is suitable for replacement of primary fiber. Waste paper collection can be efficiently solved by collection together with municipal refuse, as proposed by Black-Clawson. Separate collection necessitates both public education and certain material incentives, which would appeal primarily to school children. (Text in French)

[24035]

73-4783

Aspects financiers. Table ronde. [Financial aspects. Round-table conference.] *Revue A.T.I.P.*, 26(5):407-411, 1972.

Financing problems in the pulp and paper as well as in the waste paper recycling industry in France are surveyed with respect to the activity of such major financial institutions as the Institute for Industrial Development (I.D.I.), Lyon Credit Bank, and Societe Generale. In general, considerable fluctuations in the price of waste paper and cardboard have to cease before major credits to the waste paper recyling branch

become more liberal. Credits are more reluctantly extended to medium and small-size industries. (Text in French)
[24036]

73-4784

Conclusions du colloque 'vieux papiers'. [Conclusions of the 'Waste Paper' Conference.] *Revue A.T.I.P.*, 26(5):413-415, 1972.
Conclusions of the 'Waste Paper' conference regarding the technical and economic problems of paper and cardboard wastes recycling are presented. Several technical problems of waste paper and cardboard recycling have been solved technically, and other technical problems will be solved in the foreseeable future, thus permitting both diversification of the use of waste paper pulp, and the recovery of fibers whose recovery is not possible at the present time. With the technical aspects presenting no serious difficulties, economic problems, especially in dealer-user relationships, persist. The solutions for the economic problems, in particular that of price fluctuations, require the creation of a mixed committee of dealers in and users of waste papers. Representation of the interested ministries as well as of the I.D.I. (Institute for Industrial Development) on this committee is seen possible. (Text in French)
[24037]

73-4785

HOWARD, R. D. Financing regional solid waste management plans. *In* Proceedings; Regionalized Solid Waste Management Conference, Newton, Massachusetts, June 1-2, 1972. University of Massachusetts at Amherst and Massachusetts Department of Community Affairs. p. 140-156.
This paper discusses financing as an important segment of the regional solid waste management scene. This paper first examines some of the organizational arrangements used nationally for managing regional solid waste systems, touches on the pertinent aspects of financial planning, and discusses alternative methods of raising money for capital needs, and techniques for allocating costs among municipalities participating in a regional system. The topics disucssed in detail follow: organizational arrangements; financial planning; raising money for capital needs (general obligation bonds, revenue bonds, leasing, and grant assitance); allocating costs among municipalities; raising money to meet annual needs; and specific Massachusetts legislation. This paper recommends additional legislation to provide another option for financing regional systems. (This document is retained in the SWIRS library.)
[24038]

73-4786

MIGNO, M. Aspects economiques. 2. L'industrie de la recuperation. [Economic aspects. 2. The reclaiming industry.] *Revue A.T.I.P.*, 26(5):295-297, 1972.
French paper mills used 1.5 million tons of waste paper in 1971 of which 133,600 tons were imported. Exported were 74,900 tons consisting of grades for which there is for technical reasons no demand in France. There is no import or export duty on waste paper but transport costs are holding imports down. About 400 dealers deal in waste paper of which the majority are small businesses dealing also with scrap and other reclaimed commodities; some are semi-wholesalers and some wholesalers dealing exclusively in paper. Of the last there are 15 in Paris and 30 in the provinces. About 25 to 30 percent of all waste paper is bought up directly by the users; 10 percent is handled through sales and purchase bureaus set up jointly by users and paper dealers, which leaves 60 percent to be traded in the open market. In the interest of stabilizing the often demoralized market in paper, a policy should be evolved jointly by users and dealers based on long-range market requirements which would provide the not inconsiderable investmants which the industry will need in the near future. (Text in French)
[24039]

73-4787

OTTO, F. Kraftfahrzougsteuerbefreiung fuer Wegebau-, Strassenreinigungs- und Muellfahrzeuge. [Tax exemption for road construction, city cleansing and refuse removal vehicles.] *Staedtehygiene*, 24(4):101-102, Apr. 1973.

Because of the exacting requirements set on the city cleansing and refuse collection, the vehicles of the respective departments - even the passenger cars of the supervising personnel - are exempt from any taxes according to paragraph 2 of the Motor Vehicle Tax Law, and a judgment of the Federal Finance Court. It is especially important that supervising personnel be in a position to provide the necessary measures in case of oil or dirt impeding traffic on the streets, so that tie ups are avoided. In the case of refuse removal the supervisors have to guide the complicated special removal vehicles and other devices. For these reasons the passenger cars of the supervising personnel are absolutely necessary to fulfill their duties and therefore have to be exempted from taxes like any other vehicle used directly for cleaning or refuse removal. (Text in German)
[24040]

73-4788

REGAN, W. J., R. W. JAMES, AND T. J. MCLEER. Markets for iron and steel scrap. *In* Identification of opportunities for increased recycling of ferrous solid waste. Washington, U.S. Environmental Protection Agency, 1972. p. 118-176.
This paper discusses markets for iron and steel scrap. The American steel industry is discussed in terms of industry structure, industry growth, steelmaking technology, impact of emerging technologies, continuous casting, and direct reduction. The iron and steel casting industries are also discussed along the following lines: structure; growth; and casting technology. Export markets, copper precipitation, detinning, and future scrap requirements are also described. Extensive tabular data are provided. (This document is retained in the SWIRS library.)
[24041]

HAZARDOUS WASTES

73-4789

Umwelterfreundliche Muellplaetze fuer giftigen sondermuell. [Sanitary landfills for toxic special refuse.] *Umschau*, 73(8):226, 1973.
A new corporation for the disposal of special refuse has been founded in Bavaria. About 45 percent of the total special refuse quantity in Bavaria is industrial sludge; 14 percent is solutions and emulsions; 13 percent is residue from gasoline dischargers; 10 percent is oily soils, 17 percent is acids and lyes; 4 percent is toxic substances containing arsenic; and 3 percent is waste oils. The ground below the sanitary landfill for special refuse is covered with concrete in order to avoid the penetration of polluted water into the underground. (Text in German)
[24042]

HEALTH/SAFETY

73-4790

OTTO, F. Haftung fuer Muelltonnen Gehweg. [Liability for refuse bins on side walks.] *Staedtehygiene*, 24(4):98, Apr. 1973.
A customer who left a shop stepped down from the sidewalk in order to avoid the refuse bins of the shop. He fell and asked indemnity from the shop owner. The Court of Appeal Koblenz ruled under file No. 3 U 918/70 that the shop owner was not to pay an indemnity as the leaving of the sidewalk was not unusual and therefore no reason for special danger. It was the fault of the pedestrian that he did not pay attention and did not assure himself that he could evade the bins without any danger to his health. (Text in German)
[24043]

INCINERATION

73-4791

BECKMAN, J. A., C. GRANT, E. L. KAY, AND J. R. LAMAN. Destructive distillation. *Rubber Age*, 105(4):43-48, Apr. 1973.
Statistics on the volume of road-worn tires as well as other scrap rubber confirm that the rubber industry is faced with a pressing solid waste disposal problem. Several processes which are being investigated may solve the problem. One of these processes, the destructive distillation of scrap rubber has the potential of conserving natural resources. Valuable materials can be recovered from scrap rubber and recycled to manufacturing operations. The destructive distillation of scrap tires gives three primary

crude products0 char, oil, and hydrocarbon rich in hydrogen. The effects of the process variables on the distribution of the primary products are discussed as well as the effects of batch versus continuous process operation. Preliminary product development work on the primary pyrolysis products indicates that marketable materials can be manufactured.
[24044]

73-4792

BOND, R. G., AND C. P. STRAUB. Incineration data: cost, equipment, and performance. *In* Handbook of environmental control. v. 2. Solid waste. Cleveland, Ohio, CRC Press, 1973. p. 453-482.
This paper presents data, diagrams, and graphs on incineration costs, equipment, and performance. The topics covered follow: approximate combustion characteristics of various kinds of materials and amounts of air needed for combustion; calculated variations in refuse incinerator data for various refuse heating values and compositions; parameters of design for refuse furnaces; gas burner recommendations for general refuse incinerators; typical physical properties of refractories; comparative costs for two types of incinerators, Chicago; typical comparative cost figures for furnace systems; incineration costs, 1967 to 1968; operating costs for municipal incinerators; incinerator residues; chemical analysis of incinerator fly ash; effects of air flow in air pollutant emissions by incinerators; control equipment efficiencies and costs; and characteristics of incinerator waste water. Source material is provided for the data given. (This document is retained in the SWIRS library.)
[24046]

73-4793

BOND, R. G., AND C. P. STRAUB. Incineration. *In* Handbook of environmental control. v. 2. Solid waste. Cleveland, Ohio, CRC Press, 1973. p. 395-424.
This paper presents data, diagrams, and graphs on solid waste incineration. The topics covered follow: installed incinerator capacity, U.S., 1966; average size of incinerators in 1966; volume reduction by incineration; process flow chart with incinerator-boiler; equipment for continuous incineration; possible reaction modes in an incinerator; multiple chamber incinerator design factors; operating procedures for crematory; classification of seven wastes and nine incinerators; maximum burning rate of various type wastes; BTU values; incinerator capacity chart; recommended incineration equipment; and conversions of dust loadings in flue gas. Source material is provided for the data given. (This document is retained in the SWIRS library.)
[24045]

73-4794

BOND, R. G., AND C. P. STRAUB. Interim guide of good practice. *In* Handbook of enviromental control. v. 2. Solid waste. Cleveland, Ohio, CRC Press, 1973. p. 425-452.
This paper presents a guide for good incineration practices in the form of text, diagrams, and graphs. The topics covered follow: excerpts of interim guide of good practices for incineration at Federal facilities; applicability of Federal regualtions to incinerators; standards for particulate emissions; standards for visible emissions; considerations for good planning other than incinerator design; definitions of incinerator terms; design recommendations for general refuse incinerators; types of general refuse incinerators; scrubber design parameters; scrubber controls; scrubber construction; mist eliminators; materials of construction; general refuse incinerator requirements; pathological incinerators; general refuse incinerators with or without scrubbers; and minimum incinerator thicknesses. Source material is provided for the data given. (This document is retained in the SWIRS library.)
[24047]

73-4795

BOND, R. G., AND C. P. STRAUB. Power from incimeration. *In* Handbook of environmental control. v. 2. Solid waste. Cleveland, Ohio, CRC Press, 1973. p. 483-489.
This paper presents data, diagrams, and graphs on power from incineration of solid waste. The topics covered follow: steam and power from in-

cineration in France, Germany, and Switzerland; summary of operating costs for Chicago's municipal heat-recovery incinerator; East coast incinerator-boiler installations; effect of refuse moisture and excess air on steam generating capacity; refuse-fired gas turbines; apartment and residence incinerators; estimated emission rates from incinerators; and costs for three types of domestic incinerators. Source material is provided for the data given. (This document is retained in the SWIRS library.)
[24048]

73-4796

BOND, R. G., AND C. P. STRAUB. Pyrolysis. *In* Handbook of environmental control. v. 2. Solid waste. Cleveland, Ohio, CRC Press, 1973. p. 519-524.
This article presents data on pyrolysis of solid wastes. The topics covered include: San Diego sanitary fill material survey, 1965-1966; pyrolysis product yield; gases evolved by pyrolysis; gas evolved per pound of typical refuse combustibles; proximate analysis of pyrolysis char; pyrolysis of newspaper; typical low pressure pyrolysis systems; volatile matter yields; analyses of gas from pyrolysis of refuse components for pyrolysis tests; and cost and revenue estimates for pyrolysis. Detailed source material is provided for the data given. (This document is retained in the SWIRS library.)
[24049]

73-4797

BURGESS, J. V. Developments in sludge and waste incineration. *Process Biochemistry*, 8(1):27-28, Jan. 1973.
Approximately 1 million tons of dry solids are contained in the 25 million tons of sewage sludge produced annually in the United Kingdom. Of the available sludge and liquid disposal options, incineration provides the most complete and safe disposal of organic matter, producing only clean gases, water vapor, and ash. Its high cost may be reduced through centralized facilities. Various types of furnaces are commonly used: multiple-hearth, mono-hearth, fluidized-bed, rotary drum, and liquid incinerators. Many other furnace combinations are under consideration and construction.
[24050]

73-4798

CRAWFORD, G. Incineration. *Waste Age*, 4(1):16, 83, Jan./Feb. 1973.
Solid waste disposal is a major problem affecting nearly everyone. Special consideration for waste disposal must be made at the very inception of a new building. On site incineration of solid waste disposal in high rise buildings for a modern system consists of five basic components: refuse chute; refuse charging apparatus; multiple chamber incinerator with primary and secondary burners; scrubber (optional depending on application and codes); and chimney. All incinerators require substantial amounts of combustion air to prevent poor combustion.
[24051]

73-4799

Direct incineration plant. *Public Cleansing*, 63(3):104-114, Mar. 1973.
The experience acquired in the study of the design of a number of incinerators, is presented in various categories0 operating experience, profiting by experience, calorific value, environmental considerations and conservation. Before going the incinerator route, a feasibility study is first suggested to identify the best method of waste disposal. Nowadays, the incinerator route has fewer of the difficulties encountered in early British direct incineration plants. A technical discussion of the paper is also included.
[24052]

73-4800

DOTREPPE-GRISARD, N. Incineration des plastiques et pollution atmospherique. [Incineration of plastic materials and air pollution.] *Tribune du Cebedeau*, 25(348):476-475, Nov. 1972.
Air pollution problems involved in the incineration of plastic and other wastes are reviewed. Domestic refuse in Belgium presently contains 2.25 percent plastic materials, of which 1.75 percent is polyethylene, 0.30 percent is polystyrene, and 0.20 percent is polyvinyl chloride. The percentage of plastic materials in domestic waste is expected to reach 7 percent in 1975, and 10 per-

cent in 1980, when the share of polyvinyl chloride will rise to 11.5 percent. Incinerator equipment may be subject to corrosion due to the destruction of its protective oxide film by carbon monoxide, especially at temperatures above 400 C. Corrosion can be also caused by sulfur dioxide, and chlorine compounds. Chlorine compounds produce buildups of ferrous and ferric chloride, which latter readily separates from the metal surface. Corrosion can be prevented by maintaining the flue gas temperature between 900 and 1,000 C, by injecting secondary air for postcombustion, by limiting the gas flow rate to 6 to 8 m per second and through diminishing aburpt changes in flow direction. Incrustations of the incinerator surfaces can be prevented in a similar manner. The formation of hydrochloric acid from incinerated polyvinyl chloride may be due to high-temperature reactions of inorganic chlorides with fused iron and aluminum silicates, producing highly volatile iron and aluminium chlorides which ultimately hydrolyze into hydroxides and hydrogen chloride or due to reactions of alkaline chlorides and acid sulfates in buildups, which results in hydrogen chloride under high humidity and temperature conditions. Through injecting lime into the flue gas 70 to 80 percent of all hydrogen chloride formed can be bound. (Text in French).
[24053]

73-4801

EBARA MFG. CO., LTD, TOKYO. Gasuka shokyaku hoshiki ni yoru tokushu gomi oyobi sangyo haikibutsu shokyakuro. [Incinerating furnace for special trash and industrial waste by a gasification and combustion method.] *Kotai Haibutsu*, (8):44-49, Dec. 1972.
The gasification and combustion method is a process developed with the object of preventing the occurrence of secondary pollution and of serving as one of the future energy sources by the conversion of the byprocuct formed by this method to flammable gas. The facility consists of a pre-treater, a supplying system, gasification equipment, gas absorption equipment, and combustion equipment for generated gas. The adequately crushed flammable solid wastes, such as plastics, synthesized rubber, coarse trash, etc., are thrown into the incinerating furnace after being mixed up in a pit for waste, preheated by the generated hot gas rising from the lower part of the furnace, then heated at 250 to 400 C at a dry-distillation stage, and volatile substances such as hydrochloric acid are removed. It is heated at 500 to 600 C at a reduction stage until the majority of waste is carbonized, and at the last oxidizing stage the carbon is consumed by the reaction of the carbon with the atmospheric oxygen. Thus the heat so generated promotes the reactions such as reduction and dry distillation. The temperature of the oxidizing stage is 800 to 850 C, and the gas coming out of the oxidizing stage is introduced to the outside of the furnace through each stage of reduction, dry distillation, and preheating. The amount of gas generated from the gas generated from the gasification furnace is one-sixth to one-tenth that of the former incinerating furnace, thus making the air pollution equipment less costly. (Text in Japanese)
[24063]

73-4802

EWING, R. C. Amoco installs fluid-bed incinerator. *Oil and Gas Journal*, 71(4):103, 106, Jan. 22, 1973.
A new fluid-bed incinerator is now operating at the Amoco Oil Co. refinery at Whiting, Indiana. The unit is charged up wil liquid wastes and semi-solid sludges from various waste sources. Incinerator operation is continuous with feed tankage capacity permitting a shutdown of 20 days. Products of the unit are effluent flue gas out of the stack and solids from the reactor. Twenty conditions of operation must be met to automatically start the unit; otherwise, one or more control loops will prevent startup. Alarms are sounded during operation if one or more interlocks are involved during operational monitoring.
[24054]

73-4803

EWING, R. C. Centralized incinerators burn plants' waste. *Oil and Gas Journal*, 71(11):109, 112, Mar. 12,1973.
The Bayport Central Waste Treatment Plant is located on a 120-acre site within a still develop-

ing industrial park in southwest Harris County, Texas, serving 19 industrial installations. The incineration unit consists of two 1,000 gal per hr liquid incinerators, six 20,000 gal holding tanks, and 20,000 gal mix tanks. One incinerator is equipped with a high-energy, venturi-type wet scrubber which removes particulate matter not comsumed in the combustion process. Waste containing inorganic matter is processed through this unit. The unscrubbed incinerator burns only wastes which contains organics. The plant incinerates on a batch basis but both incinerators run continuously24 hr per day, 7 days per week.
[24055]

73-4804

FABRY, F. A. M. Incinerateur perfectionne pour ordures et residus solides ou liquides. [Incinerator for liquid or solid wastes.] Canadian Patent 906,327. Issued Aug. 1, 1972.
An incinerator for any king of solid or liquid wastes is described. The incinerator comprises a combustion grate, a distributor system for the distribution of the waste materials over the grate, and feed chute for the distributor, an auxiliary burner placed underneath the grate, and the collecting tray mounted below the grate for collecting wastes passing the incinerator without being destroyed. The air supply and the auxiliary burner operation are thermostatically controlled. The incinerator is designed to operate as a heat generator whenever there is not waste to be incinerated. Wet type flue gas cleaning system is provided for. (Text in French)
[24056]

73-4805

FERREL, J. F. Sludge incineration. *Pollution Engineering*, 5(3):36-39, Mar. 1973.
Although sludge incineration is usually more expensive than land dumping, the former is coming more and more to the fore when a balance of pro and con factors is made. Various methods of sludge incineration are then discussed: multiple hearth furnace, flash drying and incineration system, cyclone type, kiln type, fluid bed reactor and wet air oxidation. Performance and cost curves are presented along with system schematics.
[24057]

73-4806

FIELD, A. A. Waste incineration. *Heating/Piping/Air Conditioning*, 45(3):95-97, Mar. 1973.
With the increasing need to put a brake on all forms of pollution, incineration is now getting priority as a means of waste disposal in most European countries. A few cases in Europe are described where incineration is being combined with power generation to sometimes produce steam for district heating. Advantage is thus being taken of the increasing calorific value of the millions of tons (18 million tons in the United Kingdom last year) of domestic waste being generated these past years.
[24058]

73-4807

FIFE, J. A. Solid waste disposal: incineration or pyrolysis. *Environmental Science and Technology*, 7(4):308-312, Apr. 1973.
Combustion processes, reduce not only the volume of the refuse, such as in the shredding and baling operations, but also its weight. Weight becomes an important factor when waste must be transported over significant distances. Of the combustion processes, incineration and pyrolysis, the former occurs in the prosence of air whereas the latter doesn't. After describing the nature of both types of processes and comparing them, selection factors are presented to enable one to decide which process should be selected for a given situation.
[24059]

73-4808

HASELER, A. E. Refuse incineration-the environmental answer for district heating schemes. *The Building Services Engineer*, (4):A31-A34, Mar. 1973.
District heating enables fuel technologists, engineers, town planners, administrators and councillors all to have opportunities to make a very considerable contribution to the reduction in the rate of world fuel comsumption including the reuse of civilization's waste products. A part of telethermics- the transmission and distribution of thermal energy in the form of piped hot water

in thermally insulated mains, district heating is anetwork of pipes circulating hot water from any convenient source of heat to all urban buildings. On the other hand, refuse may be regarded as a valuable source of useful energy. The idea is to employ this refuse heat from incinerators as part of the heat input into the district heating scheme to not only provide heat energy but also to reduce environmental pollution in a very effective way.
[24060]

73-4809

Heat rocovery at Bristol sewage works. *Energy Digest*, 2(2):11-13, Mar. 1973.
An economic self-contained installation at Bristol, England, provides electricity supplies for complete sewage pumping and treatment plant, and for a large refuse incinerator. The incinerator has a maximum load of 1,450 kw. It is operated initially on a two-shift, 5 days per week system, equivalent to 80 hours, Monday to Friday. On completion of an extended power plant installation, sludge gas yield will be sufficient to meet the fuel requirements of the engines when the alternator sets are providing base-load power for the sewage works and incinerator.
[24061]

73-4810

How to get rid of liquid waste. *Factor*, 6(1):64-65, Jan. 1973.
Disposal of liquid plant wastes economically and without fouling the environment is a problem faced by many manufacturers. In this case, the Union Carbide Corporation of Elk Grove, California had two types of liquid wastes- a toxic distillate and liquid solvent wastes. The latter was used to supplement the fuel needs to incinerate the former in a liquid waste incinerator designed by the Thermal Research and Engineering Company of Conshohocken, Pennsylvania.
[24062]

73-4811

Incineration makes a comeback. *Factory*, 6(1):51, Jan. 1973.
The starved air design incinerator of the Kelley Co. of Milwaukee, Wisconsin has been shown by independent laboratory tests to have an emission rate well below the standard set by most States. By holding back on the air used for combustion, a less turbulent and more even burning process is promoted to burn off the combustion gases, along with the smoke, in a secondary chamber, located at the base of the stack, above the primary chamber. Natural gas is introduced in the secondary chamber to ignite the combustible gases.
[24064]

73-4812

KNAAK, R., AND H. KUHL. Ergebnisse der Grossversuche mit gemeinsamet Verbrennung von Muell und klaerschlamm in den Muellverbrennung sanlagen Kopenhagen und Bonn-Bad Godesberg. [Results of tests with joint combustion of refuse and sewage sludge in the incineration plants Copenhagen and Bonn-Bad Godesberg.] *VGB Kraftwerkstechnik*, 53(4):210-213, 1973.
Tests with regard to a joint combustion of sewage sludge and refuse were conducted at Copenhagen and Bonn. Both incineration plants has a throughput of 5 tons of refuse per hr. A rotary shaft furnace is especially adapted for the combustion of sewage sludge. The tests were conducted with four different sludge types having a water content of 49 to 78 percent. Three sludge types were rotted sludges while in the last test series activated sludge was combusted. In one case the sludge was dosed by a rotating roll, in the second case it was dosed by hand, one sludge types was fed into the furnace by means of a crane, and the last test sample was fed directly into the rotating furnace. It was found that under the given conditions all types of sludge burnt satisfactorily, the unburnt substances amounting to only 0.2 percent at Copenhagen and less than 0.1 percent at Bonn. Even the fresh sludge with a water contents of 78 percent burnt completely at sufficient furnace temperatures. However, it is very important for complete combustion that an intensive mixing of sewage sludge and refuse is provided for. (Text in German)
[24065]

73-4813

MAUGH, T. H. Fuel from wastes: a minor energy source. *Science*, 178(4061):599-602, Nov. 10, 1972.

Simultaneously, the United States has begun to consume far greater quantities of fossil fuels than can be produced domestically and to produce far greater quantities of solid organic wastes than can be taken up by landfills and other conventional methods of disposal. There is the hope that these wastes could be converted into synthetic fuels to simultaneously solve both problems. Three major routes are available to do so: hydrogenation, pyrolysis, and bioconversion. However realistically, the vision of fuel from wastes would seem to be of minor importance. A more optimistic route, that may take as long as 25 years, would start with algae.

[24066]

73-4814

NBS helps with problems of waste incineration. *National Bureau of Standard Technical News Bulletin*, 57(2):42-43, 48, Feb. 1973.

Industrial incinerators that burn cleaner and last longer could result from readily usable thermodynamic data compiled by NBS scientists on likely incinerator reactants and products. These data help engineers in the proper design and operation of incinerators by solving important problems: determination of waste material composition, analysis of main ingredients or reactants, and determination of the heat balance of the combustion process to maintain correct temperature control.

[24067]

73-4815

New burner tip makes residue-disposal routine. *Chemical Engineering*, 80(9):80, Apr. 16, 1973.

Attempting to burn dirty liquid wastes can result in burner fouling where the burner tip becomes clogged with deposited solids which may be carbon. A new burner tip design is described that prevents fouling. Both fuel and a cooling atomization medium, steam, combine in a spiral mixture flow inside the tip in a dynamic way so that the mixture exits into the combustion zone through a single large port. At this point, additional atomizing medium impinges onto the into the fuel mixture to provide additional external atomization. The atomizing medium ports, about the single large fuel mixture port, produce a rotary motion opposing that of the flowing fuel mixture.

[24068]

73-4816

New facility to produce industrial steam from municipal refuse. *Secondary Raw Materials*, 10(10):92, Oct. 1972.

A new waste energy recycling facility is to be built on the present site of the sanitary land fill in Saugus, Massachusetts by the Thermal Energy System Co. as a joint venture of Combustion Engineering and the M. DeMatteo Construction Co. Construction was slated to begin in July 1972 and be completed in mid-1974. It represents an economically and ecologically attractive answer to municipal trash disposal problems by combining steam generation with efficient refuse incineration. The solid waste of the collected refuse will be shredded, metals removed, and then used as fuel to produce up to 350,000 pounds of steam per hr for sale to area industries.

[24069]

73-4817

New incinerator features mobility aspect. *American Gas Association Monthly*, 55(20):34, Feb. 1973.

A mobile and smokeless incinerator meets the needs of construction projects, park systems and other activities where accumulation of solid waste is widely scattered as well as those of plants, stores, or building sites. The unit is mounted on a flatbed trailer, with the emission stack hinged to clear any underpass or wires. An automatic feeder is included to move waste into the primary chamber continuously during combustion. Use is made of the starved air principle to maintain air flow during incinerator operation and to promote combustion to drive off certain combustion gases.

[24070]

73-4818

New-type incineration effective at textile plants. *Modern Textiles*, 54(2):22-23, Feb. 1973.

A number of companies have gone the incineration route with the Keelley Co. 'starved air' design incinerator in operation as demonstrated by the Wallis Equipment Co. of Charlotte, North Carolina. This decision was made on both ecological and economic grounds. A minimum amount of air is used to release a comsubtion gas that rises, with smoke, into a secondary chamber, where the gas is ignited to 'burn up its own smoke'. The incinerator can be kept burning at a high site and high temperature around the clock, 50 weeks a year, in one case.
[24071]

73-4819

PARIEL, J. M., AND G. ROBIC. Procede et appareillage d'incineration de liquides pollues et de boues. [Process and device for the incineration of waste liquids and sludges.] French Patent 2,088,628 owned by the Societe Anonyme Heurtey et Elf-Union. Issued Jan. 7, 1972.
Procedure and apparatus for the burning off of impurities in liquids and sludge are described. The impurities present in liquids or sludge are destroyed by the production of a finely divided pseudo-homogeneous mixture resulting from the mutural dispersion of two immiscible phases at least one of which is contaminated and at least one being a fuel. The resulting mixture is admitted into a reaction chamber for gasification and combustion with recirculation of the gas generated in the chamber so that is contacts the chamber walls near the inlet zone. The combustion chamber is composed of a cylindrical part with a height-to-diameter ratio of at leat 3, another convergent conical part with a top angle of 44 degrees, and of a cylindrical outlet with device for partial obturation. (Text in French)
[24072]

73-4820

Plastic wastes are a burning issue. *Chemical Week*, 112(9):51, Feb. 28, 1973.
New pyrolysis techniques, incinerators for steam generation, and reuse of industry-generated scrap promise to alliviate plastics waste disposal problems. The article presents the gist of a report prepared for the Manufacturing Chemists Association: Pyrolysis is pollution free, needs little fuel, and recovers a wide variety of materials. Test scale pyrolysis units are in operation at Monsantos St. Louis plant and in Denmark. It is suggested that incinerators use water walls for water heat utilization. A previous report indicated no problems in the incineration of plastics in well-designed and operated incinerators.
[24073]

73-4821

Portable debris incinerator takes to the water. *Construction Methods and Equipment*, 55(5):75, May 1973.
Owners, faced with the problem of getting rid of debris along the shores of the newly completed 4,000-acre Bullards Bar Dam reservoir in northern California, called for the camram Corp. of Seattle to do the job with its portable Air Cushion Combustion Destructor. A crawler crane, mounted in the incinerator barge, cleans the shoreline of slash, and piles material aboard the barge in preparation for disposal in the mobile incinerator. It has a knucklebone crane at its head end that feeds debris to the air combustion chamber in a continuous operation. Ash, dirt, and rock pass through the grates into an ash barge that dumps the residue ashore every 12 hr.
[24074]

73-4822

Reacteur a lit fluidise. [Fluidized bed reactor.] French Patent 2,091,161 owned by the Fuller Company. Issued Jan. 14, 1972.
Fluidized-bed reactor for the incineration of combustibles residues is described. The reactor contains a grill for the granulated bed material, a device for continuous air supply, and a heating unit using fuel, combustible residue or combinations thereof as heat source. Heat sensing and heat detecting units compare the temperatures occurring in the fluidized bed and in the free zone above the fluidized bed to a preset reference value, and control the feed rates of the residue, fuel, and cooling water as a function of the determined difference in temperature. The fluidized-bed reactor provides for complete combustion, and consequently for deodorization, of combustible residues. (Text in French)
[24075]

73-4823

Solid wastes treated by pyrolytic process. *Machine Design*, 45(7):8, Mar. 22, 1973.

In a pyrolysis study of Torrax Systems Inc. of Orchard Park, New York solid wastes are converted into a useful gas and a solid material. The solid wastes are hard to dispose of items such as auto body parts, tires, tree stumps, plastics and old appliances. The items are loaded into a furnace called a gasifier and subjected to blasts of air heated to 2,000 F by natural gas. Organic portions of the wastes are literally decomposed and most of the wastes are turned into gases. The remaining material settles to the bottom of the furnace and is liquified into a molten slag, which may be used as base material in highway construction. The produce gases may be burned to make electricity and steam to heat buildings.

[24076]

73-4824

STRIBLING, J. B. New Furnace. *Oil and Gas Journal*, 71(12):72-74, Mar. 19, 1973.

The cyclone furnace, developed by Lucas Furnace Developments Ltd and licensed in the United States by Fluor Utah Inc. of San Mateo, California, is especially designed for wastes disposal purposes. It is proving highly efficient for all types of wastes except those containing an appreciable amount of either sodium or potassium; at high temperatures, these metals attack the refractory material to form a glass-like slag necessitating the exploration of other refractory materials which would allow the incineration of these compounds without difficulty. Four categories of material are handled by the cyclone furnace: particulate solids, large solids, sludges and semi-liquids, and liquids. Continual automatic measurement and control of four main variables of cyclone operation is possible: furnace pressure and temperature oxygen content of products of combustion, and carbon monoxide level of the burning surface.

[24078]

73-4825

STRIBLING, J. B. The cyclone furnace for waste incineration. *Process Biochemistry*, 8(1):29, 31, 34, Jan. 1973.

The British policy of dumping by land or sea may become impossible after tomorrow as the disposal problems increases exponentially. Alternatives to dumping must be found and such related costs must be paid for. The incineration process appears most acceptable provided it is efficient. The cyclone furnace is so regarded, adapting itself as it does to changes in the nature of the waste being incinerated through the rapidly spinning motion of the column of gas inside the chamber to best incinerate fine particulate, solids, larger solids, sludges and semi-liquids, and liquids. Yet sodium and potassium compounds prove most difficult to handle because the refractory meterial of the furnace breaks down into glass-like slag in their presence. Improved refractory material is therefore needed. This calls for an all-encompassing technology effort specifically suited to the exacting needs of modern waste disposal.

[24077]

73-4826

System for treating fluid and solid waste. *Ship and Boat International*, 25(11):19, Nov. 1972.

A/S Atlas of Copenhagen has now introduced a product that can deal with effluents from toilets as well as sludge and oily bilge water. It is a dual unit, one providing waste effluent treatment and the other incineration. The water and sewerage treatment unit leaves the treated material free from bacteria and odor. Residual sludge, perhaps with a considerable percentage of oil, can be dealt, immediately, with the automatically controlled incinerator unit. The 7 ft high dual unit can deal with all classessses of waste material from a ship's crew of fifty people.

[24079]

73-4827

Verbrennungsanlage fuer Gummiabfaelle Rb4. [Incinerator for rubber waste products RB4.] *Die Technik*, 28(5):321, 1973.

The incinerator for combustion of rubber and plastic waste products is equipped with two burners. One is installed in the combustion chamber. It extinguishes automatically once the operating temperature of 1000 C is reached. The other burner is used for afterburning combustion

products. It remains in operation. As fuel for the burners, diesel oil, light fuel oil and gas can be used. The fuel consumption is 20 kg per hr. One combustion cycle last 4 to 5 hr. One charge may have a maximum volume of 4 cu m. The height including stack is 6700mm. The waste products are burned without smoke, dust and odor. (Text in German)
[24080]

73-4828

WIEDERMANN, F. Heizzentrale mit Muellverbrennung. [Heating system with refuse incineration.] *Staedtehygiene*, (4):103, 1973.
Contrary to the general opinion that only incineration plants which are laid out for large quantities work economically, the example of a hotel in the Swiss Alps shows that small plants also offer special advantages. In order to avoid the dumping of refuse in the mountain region the hotel had to construct an incineration plant of its own. The daily refuse quantity of the hotel of 2 to 3 cu m is burnt in two combustion chambers where a ventilation system provides for the necessary air. The first chamber is used for burning the refuse while the second one is provided with an oil burner which burns the cases from the refuse incineration so that they leave the plant completely odorless. About 360,000 of the 1 million kcal in which are required for heating purposes are produced by the incineration plant of the hotel. One hundred kg of refuse produce about 5,000 liters of hot water at a temperature of 60 C. Slag and ash are used for landfill purposes. (Text in German)
[24081]

INDUSTRIAL WASTES

73-4829

BOND, R. G., AND C. P. STRAUB. Industrial and commercial waste disposal. *In* Handbook of environment control. v. 2. Solid waste. Cleveland, Ohio, CRC Press, 1978. p. 544-550.
This paper presents data on industrial and commercial waste disposal. The following topics are covered: Monthly rates for commercial collection based on quantity of refuse collected; commercial rates for refuse collection based on kind of business, 1961; bases used by four cities to compute commercial rates for refuse collection; commercial treatment of industrial and municipal solid wastes; scrap and waste quanitites and utilization achieved; waste produced by processing minerals and fuels in 1965; and U.S. disposal of solid wastes, methods and quantities. Source material is provided for the data presented. (This document is retained in the SWIRS library.)
[24082]

73-4830

BOND, R. G., AND C. P. STRAUB. Industrial solid wastes--manufacturing industries. *In* Handbook of environmental control. v. 2. Solid waste. Cleveland, Ohio, CRC Press, 1978. p. 93-108.
This paper discusses solid wastes in the manufacturing industries. An extensive listing is provided of the principal industrial waste components according to source, waste, characteristics, composition, and means of treatment of disposal. Solid waste disposal is categorized by State. Data are also provided on the following: manufacturing wastes, 1967; large firm multipliers; small firm multipliers; estimation of industrial wastes generation rates; solid waste generated by the fabricated rubber products industry, 1968; solid waste generated by tire and tire products manufacturing; and the Pennsylvania anthracite refuse banks. Detailed source material is provided for the data given. (This document is retained in the SWIRS library.)
[24083]

73-4831

BOWERS, D. Control of liquid wastes in printing ink plants. *American Ink Maker*, 51(3):16-17, Mar. 1973.
For years the printing manufacturers have been aware of the need for living within the pollution control laws. It is now demonstrating its response to that awareness through a developing technology involving both products and systems to solve environmental problems. Two major obstacles facing the printing ink plants are the time limit and the individual State landfill regulations. Presently methods such as reducing the amount of waste by reducing solvent usage or by

recovering solvent are ways available to the printing ink plants for eliminating pollution. The author concludes by saying that it is apparent that there is a need for getting on with the application of what new technology is available. This is necessary so that the ink manufacturers may evaluate the disposal problems they encounter this year or next year versus the solutions they can turn to this year or next.
[24084]

73-4832

CROWLE, V. Water conservation and nickel recovery. *Metal Finishing Journal*, 18(212):269-272, Sept. 1972.
Water reuse and nickel recovery are discussed. The Lancy Laboratories proposed the integrated method of effluent treatment incorporating a rinse water conservation and recirculation plant which reduced the estimated quantity of water used for rinsing by 80 percent. This type of plant treatment also facilitated easy rocovery of metal values and therefore an additional plant to recover nickel for reuse in the plating solution was also proposed. Processes concerning plating facilities, effluent treatment, sludge filtration, nickel recovery, recovery plant costs and total and future savings are discussed. It is concluded that Raleigh Industries Ltd., has shown that effluent treatment need not be an expensive process. Savings in water, nickel, and in the future savings are discussed. It is concluded that Raleigh Industries Ltd., has shown that effluent treatment need not be an expensive process. Savings in water, nickel, and in the future copper, not only pay for the costs of treatment but also show the company an annual profit. It is pointed out that water and discharge costs will at least double in the next few years resulting in even greater savings.
[24085]

73-4833

DAVIES, W. E. Geologic factors in waste bank. *Mining Congress*, 59(1):43-46, Jan. 1973.
The geologic problems in disposal of coal refuse vary greatly from region to region depending on the topography in the mining area. In the Appalachians, the rugged ground makes it necessary to deposit most of the refuse as fills in small side valleys or large piles along valley walls. In the more gentle areas of the Appalachians, refuse is disposed of in the form of large mounds on teh tops of slopes and hills as well as in valley fills and in the flatter areas of the midwest prectically all the refuse is heaped in large mounds. In achieving waste bank stability, sound application of soil mechanics and engineering know-how are to be applied. If they are not the results are heaps of refuse piles and dams which can be traced to lack of regard regarding proper application of principles in these fields. The article deals mostly with valley fill and hillside banks. There are four figures in this article.
[24086]

73-4834

Driving a tunnel downhill. *Western Union*, 48(1):23-24, Jan. 1973.
Under the Rocky Mountains a tunnel is being built by Dravo Corp. All of the tricks and the tenacity of the men in mining are required to build this tunnel. The 10 mile bore will pass 4,600 ft under the Continental Divide, near Empire Colorado. It is to carry a railroad from a new deep molybdenum mine to an ore-processing plant. Geology and water cause great problems to the miners. The alignment passes through a series of faults and highly fractured zones. The water runs towards the face and the working operations. The reason is that the tunnel is being driven on a 3 percent descending grade into the range and toward the ore deposit. The project is being carried out under a contract with American Metal Climax Inc., as part of the Henderson Mine Development in Colorado's high country. Key personnel have been hired to solve the difficulties and hazards of fractured rock and running water.
[24087]

73-4835

DUMAN, R. Chemical engineering and environment. *La Technique Moderne*, 64(11):35-39, NOv. 1972.
Efforts made by the chemical industry to abate environmental pollution are reviewed. Sanitary landfilling has definite advantages over uncon-

trolled disposal of solid wastes, but incineration and pyrolysis represent the only genuine solution to the problem of safe waste disposal. However, the best way to avoid wastes is adopt technologies which generate minimum amounts of waste, and to recycle all wastes. A process has been developed by the Heurty Co. for the conversion of forging scales, and steelwords and mine dusts mixed with bitumen into balls by subjecting the wastes to normal heat treatment. (Text in French)
[24088]

73-4836

Fly ash removal from wastewater. *Industrial Wastes*, 18(5):38-40, Nov./Dec. 1972.
The Marshal, Texas plant of ICI America, Inc produces activated carbon by burning lignite under heat and pressure in large rotary kilns. This process produces large volumes of fly ash which must be removed from the air and water effluent. The water in the fly ash sump sontains particulate matter from the air control system and the rotary kilns. This slurry is pumped through cyclones where the larger particles are removed and collected in an undertank, while the smaller particles are pumped to the plant's wastewater sump. The wastes in this sump are initially neutralized with lime. They then go to a neutralizer and from there to a large clarifier. Flocculants are added at the clarifier and the sludge is pumped to the filter building where large rotary vacuum filters remove the water. Solids are discharged as filter cake. Clear water from the clarifier and filtrate from the rotary filters go to the effluent tank. Half of the contents of this tank are recirculated in the plant to the saturator. The other half is discharged into the creek. The air and water quality control equipment cost $4 million to install and half a million dollars per year to operate. A good measure of the success of the wastewater treatment is that fish are present downstream from the plant. Several pictures ; nd a graph are included in this report.
[24089]

73-4837

GROPP, R. F., AND R. E. MONTGOMERY. Recycling plant tissue effluent. *Industrial Wastes*, 19(3):18-19, 22-23, 46-47, May/June 1973.
Kimberly Clark's tissue plant on the Big East River in Muskoka, Ontario, has been concerned with controlling discharge since pollution of the waterways would affect the area's natural beauty. The Ministry of the environment conducted hydrological, biological, and bacteriological surveys on the river and determined that it the plant discharge did not exceed 500 lb of BOD per day or 50 mg per liter of suspended solids, the aquatic life in the system would not be affected. The Ministry also determined that the wastewater effluent could not cause unacceptable conditions in the river such as odor, color, foam, or taste. The discussions include the treatment plant, sludge removal, freeing suspended solids to produce 1 ton of paper, the clarifier bleed, the importance of being aware of the oxygen demand through the water and effluent treatment on a daily basis, temperature control, and color removal. The two major keys to the success of the plant are: a well integrated design to minimize waste with sufficient safeguards to allow for human errors, process upsets and equipment failures; and a total commitment by all plant personnel to fight pollution of th scenic region.
[24090]

73-4838

KREPLICK, R., W. LITSKY, AND H. B. GUNNER, ED. Proceedings; Regionalized Solid Waste Management Conference, Newton, Massachusetts, June 1-2, 1972. University of Massachusetts at Amherst and Massachusetts Department of Community Affairs. 216 p.
This document covers papers presented on the legal and socioeconomic aspects of regional solid waste management in the United States. The topics covered follow: a systems approach to refuse disposal on a regional scale; environmental impact of alternative disposal methods; legislative provisions; local political systems in relation to regionalization; regional planning decisions and citizen participation; a Statewide solid waste management proposal for Mas-

sachusetts; a process for planning in a regional basis; and financing regional solid waste management plans. An appendix is included which outlines pertinent legislation. (This document is retained in the SWIRS library.)
[24091]

73-4839

MALY, V. Charakteristika popilku z hnedeho uhli a moznosti jejich vyuziti. [Characteristics of brown coal fly ash and possibilities of its utilization.] *Uhli*, 20(8):328-331, 1972.
Granulation, physical and chemical characteristics of brown coal fly ash depend on the type of coal, on the manner of combustion, and on the type of separation method, i.e., electrostatic or mechanical. Mechanical separators yield ash with particle size from 0.8 to below 0.06 mm. Fly ash taken directly from separators has less than 1 percent humidity, specific mass of 2 to 2.5 g per cu cm, specific surface from 1,060 sq cm per g to 3,200 sq cm per g, and water absorption varies greatly. Siica content varies from 63 to 86 percent for brown coal (79 to 80 percent for anthracite coal), iron oxide - 5 to 11 percent, and aluminum oxide-8 to 13 percent. All samples contained boron, vanadium, cobalt, nickel, copper, almost all chromium, titanium and lead; half the samples contained arsenic, zinc, tin, strontium and germanium, occasionally barium, beryllium, and silver. The ash can be used for conversion to magnetite, to aluminum oxide, and for the recovery of germanium and of other elements. It can be used in agriculture as a mineral fertilizer for the improvement of heavy soils, in the manufacture of construction materials, as an additive to cement, in the manufacture of hydraulic bonding materials, and in the manufacture of artificial stone. (Text in Czech)
[24092]

73-4840

MCKINNEY, R. E. Biodegradation of concentrated aqueous solid wastes0 aerobic versus anaerobic systems. *In* Proceedings; National Industrial Solid Wastes Management Conference, Houston, Texas, Mar. 24-26, 1970. University of Houston and Bureau of Solid Waste Management. p. 166-171.
This paper discusses the biological treatment of concentrated aqueous solid wastes. The fundamental concept described is the biological stabilization of organic wastes which is carried out by simple microbial metabolism over a definite period of time in a controlled environment. A flow chart is included to assist in explaining this concept. Aerobic-anaerobic environments are described in equations and in terms of pH and temperature. The waste characteristics of various solids (paper, garbage, grass, tree trimmings, metal, and glass) are also discussed. The biological systems outlined which can be used to treat concentrated wastes follow: anaerobic digestion; anaerobic lagoons; aerobic digestion; oxidation ditches; sanitary landfill; composting; and surface stabilization. Their advantages and disadvantages are covered. It is concluded that by understanding the waste characteristics, the fundamentals of biotreatment, and the desired degree of treatment a proper system can be selected and designed. (This document is retained in the SWIRS library.)
[24093]

73-4841

MICHAELIS, H. Die Stellung der NE-Metallhuetten. [Removal of industrial refuse.] Presented at the VTG-Dechema Conference, Kniebis, Nov. 20, 1972. 4 p.
In the whole Western world, about 25 percent of aluminum, 41 percent of lead, 37 percent of copper, 22 percent of zinc, and 26 percent of tin were recycled from waste materials. Aluminum alloys are refined by means of the chloride-nitrogen process. Zinc scrap can be used for recycling high-quality zinc or zinc oxide by means of distillation. Owing to the low iron content of Australian bauxite which is used in aluminum works, it becomes more difficult to recycle the developing red sludge so that the bulk of it has to be disposed in sanitary landfills. Owing to the recently developed Jarosite and Goethite precipitation methods, the leach residue of the zinc electrolysis contains only a very small quantity of zinc so that a thermal smelting process is not feasible any more. The precipitation sludges therefore cause a new problem in sanitary landfills. Slag from copper smelting works does not cause any problems as it can be used as gravel in

road construction. (This document is retained in the SWIRS library.) (Text in German)
[24094]

73-4842

News trends. *Machine Design*, 45(15):46, June 14, 1973.
Three topics are discussed. In 'Scientists Recommend Coal Baths,' Dr. Robert Meyers and a team of scientists have found a way to remove from 40 to 80 percent of the sulfur from coal. Coal sulfur is the largest source of sulfur-dioxide in the United States. This process is accomplished by giving it a warm bath (about the temperature of tepid tea) in a ferric-sulfate solution. The second topic, 'Fluoropolymer Developed for Rotomolding' discusses a new rotomolding technique that can readily be extended with Halar 5002 to include rotolining of chemical processing, storage and transfer equipment. In rotolining, the piece of equipment to be lined is employed as the mold, and Halar resin is molded inside the equipment to form an integral, pinhole-free liner. Valves, pipes, and flow meters are some of the equipment possibilities. The last item, 'Titanium Scrap Recycled into Usable Product', states that a new process converts titanium metal-machine turnings into an inexpensive general purpose metal. This new product is called Utili-Ti and it is well suited for many applications considered to require nickel-bearing stainless steel and nickel copper metals. Utili-Ti has a very good strength-to-weight ratio, is much stronger than chemically pure titanium, is more corrosion resistant, and will be lower in price on a volume basis.
[24095]

73-4843

Oil shale-a stateside answer to petroleum shortage. *Mining Engineer*, 24(10):95-98, Oct. 1972.
The Colony Development Operation in western Colorado has a developing program focusing on oil shale as a source of crude oil and energy for the United States at a time when the nation's oil production is not meeting the demand. Some 80 billion barrels are in the Piceance basin. At the depositional center of the Piceance basin, the oil shale deposit is more than 2,500 ft thick. It is in three separate zones. An experimental history of oil shaling in the United States since World War II is mentioned. The Tosco 2 process for retorting oil shale is discussed along with mining methods used in oil shaling, disposing of the processed shale from the retort and land status concerning developing commercial oil shale on privately owned land and on Federal land. Seventy percent of all oil reserves are on Federal land. Since World War II, the government has passed the Synthetic Liquid Fuels Act which is aimed at the creation of new and more economic mining, retorting, and refining technology, plus providing studies to determine reliable information on the costs of oil shale production. The Department of the Interior has played an important role in this area.
[24096]

73-4844

OSBORN, E. E. Emergency investigation of coal waste embankments. *Mining Congress Journal*, 59(1):40-42, Jan. 1973.
A special task force under the auspices of the Department of the Interior was assigned two immediate and two long range goals. The first was to make a thorough study of the Buffalo Creek disaster. The Buffalo Creek tragedy resulted from the sudden and total collapse of a coal refuse dam on Feb. 26, 1972, at Saunders, West Virginia. Approximately 21 million cu ft of water was released in minutes and a wild 17 mile plunge down Buffalo Creek at velocities of up to 20 ft per second began. All the homes and the structures in the upper end of the valley were destroyed. The Task Force was to identify as soon as possible all the waste dams, banks or impoundments with unsafe conditions that could threaten lives or property. It was to work toward developing more effective and accurate means for recognizing hazardous conditions and all the possible modes of failure at coal waste sites. And it was told to recommend how safer storage or disposal technology for mining wastes might be developed through research. After much research, the lessons learned from Buffalo Creek are that unless disposal practices are improved and waste banks and impoundments controlled, the problems will become even more critical and the probability and consequences of

failure will increase. Authoritative and adequate laws and a clear definition of responsibility are needed. Congress should provide these.
[24097]

73-4845

REGAN, W. J., R. W. JAMES, AND T. J. MCLEER. Ferrous solid waste. *In* Identification of opportunities for increased recycling of ferrous solid waste. Washington, U.S. Environmental Protection Agency, 1972. p. 56-117.
Ferrous solid waste is discussed as an integral part of our total solid waste problem. The following topics are discussed in detail: sources of iron and steel scrap0 home scrap, purchased scrap, prompt industrial scrap, and obsolescent scrap; junked motor vehicles; the steel can; discarded major household appliances; and potential supplies. Data are presented on the following: the iron and steel cycle and ferrous solid waste; home scrap generated by industry and types of manufacturer, 1960 to 1970; home scrap generation by State, 1969; estimated prompt industrial scrap by major States, 1969; automotive comsumption of iron and steel products, 1960 to 1969; and composition of incinerator residues. (This document is retained in the SWIRS library.)
[24099]

73-4846

REGAN, W. J., R. W. JAMES, AND T. J. MCLEER. THE FERROUS THE FERROUS SCRAP PROCESSING INDUSTRY. *In* Identification of opportunitites for increased recycling of ferrous solid waste. Washington, U.S. Environmental Protection Agency, 1972. p. 177-231.
The ferrous scrap processing industry is outlined in terms of functions, profile, and capabilities. The following topics are covered under capital equipment: types of capital equipment; recent developments in processing equipment; new developments in processing equipment; impact of the auto body shredder; the role of capital equipment in recycling; survey data on equipment usage; and problems related to the use of capital equipment. Iron and steel scrap grades, stainless and alloy steels, railroad car dismantling, demolition and shipbreaking, problems of the ferrous scrap industry, problems as seen by industry members, and residue disposal are also discussed. Extensive tabular material is provided. (This document is retained in the SWIRS library.)
[24098]

73-4847

Scrap trade faces direct dealing. *Waste Trade Journal*, 68(42):1, 3, Oct. 21, 1972.
The spread of the practice of bypassing the scrap dealer through increased recycling activities is the most serious problem confronting the scrap trade in years. As an example, U.S. Steel purchased several thousand tons of auto bundles from the Fischer Body plant of General Motors, thus bypassing scrap dealers. Recently a former scrap broker recommended that steel mills buy their supplies directly from the producer and eliminate the scrap dealer. Recycling is urged to increase the supply of solid wastes from industrial plant producers who want higher prices. Dealers find that the consumer expects that increased supplies from recycling should result in lower prices. Thus as supplies increase, market prices drop. Scrap dealers' profit margins are so narrow that it requires luck to cover operating costs. This has been brought about by the recycling drive which serves to weaken the supply balance and may continue to reduce prices.
[24100]

73-4848

STOPKA, F. Skusenosti s pousitim kaustificacneho kalu na vyrobu vezovej kyseliny. [Experience with the use of caustic sludge for the manufacture of tower acid.] *Papir a Celuloza*, 27(6):125-127, 1972.
Where sulfate and sulfite paper mills are located in a single complex caustic sludge can partly or wholly replace limestone in the manufacture of tower acid for sulfite cellulose production. Caustic sludge, a fine precipitate of calcium carbonate with various predominantly inorganic impurities, contains 2.65 percent sodium salts, 0.57 percent organic oxides, 95.31 percent calcium carbonate and 1.47 percent magnesium carbonate of which lime is 53.40 percent and magnesium oxide 0.72 percent. Thus the calcium car-

bonate content is about equal to that of limestone. The replacement of limestone with sludge in the manufacture of tower acid by the absorption of gaseous hydrogen sulfide in a solution of the caustic sludge has the advantage of a more intensive and complete reaction of the gaseous hydrogen sulfide with the dripping sludge suspension in the tower and the additional advantage of a comparatively high content of sodium salts. The stability of the acid obtained by this method is good; its decomposition is minimal. The boiling of cellulose with acid obtained from such sludge poses no difficulties. In 5 years no negative effect on cellulose yield or on its mechanical properties was noted. The principal advantage is the saving of the cost of limestone, of its transport and handling. (Text in Czech)
[24101]

73-4849

Weirton steel gets it all together at new plant on Brown's Island. *Magazine of Metal Producing*, 11(1):27-30, Jan. 1973.
The Weirton steel plant attacks air and water pollution with so many novel elements that it represents the greatest collection of coal equipment ever assembled for a single coking operation. In opting for the 3,000 ton per day installation, Weirton plant managers had these objectives in mind: sufficient capacity to increase coke availability and at the same time permit the eventual closing of an existing coke plant considered too old and too cramped to undergo modernization; reducing air and water pollution sources within the coke battery to meet Federal standards; and recovering high-purity sulfur. Weirton attacked the pollution problems on four fronts: emissions during charging, leaking oven doors and lids; emissions during pushing and quenching; and air and water contamination from coke oven off-gas. A description of each of these processes is given. Among the features of the Weirton battery are a version of the smokeless charging equipment; an enclosed underground quenching system; machinery for cleaning stove pipe elbows oven doors and door jambs automatically; double gas collecting mains; a biological oxidation system for removing certain chemical compounds from waste water; and ammonia destruction and sulfur recovery facilities.
[24102]

INSTITUTIONAL WASTES

73-4850

CROSS, F. L., JR., AND G. NOBLE. Appendices A to K. *In* Handbook on hospital solid waste management. Westport, Connecticut, Technomic Publishing Co., Inc., 1973. p. 85-103.
These 11 appendices provide data, diagrams, and illustrations relating to hospital solid waste management. The topics covered follow: glossary of terms; detailed inventory of hospital solid waste by point of origin; cost of composite solid waste systems for hospitals; cost of equipment; incinerator classification of wastes; cost of a hospital solid waste management system; determining emissions from incinerators by source testing; summary of survey of State regulations applicable to single-use items; controlled air incinerator installation; format0 NSWMA stationary compactor rating; and manufacturers of on-site refuse handling equipment. (This document is retained in the SWIRS library.)
[24103]

73-4851

CROSS, F. L., JR., AND G. NOBLE. Classification. *In* Handbook on hospital solid waste mangement. Westport, Connecticut, Technomic Publishing Co., Inc., 1973. p. 4-10.
This paper discusses the variety of waste produced by hospitals. A table is used to list the many disposable items used in hospitals. Five classification schemes for hospital solid waste presented from 1963 to 1968 are summarized. The general classification systems described cover the following waste types: domestic (kitchen, office, and packaging); pathological; contaminated; and special (hazardous wastes other than pathological, such as radioactive wastes and discarded acids). Problems associated with waste types are summarized in a table. The design of an internal handling and collection system is discussed in detail. The approximate variation in density of hospital solid waste is shown in a table as are the advantages and dis-

advantages of using disposables. (This document is retained in the SWIRS library.)
[24104]

73-4852

CROSS, F. L., JR., AND G. NOBLE. Disposal of solid waste. *In* Handbook on hospital solid waste management. Westport, Connecticut, Technomic Publishing Co., Inc., 1973. p. 53-65.
This paper discusses the disposal of hospital solid wastes. Ocean dumping is not recommended for hospital wastes because of pollution, and sanitary landfills would be considered adequate only if they were properly placed and maintained. Only 6 percent of the 6,000 sites in the United States are. Sanitary landfill is, however, economically feasible, although more expensive than operating a dump. It is also suggested that rather than handling the disposal of contaminated and pathological waste in hospitals it may be considered economical to transport waste to a municipal incinerator. A table containing data on municipal incinerator costs and flow charts on basic incinerator design and ultimate disposal by municipal incineration are provided. Composting is considered advantageous bacause of its recycling aspects, but only kitchen hospital wastes can be disposed by this method. A flow chart of composting operations is also provided. It is concluded that composting is an attractive method for ultimate disposal but one which is not now economically feasible. (This document is retained in the SWIRS library.)
[24105]

73-4853

CROSS, F. L., JR., AND G. NOBLE. Future trends. *In* Handbook on hospital solid waste management. Westport, Connecticut, Technomic Publishing Co., Inc., 1973. p. 76-84.
This paper discusses developments in all areas of hospital solid waste management in recent years. Storage has been helped by the introduction of plastics. Personnel are receiving better training in the classification and disposal of wastes. Collection has been improved by the treatment of many wastes at the point of origin. Sanitary compactors and other equipment have made the processing of hospital wastes easier. Compaction has also made transportation (rail haul) more economical. Ultimate disposal of hospital wastes is being improved by changes in the materials used for disposables and resource recovery of waste heat from incineration of hospital wastes. This energy could be applied to the generation of steam, production of hot water, and the reduction of refuse to be collected and transported for ultimate disposal. The application of radiation techniques to pathological wastes is under study. It these techniques prove feasible, sterilized pathological wastes will no longer have to be incinerated and all hospital wastes may be handled and disposed of in the same manner. (This document is retained in the SWIRS library.)
[24106]

73-4854

CROSS, F. L., JR., AND G. NOBLE. Handbook on hospital solid waste management. Westport, Connecticut, Technomic Publishing Co., Inc., 1973. 107 p.
This document discusses the general, technical, economic, and legal aspects of hospital solid waste management. The specific topics covered include: quantity; classification; internal collection methods; processing of solid waste; integrated systems for collection and disposal; disposal of solid waste; outside influences on inside practices; and future trends. Eleven indexes are provided which include data, diagrams, and illustrations. Extensive bibliographic materials are also provided. (This document is retained in the SWIRS library.)
[24107]

73-4855

CROSS, F. L., JR., AND G. NOBLE. Integrated systems for collection and disposal. *In* Handbook on hospital solid waste management. Westport, Connecticut, Technomic Publishing Co., Inc., 1973. p. 49-52.
This paper discusses the application of integrated systems for the collection and disposal of hospital wastes. The ideal system should be economical, have the least operation and maintenance problems, and include both the internal and external operations and alternate combinations of transport and processing equipment.

Local or State regulations will dictate whether an incinerator can be used by a hospital for all wastes, pathological waste and contaminated waste, or pathological wastes only. A unique approach which is discussed in detail is the use of small compactors on each floor for the following purposes: compaction at nursing stations on each floor; decrease in the frequency of collection; decreasing the storage requirements during all intermediate steps; and permitting the solid waste problem to be solved as a materials handling problem. Flow diagrams are used to describe solid waste management by the following methods: wet pulping; central compaction; central incineration; and remote compactors. (This document is retained in the SWIRS library.)'
[24108]

73-4856

CROSS, F. L., JR., AND G. NOBLE. Internal collection methods. *In* Handbook on hospital solid waste management. Westport, Connecticut, Technomic Publishing Co., Inc., 1973. p. 11-25.
This paper deals with precollection, storage, collection, and transportation of hospital wastes. A flow diagram is provided to illustrate the involvement of storage, collection, and transportation in the entire flow of wastes through a hospital system. A storage rating system for hospital solid waste and a recommended plastic bag system for hospital pathological and animal wastes and surgery wastes are presented in tables. The advantages and disadvantages of internal transportation systems consisting of elevators, gravity chutes, pneumatic chutes, automatic carts, and conveyors are discussed. The economics, advantages, and disadvantages of pulping systems, pneumatic tube systems, monorail systems, and self-propelled cart systems are described in detail in the text, tables, and graphs. (This document is retained in the SWIRS library.)
[24109]

73-4857

CROSS, F. L., JR., AND G. NOBLE. Outside influences on inside practices. *In* Handbook on hospital solid waste management. Westport, Connecticut, Technomic Publishing Co., Inc., 1973. p. 66-75.
This paper discusses the economic, technical, and regulatory factors which influence the management of hospital solid wastes. Hospitals are heavily labor intensive and extremely sensitive to increases in labor rates. The daily labor costs of solid waste handling and disposal for seven Los Angeles hospitals are shown in tabular form. The adequacy of municipal incinerators is discussed in terms of its influence on a hospital's use of food grinders. A municipality's sewer size and slope may also influence design and self-cleaning velocities and these data are also presented in tabular form. Legislation is discussed in reference to processing of hospital wastes, particularly in terms of particulate emissions from incineration, visible emissions, and odors. Hospitals must also consider the cost of transportation systems and the use of volume reduction methods to reduce the cost of hauling wastes. The technical difficulties which face hospital solid waste upon arrival at a landfill are also outlined. (This document is retained in the SWIRS library.)
[24110]

73-4858

CROSS, F. L., JR., AND G. NOBLE. Processing of solid waste. *In* Handbook on hospital solid waste management. Westport, Connecticut, Technomic Publishing Co., Inc., 1973. p. 26-48.
This paper discusses the processing of hospital solid wastes. Physical, chemical, and biological processing are discussed in detail as are shredding, grinding, compaction, pulping, and incineration. The economic aspects of all these methods are also mentioned. Incineration is seen as the method which produces the best total volume reduction but the following air pollution emissions; and unskilled operators. Data are presented on the following topics: equipment cost for wet scrubbers; cost of incinerators; hospital incinerator selection guide; advantages and disadvantages of waste handling systems (central compactor, central incineration, wet pulping, and combination systems); relative merits of major components of waste handling systems; service life of solid waste processing equipment; and a comparison of proposed

systems based on economic and environmental factors. (This document is retained in the SWIRS library.)
[24111]

73-4859

CROSS, F. L., JR., AND G. NOBLE. Quantity. *In* Handbook on hospital solid waste management. Westport, Connecticut, Technomic Publishing Co., Inc., 1973. p. 1-3.
This paper provides data and discussion on the quantity of solid waste generated by hospitals in the United States. These institutions generate an estimated 55 million tons of solid waste per year or 1.5 percent of the total waste generated in the United States. This is two to 10 times the domestic generation rates, or 10 lb per year per patient. Due to the nature of the solid wastes generated and the great need to limit disease transmission, the hospital collection rate must equal the generation rate. The frequency of collection must also be much greater in a hospital compared to most solid waste systems. By the year 1980 it is projected that hospital solid waste will increase 76 percent due to the use of disposables. The following information is presented in the form of tables and graphs: total U.S. solid waste generation; estimates of waste generation by various commentators from 1963 to 1971; a comparison of growth of U.S. solid waste generation compareed to hospital solid waste generation; and the disposables market compared to the total medical supplies market. (This document is retained in the SWIRS library.)
[24112]

LAW / REGULATIONS

73-4860

Bay State laws for sanitary fill. *Solid Wastes Management/Refuse Removal Journal*, 15(10):52, 65, Oct. 1972.
This article outlines Massachusetts' sanitary landfill laws. In this State, sanitary landfill sites can only be located in areas where the potential for environmental pollution is minimal. Geographical characteristics of the facility must be determined by on-site investigation to determine or evaluate the following: availability, quality, and quantity of on-site soil for cover material; the influence that geologic factors would have on the ease of excavation and potential for ground and surface water pollution; maximum and normal ground water table elevation, and ground water patterns; probable patterns of underground travel of gasses and attendant restriction on nearby land use; and the public importance of ground water supply to be affected by the operation. Open burning is prohibited at landfill sites as well as the salvaging of materials. All accumulated salvaged materials shall be removed from the disposal site at least once a week.
[24113]

73-4861

BOND, R. G., AND C. P. STRAUB. Solid waste controls and management - legal aspects. *In* Handbook of environmental control. v. 2. Solid waste. Cleveland, Ohio, CRC Press, 1973. p. 179-202.
The legal aspects of solid waste management are discussed in this paper. The Solid Waste Disposal Act is discussed in detail in terms of research, demonstration, training, reclamation, interstate cooperation, grants, executive agencies, disposal sites, labor standards, and recommended guidelines. The St. Louis County, Missouri, Refuse Disposal Ordinance of 1953 and the City of New Orleans Solid Waste Ordinance are also outlined. Waste disposal at sea is presented and the following topics are especially noted: current authorization procedures; the existing legal framework; international law; current Federal laws; State laws; international agencies; Federal agencies and State agencies. (This document is retained in the SWIRS library.)
[24114]

73-4862

GRAD, F. P. Legislative provisions: evaluation and recommendations. *In* Proceedings; Regionalized Solid Waste Management Conference, Newton, Massachusetts, June 1-2, 1972. University of Massachusetts at Amherst and Massachusetts Department of Community Affairs. p. 58-72.

This paper discusses the field of environmental law. What has happened with regard to pollution problems generally, is that the problems have burst out of their narrow geographical jurisdictional boundaries. Pollution is almost inherently an intergovernmental problem because the place of emission and the place of fallout are invariably in different jurisdictions. The legal aspects of regionalized solid waste management are discussed along with the legal developments on the Federal, State, and local levels with respect to solid waste and the the role of the U.S. Environmental Protection Agency. Also discussed are the regional waste disposal methods being used in Maryland, Pennsylvania, and Massachusetts. The legal and economic changes which will be required to move towards more recycling are also indicated. (This document is retained in the SWIRS library.)
[24115]

73-4863

HIGGINS, J. Congress zeroing in on land use, strip mining, plant siting legislation. *Coal Age*, 78(3):65-67, Mar. 1973.
Mr. Nixon's environmental and natural resources message to Congress told of the many environmental problems existing in the United States. However his message barely touched the serious energy crisis which is of great concern to many legislators particularly Senators Jackson and Muskie and Representative James A. Haley. To meet this energy crisis, these legislators are calling for new and tougher laws on land use, strip mining, and plant siting. They are also asking for the creation of new agencies to deal with specific environmental problems and at the same time new agencies to advise existing departments such as the creation of a National Advisory Land Use Policy to advise the Interior Department. The author suggests that in 1973, it looks good for the passage of a new strip mining bill; and that in the land use area, some sort of a federal grant-in-aid program to assist States in making long range plans may pass.
[24116]

73-4864

Kein platz mehr fuer muellwoelfe. [No permission for household shredders any longer.] *Umschau*, (8):252, 1973.
For several years a household shredder was sold which shredded residential refuse like bones, glass, and tins into a fine powder which could be removed together with the waste water. A new regulation by the official authorities of North-Rhine Westfalia rules that material like sand, ash, rubbish, dung, kitchen refuse, and other solid substances, even if shredded must no longer be thrown into the sewer which means that the utilization of household shredders is no longer permitted. (Text in German)
[24117]

73-4865

NAWATA, H. Impact of national pollution-control policies on international affairs. *Chemical Economy and Engineering Review*, 4(9):35-37, 1972.
This article discusses the technoeconomic movement of industrial pollution. Transnational pollution, such as air and water contamination across the national borders of European countries is discussed. New regulations on a national or regional level over automobile engines, fuel oil, and other product standards are discussed along with international environmental standards. It is pointed out that while standards for water contamination would not be so difficult to set, emission standards would be more difficult, because of wind conditions. The 'polluter pays principle' is suggested as the most sensible guideline for the export industries, enabling them to reflect their environmental control costs on their export prices. Extensive data on air and water pollution in the United States and Japan and on the economics of pollution control are also provided.
[24118]

73-4866

Oregon county committee sets landfill regulations. *Solid Wastes Management/Refuse Removal Journal*, 15(12):32, 64, Dec. 1972.
A regulation has been established in Marion County, Oregon, to provide for landfill operations. It sets procedures for the franchising of

refuse collectors and disposal site operators in the following areas: franchising solid wastes collection and disposal; requirements for collection franchises; issuance of collection franchises; disposal franchise requirements; issuance of disposal franchises; appeal on a franchise; exclusive joint service under a franchise; transfer of a franchise; responsibilities of franchise holders; rates and charges for collection and disposal service; rate preferences prohibited; responsibility for payment of charges for service; enforcement of franchise provisions; preventing interruption of services; and use of franchise fees.
[24119]

73-4867

PANTON, J. E., AND J. C. MEYER, JR. Expanding the role of local police in environmental protection. *Environmental Affairs*, 2(2):358-364, Fall 1972.

This article discusses the enforcement of antipollution legislation. The role of the Police Department is discussed in terms of policing the environment, problems of local enforcement, and environmental affairs in general. Four categories of environmental pollution are outlined: unintended incremental pollution; by-products of living; residuals of urban dacay; and results of overtaxing the natural environment. It is recommended that a model local government environmental code be created which would provide the necessary guidance for municipalities in directing enforcement and levying sanctions for violations.
[24120]

73-4868

Permits for dredged or fill material. *In* Summary of legislative activities and accomplishments of the Committee on Public Works, United States Senate. 92d Cong., 2nd sess., Serial No. 92-28. Washington, U.S. Government Printing Office, 1972. p. 51.

This excerpt discusses permits for dredged or fill material and the disposal of sewage sludge. The U.S. Environmental Protection Agency has three responsibilities in the landfill area and authority to act on the following: for failure to obtain a permit for disposal of dredged spoil or failure to comply with the condition thereon; determining whether or not a site to be used for the disposal of dredged spoil is acceptable when judged against the criteria established for fresh and ocean waters similar to that required under the ocean dumping section of the law; and determining that the material to be disposed of will not adversely affect municipal water supplies, shellfish beds and fishery areas, wildlife or recreation areas. The law concerning the disposal of sewage sludge contains a provision which relates to the disposal of sewage sludge from waste treatment plants. Disposition of sewage sludge in any manner which might affect the inland or coastal navigable waters is prohibited. This provision should provide adequate safeguards against immediate threats to the shorelines, beaches and fish, wildlife, and recreational resources in coastal areas.
[24121]

73-4869

Resource Recovery Act oversight. *In* Summary of legislative activities and accomplishments of the Committee on Public Works, United States Senate. 92d Cong., 2d sess., Serial No. 92-28. Washington, U.S. Government Printing Office, 1972. p. 58-59.

This excerpt discusses oversights in the Resource Recovery Act of 1970 and outlines changes in the current solid waste program which appear to be necessary if the Federal programs dealing with the solid waste management problem are to have any degree of success. These recommendations and problems follow: Federal policy must change its direction from emphasizing disposal to emphasizing recycling; sites for future land disposal of solid waste are increasingly difficult to find; Federal regulation of products to reduce the volume of solid waste before the point of disposal is necessary, especially in the area of packaging; and there is significant citizen awareness of the need to use recycled products, but not enough of these goods are available.
[24122]

73-4870

Technology for a cleaner environment; the National Society for Clean Air Spring Seminar in Manchester. *Heating and Ventilating Engineer*, 46(542):118-121, Sept. 1972.

This article outlines the papers presented at the National Society for Clean Air Seminar in Manchester, and discusses the United Kingdom's outstanding record of cooperation between Government and industry in the field of environmental cleanliness. Air and water pollution control legislation from 1830 to the present is outlined. The topics covered in some of the papers follow: destroying wastes at the source of generation instead of transmitting them elsewhere; the argument for municipal incinerators; incinerating polymers; sewage incineration; the concept of integrated design; pollution from the heating point of view; dust-producing processes; dust and gases; and furnaces and chimneys.
[24123]

MANAGEMENT

73-4871

BOND, R. G., AND C. P. STRAUB. Municipal solid waste controls. *In* Handbook of environmental control. v. 2. Solid waste. Cleveland, Ohio, CRC Press, 1973. p. 203-245.

This paper presents data, slow diagrams, and charts on municipal solid waste controls. The topics covered follow: major municipal disposal methods; waste disposal routes (flow diagram); common solid waste disposal methods and costs; solid waste flow from consumer to disposal site or recycling; disposal modes used for nonpackaging paper; costs for disposal of activated sludge; collection and landfill studies; landfill operation and maintenance costs; Des Moines solid waste collection and disposal summary; seasonal and compaction factors and unit weights for landfills; cost estimates for incineration and sanitary landfill operations; summary for incineration and sanitary landfill operations; summary of disposal costs for sewage solids; packing house waste calculations; auto salvaging industry statistics collection personnel computations; Fresno area waste management study; and cost benefit analysis of agricultural systems (graphs). (This document is retained in the SWIRS library.)
[24124]

73-4872

COUSINS, A. E. Procedure for plan distribution including the system of hearings and regional meetings. *In* Proceedings; Regionalized Solid Waste Management Conference, Newton, Massachusetts, June 1-2, 1972. University of Massachusetts at Amherst and Massachusetts Department of Community Affairs. p. 109-112.

This paper describes the planned distribution of Massachusetts' Solid Waste Study. The various State departments to which copies were delivered are listed. The bidding process for the reproduction of the study is also described. The procedures for delivery are outlined. Following the completion of the distribution, a public meeting will be held in each of the 12 Regional Planning Districts under the sponsorship of the Water Resources Commission. The purpose of the meetings will be to allow direct public participation in the development of the State's Solid Waste Management Master Plan. (This document is retained in the SWIRS library.)
[24125]

73-4873

FEIBUSCH, H. A process for planning on a regional basis. *In* Proceedings; Regionalized Solid Waste Management Conference, Newton, Massachusetts, June 1-2, 1972. University of Massachusetts at Amherst and Massachusetts Department of Community Affairs. p. 133-139.

This paper discusses solid waste management experiences in the San Francisco Bay region. It is suggested that the fragmentation and disorganiation of local government is clearly visible in the area of management of solid wastes. In the nine-county Bay area, for example, 99 cities, counties, and refuse disposal districts deal individually with 45 private companies, who in turn are regulated by at least 30 different regulatory agencies. Some basic concepts are outlined as follows: reduction at source; reuse without processing; reuse with processing; conversion; change of state; and burial. Other topics which are covered in detail include a proposed regional

plan, carrying out the Bay area plan, and a description of a 3-yr project to demonstrate the feasibility of total resource recovery concepts and using composted Bay area waste to improve agricultural use of the Delta Islands. (This document is retained in the SWIRS library.)
[24126]

73-4874

FOSTER, C. H. W. Remarks on the Governor's Solid Waste Council. *In* Proceedings; Regionalized Solid Waste Management Conference, Newton, Massachusetts, June 1-2, 1972. University of Massachusetts at Amherst and Massachusetts Department of Community Affairs. p. 90-94.
This paper reviews what Massachusetts is doing about solid wastes, and specifically the work of the Governor's Solid Waste Council. Massachusetts has been conducting a Statewide management study of solid wastes with financial assistance from the Federal Environmental Protection Agency. The Massachusetts Bureau of Solid Waste Disposal within the Department of Public Works has been searching for landfill sites capable of immediate use. The Council recommended the following four steps: that solid waste planning be removed from the province of a construction agency and transferred to one with more of an interagency character; that decisions relating to solid waste management require a substantial commitment of resources by local communities; that adequate environmental impact studies should be undertaken for every new landfill site; and that an aggressive State effort should be made to obtain Federal and regional funds for solid waste program purposes. (This document is retained in the SWIRS library.)
[24127]

73-4875

KIRBY, J. J. The Raytheon proposal for a Statewide solid waste management plan. *In* Proceedings; Regionalized Solid Waste Management Conference, Newton, Massachusetts, June 1-2, 1972. University of Massachusetts at Amherst and Massachusetts Department of Community Affairs. p. 94-108.
This paper reviews a study of the problem of solid waste in the State of Massachusetts. The study consisted of four phases which are discussed in detail: data collection; data analysis; solid waste technology; and study findings. It is concluded that 41 districts is a logical division of the State in order to grapple with the problem through optional use of technology which can grow as the problem grows; that the State at the bureau level will be able to operate, supervise, and administer if it has four units; and that this report is a basis for a State master plan. Data and organization charts are also included. (This document is retained in the SWIRS library.)
[24129]

73-4876

Les industries de l'environnement. [The environmental industries.] *Annales des Mines*, Nov. 9-22, 1972.
A survey was made of the operations of some 300 French companies engaged in the manufacturing of equipment serving air and water pollution control, noise control, waste treatment and manufacturing pollution monitoring and measuring equipment. The air pollution control equipment industry has a volume of 300 million francs of which 15 to 20 percent is exported, 2 to 3 percent spent on research. Most of these companies are foreign-owned or use foreign licences. The water pollution control industry had in 1971 a business volume of 250 million francs of which from 25 to 40 percent was for export, 2 to 5 percent for research. Both these industries have an annual growth rate of 10 to 20 percent. Noise control equipment (measuring instruments and noise control insulation) is manufactured by several companies only as a side-line. There still is no great awareness of the problem in France. The instrument industry has a volume of business of some 200 million francs realized by 13 companies which seem up-to-date technically but suffer from the narrowness of the French market. The waste treatment equipment industry (incinerators, crushers, garbage cans etc.) has a volume of business of 200 million francs, the reclaiming industry (metal scrap, old paper, glass, textiles) is sizeable and has a volume of business exceeding 5 billion francs. Conclusions and recommendations arrived at from the sur-

vey calling for governmental measures that would benefit the industries surveyed are outlined. (Text in French)
[24128]

73-4877

MAYBANK, J.-C. Ressources et collecte. 3. Industrie des vieux papiers en Grande-Bretagne. [Resources and collection. Part 3: Waste paper industry in Great Britain.] *Revue A.T.I.P.*, 26(5):393-396, 1972.

The waste paper sorting and conditioning industry in Great Britain in general, and the British Waste Paper Association in particular, are presented. The British Waste Paper Association embraces some 140 to 150 associate members the majority of which are partially or completely affiliated with paper mills. Very strong, stable links between paper mills and waste paper suppliers have been established. The waste paper market volume in Great Britain lies at over 1,900,000 tons yearly. Brutal oscillations in waste paper and cardboard prices have been eliminated by appropriate price setting policies. While both the British pulp and paper industry and the waste paper supplier are experiencing severe difficulties, which is primarily due to the invasion of the British market by cheap pulp and paper from Scandinavia, the outlook for future recovery and rebound is bright. (Text in French)
[24130]

73-4878

OPPERMANN, H. Die stadtreiningung Hamburg. [City cleansing in Hamburg.] *Staedtehygiene*, (4):78-84, 1973.

The total annual refuse quantity at Hamburg rose from 0.76 million cu m in 1949 to 4.68 million cu m in 1972 and is expected to amount to about 8 million cu m in 1980. Once a week the usual refuse bins of 110 liter volume are emptied by about 500 collection vehicles. Since 1962 there is a regular service to remove bulky refuse once a month. Residential, bulky and industrial refuse are removed on a sanitary landfill of 45 hectares where the bulky refuse is compacted and shredded by means of two compactors. The greater part of the refuse in Hamburg is removed in the incineration plant Stellinger Moor. The refuse is emptied into a bin of 7,000 cu m and from there fed onto the reversed feed grates having a throughput of 2 times 19.5 tons per hr at a heating value of 2,000 kcal per kg. The slag is fed onto conveyors which pass under a magnet to separate the iron parts from the slag. The final volume of the slag is only 10 percent of that of the original refuse. Cleaning of the sidewalks is performed by hand once a week. The street cleaning is effected by means of 60 sweeping machines. (Text in German)
[24131]

73-4879

SENF, H. Generalplan Abfallbeseitugung Baden-Wuerttemburg. [Basic plan for refuse disposal at Baden-Wuerttemburg.] *Muell und Abfall*, 5(3):85-93, Mar. 1973.

Various data have been collected in Baden-Wuerttemberg in order to set up a general refuse removal plan. A detailed survey has been made of areas which will not be suitable places for sanitary landfills. A second survey has found suitable places for sanitary landfills through consideration of criteria, such as type of the underground soil, surface water problems, ground water reservoirs, and effluent problems. Various other aspects of the plan give detailed information on sewage sludge, commercial refuse, and abandoned cars, stating quantity, quality, and type of treatment. Based on these detailed surveys a general plan for the removal of residential refuse has been elaborated. For refuse removal purposes 96 plants are provided of which 49 are sanitary landfills having a deposit capacity for about 100,000 inhabitants each. There are 24 composting plants with a refuse capacity for 100,000 inhabitants each. Nine transfer stations are planned for 30,000 inhabitants each. A total of nine incineration plants are provided for, each burning the refuse of 200,000 inhabitants. (Text in German)
[24132]

73-4880

SHANLEY, R. A. Local political systems in relation to regionalization. *In* Proceedings; Regionalized Solid Waste Management Conference, Newton, Massachusetts, June 1-2, 1972. Univer-

sity of Massachusetts at Amherst and Massachusetts Department of Community Affairs. p. 73-79.
This paper outlines some of the methods used by political scientists to shed more light on local political systems and regionalization in the solid waste management area. The Federal Government's legislative and fiscal commitment in this field is also discussed. It is proposed that the States have not provided adequate leadership in fulfilling their responsibilities in this area and therefore little progress had been made in terms of regionalization of solid waste management programs. The main area covered in this paper include the following: political science studies of regionalization and metropolitan problems; an analysis of the politics of solid wastes management and regionalization; and an analysis of those community factors which appear to be associated with community acceptance or nonacceptance of existing regional programs in solid waste management. It is concluded that political scientists might also be of research assistance through the examination of community leader attitudes in the solid waste management area. (This document is retained in the SWIRS library.)
[24133]

73-4881

WHITING, P.-L. Resources et collecte. 4. Structure, organisation et circulation de l'information au sein de l'industrie des vieux papiers au Royaume Uni. [Resources and collection. Part 4: Structure and organization of, and communications within, the waste paper recycling industry in Great Britain.] *Revue A.T.I.P.*, 26(5):397-402, 1972.
Structure, organization of, and communications within the waste paper supply and recycling industry in Great Britain are described. The bulk of the waste paper, amounting to some 1,200,000 to 1,300,000 tons yearly, is supplied by specialized companies which handle both collection and sorting of different sorts of waste paper and board. Another part of the waste paper recycled comes directly from paper and cardboard processing plants. Local authorities supply sorted newsprint and mixed paper and cardboard. Some 70 percent of the recycled volume is processed by affiliates and companies of paper and cardboard mills. Statistical data processing and communication, conferences, detection of overproduction and of shortages, as well as importation and new source reports help establish operative contacts between suppliers and processing plants, and maintain stability in the waste paper market with stable, reasonable price setting. (Text in French)
[24134]

OCEAN DISPOSAL

73-4882

BOND, R. G., AND C. P. STRAUB. Marine disposal and water tipping. *In* Handbook of environmental control. v. 2. Solid Waste. Clevelend, Ohio, CRC Press, 1973. p. 525-536.
This paper presents maps and data on U.S. marine disposal and water tipping of solid wastes. The topics covered follow: marine waste disposal tonnages; total U.S. sea disposal of radioactive wastes, 1946 through 1967; summary of wastes barged to sea; Atlantic coast disposal areas and artificial reefs; Gulf of Mexico disposal areas and artificial reefs; Pacific coast disposal areas and artificial reefs; estimated polluted dredge spoils; major industrial wastes barged to sea; marine disposal of industrial wastes from coastal cities; costs for marine disposal of wastes in U.S. coastal waters; summary of environmental studies on industrial waste discharged at sea; and field observations and conclusions on industrial wastes discharged at sea. Detailed source material is provided for the data presented. (This document is retained in the SWIRS library.)
[24135]

73-4883

CARPENTER, E. J., S. J. ANDERSON, G. R. HARVEY, H. P. MIKLAS, AND B. B. PECK. Polystyrene spherules in coastal waters. *Science*, 178(4,062):749-750, Nov. 17, 1972.
This article describes the polystyrene spherules which are abundant in the coastal waters of southern New England. Two types are present, a clear form and a white, opaque form with pigmentation resulting from a diene rubber. They

have bacteria on their surface and contain polychlorinated biphenyls, absorbed from the seawater. The opaque spherules are consumed by eight species of fish out of 14 species examined. Ingestion of the plastic may lead to intestinal blockage in smaller fish. Data are presented on the concentration of plastic spherules in coastal waters.
[24136]

73-4884

COLE, H. A. Implications of disposal of wastes to the North Sea. *Chemistry and Industry*, (4):162-165, Feb. 17, 1973.
Waste put into the sea may effect living resources in a variety of ways. The direct effects of wastes on living resources are grouped into four subheads: killing of fish or shellfish at any stage in their life cycle; interference with biological processes; contamination with persistent toxic substances so that fish and shellfish become unsafe to eat; and tainting, so that fish and shellfish are temporarily unsaleable. Indirect effects, however, can alter the environment (the sea water or the sea bed) so that its capacity to support fish, shellfish, or the other components of the ecosystem, such as the plankton or bottom animals, upon which the shellfish and fish depend for food is impaired or changed. In the sea, dilution of wastes is very rapid so that the levels which are directly toxic to fish are found only in the immediate vicinity of the point of discharge and usually persist for only a short time. Despite the fact that the North Sea is surrounded by densely populated, heavily industrialized countries and receives vast amounts of wastes in almost infinite variety, statistics show that production of staple varieties of fish such as cod, haddock, and plaice has reached record levels in recent years. This means that adverse pollution effects are masked by other beneficial influences, such as climatic change. Nevertheless substances such as mercury and cadmium are undesirable in any measures and steps to minimize thier discharge are fully justified. In the future there is no reason why man should not use the great capacity of the seas to receive wastes and to render them harmless. This must be done on the basis of the limitations of the sea's capacity. The knowledge on which sound judgments can be based is steadily becoming more available. A table and illustrations are included in the article.
[24137]

73-4885

GUSTAFSON, J. F. Beneficial effects of dredging turbidity. *World Dredging and Marine Construction*, 8(13):44-45, 47-48, 50-52, Dec. 1972.
This paper describes the beneficial roles of clay particles. Also discussed are State and national regulatory provisions intended to reduce man-caused turbidity, the natural role of fine sediments in fresh water and marine environments, and the beneficial roles of clays and their chemical composition. The concentration of toxic substances in bay sediments and data on the toxicity levels of some metals are presented in tables. Clam experiments and turbidity in dumping are also described.
[24138]

73-4886

NAIR, S. A., U. P. DEVASSY, S. N. DWIVEDI, AND R. A. SELVAKUMA. Preliminary observations on tar-like material observed on some beaches. *Current Science*, 41(21):766-767, Nov. 1972.
This paper discusses the deposition of tar-like lumps on the beaches of the central west coast of India in the Environs of Goa. This occurred during the onset of the southwest monsoon, in association with various marine organisms. Algae formed the primary film for settlement and growth of stalked barnacles. It seems that these lumps must have existed in the open sea for a period long enought to allow settlement and growth of the organisms. It is possible that the occurrence of these lumps is due to the impact of coastal waters on the coast during the monsoon season. Further investigations to find out the nature, origin, and extent of this pollutant are in progress.
[24139]

73-4887

Ocean dumping of trash and debris poses many snags. *Solid Wastes Management/Refuse Removal Journal*, 15(5):25, 112, 146, May 1973.

A survey on the use of the ocean as a waste receptacle casts doubt on large-scale disposal of baled urban refuse at sea because of its possible effects on marine environment. More research is needed before this method of recycling waste materials should be considered for USP on a large scale. While solid wastes may be used as building material in artificial islands, surfing reefs, and floating breakwaters, the cost of sea disposal may range from $0.20 per ton for dredge spoil to $600 per ton for miscellaneous wastes, and from $0.80 to $1.20 a ton for sewage sludge. Industrial wastes cost varies from $0.60 a ton for bulk shipments to $130 per ton for containerized refuse. In 1968, 2 million tons of wastes were disposed of in the ocean at an estimated cost of $37 million, mostly spoils from the U.S. Army Corps of Engineers harbor-dredging operations. It is predicted that disposal of wastes within the U.S. coastal cities over the next 10 years will increase materially or be stopped entirely. This will be due to increasingly strict water and air pollution laws, the loss of areas now used for sanitary landfills, the ponding of liquid wastes, and the anticipated growth in industry and population in a decade. Dredge spoil, industrial wastes, sewage sludge, refuse, radioactive wastes, construction and demolition debris, military explosives, and chemical wastes are the types of waste dumped into the ocean. Highly toxic and chemical wastes are dumped at least 300 miles from shore. Industrial and urban refuse dumping sites are from 15 to 100 miles of the coast in depths less than 100 ft, and most if not all radioactive wastes and explosive disposal areas are at 6,000 ft or more. There are charts listing the number of marine disposal areas and the total U.S. sea disposal of radioactive wastes (1946 to 1967). A summary of environmental studies on industrial wastes discharged at sea is given.
[24140]

73-4888

Shipboard waste treatment systems. *Shipbuilding and Marine Engineering International*, 95(1,159):605-606, Oct. 1972.
Two Danish shipping companies, Concord Line and J. Lauritzen, will be the first to install a new complete system for treatment of fluid and solid waste on board ship. The system's manufacturer is A/S Atlas of Copenhagen. The system comprises two main components0 a unit for mechanical and chemical treatment of all waste water on board and an incineration unit for burning oil sludge, sewage from the waste water unit, and oily water from the oily water separator. Retained sludge and solids are pneumatically transported into tanks. The two basic systems are described in detail in the text, photographs, and by use of a flow chart.
[24141]

PACKAGING WASTES

73-4889

BOND, R. G., AND C. P. STRAUB. Packaging wastes. *In* Handbook of environmental control. v. 2. Solid waste. Clevelend, Ohio, CRC Press, 1973. p. 66-77.
This paper discusses packaging wastes. Information is provided on how packaging relates to aspects of solid wastes problems, such as collection, processing, littering, and pollution. Extensive data are also provided on the following: use of packaging materials contributes to increase refuse; consumption of packaging materials; distribution of packaging output, 1958-1963; polyethylene film consumed in packaging, 1961-1966; consumption of film in packaging, 1966-1976; films consumed in packaging by type; consumption of wood in packaging; shipments of wooden containers, 1958-1976; shipments of glass containers, 1940-1971; distribution of corrugated and solid fiber shipping containers, 1958-1966; consumption of aerosol containers, 1958-1966; comsumption of beverage containers; consumption of nonpackaging paper and paperboard, 1966; summary of nonpackaging paper consumption, solid waste, and recycling; nonpackaging paper entering the solid waste stream. Detailed source material is provided for the data given. (This document is retained in the SWIRS library.)
[24142]

73-4890

Les plastiques l'emballage et l'environnement. [Plastic materials, packagings, and the environ-

ment.] *Revue Generale des Caoutchoucs et Plastiwues*, 49(11):1002,1003, Nov. 1972.
Figures on the plastic material production of France and problems involved in the disposal of plastic wastes are surveyed. Some 24 percent of the plastic materials manufactured in France in 1969 were used for packaging, and this percentage is expected to rise to 33 percent of the 1974 production of 2,500,000 tons. The total amount of packaging materials is expected to rise from 5,420,000 tons in 1970 to 7,470,000 tons in 1975. The respective shares of plastic materials, cardboard plus paper, as well as of glass will increase from 195,000 tons to 548,700 tons, and the polyvinyl chloride consumption from 53,900 tons to 179,400 tons. The increase in the share of polystyrenes will be from 44,900 tons to 108,500 tons. In 1972, the total amount of municipal waste in France was estimated at 11,400,000 tons, of which 4 percent were plastic packaging wastes. In 1971, when the total amount of plastic waste amounted to 470,000 tons, the respective shares of polyvinyl chloride polyethylene, polystyrene and polypropylene were 90,000 tons, 270,000 tons, 60,000 tons, and 15,000 tons. Incineration in a temperature range of 800 to 1,000 C leads to complete destruction of plastic materials to water and carbon dioxide, with polyvinyl chloride as the only plastic material to produce hydrochloric acid emissions, accounting for 55 to 60 percent of the total hydrogen chloride emission from incinerators. Wastes with up to 6 percent of polyvinyl chloride can be incinerated safely, without producing considerable environmental hazards Plastic wastes do not interfere with the composting process, and also can be effectively separated from the waste intended for composting. On sanitary landfills, the presence of plastic materials appears to intensify the anaerobic decomposition process. Studies on the photodegradation and biodegradation of plastic materials are being conducted. Recovery of plastic materials may become the most desirable approaches to the plastic waste problem. (Text in French)
[24144]

73-4891

NISHI, Y. Hikari bunkai-zai, hari kurakku esu-I. Photo dissociating agent, Haricrack S-I.] *Harima Gijutsu Nyusu*, 1(1):14-17, Nov. 1972.
As a means of solving the social problem resulting from the plastic waste products, the Haricrack S-I, a photodissociating agent, was developed which is primarily intended for use on polyolefins. It is a photo-sensitizer which causes a photo-excitation action in the plastic molecules and can be added to plastics in any proportion, permitting control of the time of disintegration of the product in a certain range. The composition is an organometallic compound (a benzophenone derivative) which is soluble in many organic solvents. And in view of the molecular structure of the Haricrack S-I, the loss of the additive due to dissolving out or sublimation during processing of plastic, and even after finished is impossible because it has a great relative solubility in and a great affinity to plastic resins. Using the Haricrack S-I and two other sensitizers, films of polypropylene were made to check its effectiveness on the tensile strength after outdoor exposure test and the breaking strength after a weatherometer exposure test. The tests showed that the variation of the tensile strength at 30 days of outdoor exposure was very small compared to the other, and for the breaking strength, excellent effects resulted. (Text in Japanese)
[24143]

PROCESSING / REDUCTION

73-4892

Aspects techniques. II. Discussion. [Technical aspects. Part 2: Discussion.] *Revue A.T.I.P.*, 26(5):375-382, 1972.
Various technical aspects of the processing of waste paper are discussed. Beloit-model pulper and In-line Shark have perforations with a 6 mm diameter, and discharge plastic contaminants through an orifice opposite to the rotor due to the powerful vortex generated before they can reach the agitator. A Herisson type needle classifier, developed by Novipro, uses long needles mounted on moving, endless belts for the removal of the finest elements from fiber suspensions. The minimum profitable capacity of two different types of Voith hot triturators with nominal capacities of 120 and 200 tons per day are 40 and 70 tons per day, respectively. The cor-

responding figure for Reed-Black-Clawson deinking units lies at 30-40 tons per day. Satisfactory dispersion of coating materials can be achieved by the application of a temperature of 95 C under atmospheric pressure and with mechanical force, or by treatment at 130-140 C. Waxes and hot-melts do not require temperature above 95 C for their dispersion. Reprecipitation of once dispersed resins and tars at reduced temperature can be prevented by the addition of polyelectrolytes. (Text in French)
[24145]

73-4893

CARRIER, B. Aspects techniques. 2. Procede de dispersion Escher Wyss. [Technical aspects. Part 2: Escher Wyss dispersion process.] *Revue A.T.I.P.*, 26(5):311-313, 1972.
Disperser for processing tarred, inked, and dampproof paper and cardboard wastes is described. Following disintegration, the waste paper is indirectly heated with steam to 95 to 98 C, and fed into a disperser composed of a rotor and a stator. The softened tar is easily dispersed between the stator and rotor of the disperser without the use of excess pressure. The specific electricity consumption lies between 63 and 150 kw per hr per ton of pulp, depending on the sort of waste paper being processed. (Text in French)
[24146]

73-4894

LAMORT, P. Aspects techniques. 7. Utilisation du Centrifiner pour le taitement des vieux papiers. [Technical aspects. Part 7: The use of the Centrifiner for the processing of waste papers.] *Revue A.T.I.P.*, 26(5):353-357, 1972.
Uses of the Centrifiner, a combined precleaning and dispersing unit, in the processing of waste papers, are described. A processing line may be composed of pulper, a cleaner for thick pulp, and a Centrifiner. With a continuously operating pulper, capable of delivering a pulp with a maximum concentration of 3 percent, which is the minimum density suitable for the Centrifiner, a thickener between pulper and the first vat is necessary. Due to its high dispersing power for bitummen, tar, wax, plastics, and other coatings, and to its excellent classifying effect, the Centrifiner is best suited for use in combination with a hot triturator. In such combinations, the Centrifiner can be placed between pulper and triturator, and preferably after the latter. (Text in French)
[24147]

73-4895

LE MENESTREL, B. Aspects techniques. 10. Utilisation des vieux papiers dans l'impression-decriture et l'emballage. [Technical aspects. Part 10: Use of waste paper for printing and packaging purposes.0 *Revue A.T.I.P.*, 26(5):373-374, 1972.
General problems in the recycling of waste paper are described. Deinking and coating dispersion have been satisfactorily solved, while purification, especially from scotches, remains a problem. Cleaners with minute slots accepting dilute pulp, represent the only available means for the partial removal of scotches from pulp. Increased soiling and greasing of dryer and fractionator felts, frequent occurrence of products of improper quality, and sophisticated manual work constitute problems yet to be solved in the waste paper recycling area. (Text in French)
[24148]

73-4896

MORICET, H. Aspects techniques. 8. Elimination des plastiques et des 'scotches.' [Technical aspects. Part 8: Elimination of plastics and 'scotches'.] *Revue A.T.I.P.*, 26(5):359-365, 1972.
Problems and possibilities for the removal of plastic materials from waste paper pulps are discussed. Plastic materials, with specific weights close to that of fibers, cannot be efficiently separated from the pulp in pulpers, which calls for sophisticated extraction and purification techniques. Pulps with high plastic contents should be purified at reduced concentrations (2.5 percent before and 1 percent after the pulper), which requires the use of a thickener, since dispersers operate best in a concentration range of 3 to 5 percent. The plastic materials should pass through the pulper in as short time as possible before being mechanically macerated. The pulper should have holes of appriate diameter, e.g., 3mm, to minimize the entrainment of plastic

contaminants. Following dilution, the mixture should be classed so as to obtain a pulp suitable for further processing in a thickener, and another fraction containing plastic and other contaminants. Available classifiers usually are applicable to 1 percent pulp concentrations, especially needed for plastic-contaminated pulps. A 'flot-purge' installation is especially suitable for rapid removal of nonfibrous, light-weight contaminants such as plastic materials.
[24149]

73-4897

Muell und Abfallabfuhrkosten koennen gesenkt werden. [Costs for refuse transportation can be reduced.] *Wasser Luft und Betrieb*, 17(4):133, 1973.
The utilization of compaction devices helps to save up to 90 percent of the transportation costs for refuse. The compaction device consists of a machine part and a compression container. The machine is stationary while the container can be lifted and transported by special trucks. Cartons, paper, textiles, wood, refuse, and even bulky wastes are compressed in a ratio between 1 to 7 and 1 to 15. According to the size of the compressing device the working pressure is 10 to 75 tons per sq m. (Text in German)
[24150]

73-4898

Presst und verpackt Abfall. [Pressing and packing of refuse.] *Verpackungs-Rundschau*, 24(4):376, 1973.
An electro-mechanical refuse packing press has been developed. With a pressure of 5,000 kilopounds it compresses refuse in a chamber measuring 700 by 500 by 1900 millimeters, thus reducing its original volume by 80 percent. The contents of three 100 liter refuse bins are compressed to a parcel and automatically pushed into a plastic bag. The refuse packing press is especially recommended for hotels and cafeterias which have to dispose of refuse like paper, glass, tins, or plastic waste. (Text in German)
[24151]

73-4899

RAOUX, M. Aspects techniques. 9. Utilisation des vieux papiers dan l'industrie papetiere. [Technical aspects. Part 9: Utilization of waste paper in the paper-making industry.] *Revue A.T.I.P.*, 26(5):367-371, 1972.
Processes for the recycling of newsprint and cardboard are described. Newsprints are sent through a continuously operating breaker, a washer, a discontinuously operating pulper, a disperser, a sand remover operating at 1 percent concentration, and a series of three washers before being delivered to a paper-making machine. Deinking is done in the pulper at a concentration of 5 percent by the addition of chemicals such as Antharox OC 610 (Sacli), Remcopal 6110, or an American product by Monsanto. Deinking is followed by bleaching by means of 0.5-0.8 percent solution of hydrogen peroxide. In another process, cardboard waste is pulped in a continuously operating pulper, and the resulting pulp is passed through a sand remover, thickeners, and centrifiner for purification and coating dispersion before being combined with semichemical pulp for cardboard production. (Text in French)
[24152]

73-4900

RYRBERG, G. Aspects techniques. 1. Le systeme Defibrator de traitement des vieux papiers. [Technical aspects. Part 1: The Defibrator system for the processing of used paper.] *Revue A.T.I.P.*, 26(5):307-309, 1972.
A process elaborated by the American Defibrator Inc. for the processing of asphalt- and wax-coated waste paper is described. Mixed waste paper is defibrated in a hydropulper, and the pulp obtained is purified in a hydrocyclone, and with a concentration of 10 percent, it is thickened in a classical thickener before it is concentrated to 30 percent in a Davenport press. The concentrated pulp is then continually fed by feed screws into an Asplund Defibrator where the asphalt and wax coating is softened and fused at a temperature of 150 C and under 4 kg per sq cm pressure in a short time. The softened asphalt and wax is then easily dispersed between the discs of the Asplund refiner. The capacity of the Defibrator ranges from 50 to 300 tons of dry

pulp per day. The specific steam and electricity consumption lies at 800 kg and 50 kw-hr per ton. (Text in French)
[24153]

73-4901

SCHAAN, J. L. Aspects techniques. 3. Elimination des plastiques, dispersion des goudrons, cires et hot-melts. [Technical aspects. Part 3: Elimination of plastics, dispersion of tar, wax, and hot-melts.] *Revue A.T.I.P.*, 26(5):315-325, 1972.

Equipment for the processing of various sorts of waste papers, including removal of plastic, tar, wax and hot-melt coatings, and of printing ink, are described. The Inline Shark equipment, generating a vortex in the cylindrical vat by means of its rotor, is suitable for the separation from the pulp of plastic residues with specific gravities lower than that of the pulp, while heavier particles are removed from the cylindrical wall zone separately. The Barracuda disintegrator, designed for paper wastes hard to disintegrate, such as for dampproof sorts, has toothed disintegrating blades, and provides continuous operation. The Hi-Lo deinking equipment, designed for the discontinuous deinking of printed wastes, has cycle times of 45 to 60 minutes and uses different chemicals for the destruction of the printing ink, for the saponification of oils by soda, sodium silicate of sodium peroxide, for the humidification of pigments, and for the separation of ink from the fibers. The processing of tar-, wax-, and hot-melt-coated waste papers requres high-temperature dispersion systems operating under pressure. For example, a 75 tons per day capacity piece of equipment with 300 hp has a specific steam consumption of 1.85 tons per hr under a pressure of 4.2 kg per sq m and at a temperature of 153 C. (Text in French)
[24154]

73-4902

WILSON, C. M., AND P. CHAUSSEE. Aspects techniques. 5. Desencrage de journaux et magazines par le systeme Reed/Black Clawson. [Technical aspects. Part 5: Deinking newsprint by the Reed/Black Clawson system.] *Revue A.T.I.P.*, 26(5):331-336, 1972.

The Reed-Black-Clawson deinking system installed in Aylesford for the processing of newsprint waste is described. Newsprint is continuously disintegrated and triturated in a Hydropulper equipped with classical accessories such as Ragger and Junk Remover. Detergents, alkali, and bleaching solutions are dosaged continuously. The pulp extracted from the Hydropulper is diluted to about 1 percent for purification in Liquid Cyclones and Selectifiers which remove heavy particles including fine sand and all non-fibrous contaminants larger than 2 mm. The pulp is then thickened to 5 percent for washing in a Fractionater, after which it passes through Bauer type centricleaners. Following final concentration, the recovered pulp is sent to the feeding tank for being mixed with primary pulp. The plant produces 90 tons of pulp daily at a power consumption of 1, 200 hp. The deinked pulp makes up 40 to 60 percent of the newsprint. (Text in French)
[24155]

RECYCLING

73-4903

A sludge recovery system for use in pigmented paper production. *Paper Trade Journal*, 156(29):44-46, July 10, 1972.

This article outlines 10 years of research which have resulted in a technically feasible process for production of a paper filler from effluent sludge. The study concluded the following: gritty materials, such as sand, can be separated from primary treatment sludge through the use of Bauer-type Centricleaners; sludge can be dewatered through the use of a rotary drum vacuum filter; reuse of the reclaimed pigment as a wet end filler is technically feasible; and because of the high capital cost involved in the recovery of this pigment, it is not economically feasible to use this recovery process at this time.
[24266]

73-4904

ADAMS, L. M., J. P. CAPP, AND D. W. GILLMORE. Coal mine spoil and refuse bank reclamation with powerplant fly ash. *Journal of Waste Recycling*, 13(6):20-26, Nov./Dec. 1972.

This article discusses the experimental reclamation of coal mine refuse piles and strip spoil banks with fly ash from bituminous coal-fired power plants. Conventional farm equipment was used at some of the sites. Large earthmovers were required at others. The fly ash served as a neutralizing agent, diluent, and soil amendment, providing some nutrients that encouraged vegetation of the barren areas while disposing of significant quantities of the power plant waste. The estimated cost of reclamation by this method is $300 per acre of previously leveled area. Reclamation of strip soil and coal mine refuse with fly ash thus appears to be technically feasible and economically possible.
[24156]

73-4905

AFFHOLDER, M. Ressources et collecte. 1. Recuperation des fibres et protection de l'environnement. [Resources and collection. Part 1. Recovery of fibrous material, and environmental protection.] *Revue A.T.I.P.*, 26(5):383-387,1972.
General problems of the collection and recovery of waste paper as a source of pulp for paper making are reviewed. Waste paper pulp accounted for 21.8 percent of the total pulp production in industrialized countries in 1968. For Europe, the corresponding figure for 1968 lies at 26 percent, and is even higher in such countries as England and West Germany. Intensification of waste paper collection, and hence, increased rate of waste paper recycling in European countires, has been evidenced. The rate of fiber recovery in France lies at 27 percent, and shows signs of further increase. Waste paper recycling represents a valuable means of preventing both deforestation (each ton of waste paper recycled saves 0.4 hectares of forest) and environmental pollution due to such wastes, and to the elimination of an amount of pollutants that would be generated by the production of an equivalent quantity of primary wood pulp. Expensiveness of collection and sorting, presence of contaminants in waste paper, the need for substantial storage capacities, and fluctuations in the waste paper market constitute, however, serious hindrances in the scale-up of waste paper recycling, which can be remedied or alleviated appropriate economic, legislative, psychological, and technical measures. (Text in French)
[24157]

73-4906

AMAX Fly Ash Corporation reduces pollution. *Secondary Raw Materials*, 10(8):127, Aug. 1972.
Fly ash, a residue produced by the burning of finely pulverized coal in large power plants, has long been considered an undesirable waste product. Modern power plants collect fly ash by means of mechanical or electrostatic precipitators just before the exhaust gasses are forced up the chimneys for dissipation into the upper air. Once collected in this fashion, fly ash must then be disposed of, frequently by landfill processes, requiring reserve acreage over the life of a large generating plant. AMAX Fly Ash has determined that the use of fly ash as a cement extender in ready mix concrete and concrete block produces a stronger, more durable and impermeable concrete product. AMAX now plans to ship approximately 100,000 tons of fly ash to the construction industry, significantly reducing a major solid waste disposal problem.
[24158]

73-4907

ARMCO begins construction of solid waste recycling center. *Journal of Metals*, 24(11):16, Nov. 1972.
A solid waste recycling center is being constructed at Armco Steel Corp.'s Middletown (Ohio) Works. The sophisticated facility has a three stage air quality control system and will have the capacity to convert more than 800,000 tons of steelmaking waste into reusable product annually. The plant represents a total investment of $20 million, and is being built in cooperation with the Ohio Water Development Authority. The recycling center will be located on an 8.6 acre site next to the Number 3 blast furnace at Middletown, and materials will be brought from other steelmaking locations by rail or truck. Completion is scheduled for late 1974.
[24159]

73-4908

ARNAUD, J. Aspects economiques. 3. Fibres de recuperation ressource a part entiere. [Economic Aspects. 3. Reclaimed cellulose fibers: a completely separate resource.] *Revue A.T.I.P.*, 26(5):299-300, 1972.

The used paper market has traditionally been archaic, but the importance of this resource is considerable if for no other reason than because in France used paper represents fully 33 percent of the total requirement in cellulose. In other countries the figure is even higher. Increasing attention is being paid this commodity which is reflected in increased research, in the establishment of a special commission by the French Paper Producers Federation, and in the establishment of work groups dealing with the problem of paper reclamation at different governmental levels. This resource may yet be the life saver of certain specialized paper and cardboard manufacturing sectors. Waste paper is viewed as a resource by the paper industry but as a waste material by municipalities whose job it is to dispose of refuse. It is necessary that a single solution be found that would meet the requirements of both sectors. (Text in French)
[24160]

73-4909

ARTHUR D. LITTLE, INC. Additives. *In* Incentives for recycling and reuse of plastics. Washington, Environmental Protection Agency, 1972. p. I(19-29).

This paper discusses the processs of incorporating additives into a polymer, which is called compounding. By approximate compounding polymers can be made resistant to oxidation, the effects of ultraviolet radiation, and environmental degradation in general. Other additives are used to modify a molding compound to provide melt viscosity control, improve process lubrication, assist the mold release of a finished part, prevent slip or adhesion of plastic film, or improve the properties of a filled of reinforced molding compound. The additives discussed in detail follow: antioxidants; antistatic agents; colorants; fillers; fibers; flame retardants; lubricants; plasticizers; stabilizers; and ultraviolet stabilizers. Extensive data are provided. (This document is retained in the SWIRS library.)
[24161]

73-4910

ARTHUR D. LITTLE, INC. Alternative methods of paying social costs. *In* Incentives for recycling and reuse of plastics. Washington, Environmental Protection Agency, 1972. p. V(8-35).

Two alternative ways of reducing the environmental damage caused by the disposal of nuisance plastics are discussed: to decrease the volume of nuisance plastics in the disposal stream; or to change the composition of plastic materials in the disposal stream by increasing the proportion of easily disposable plastic products and decreasing the percentage of those that are more difficult to dispose of. The following ways of achieving these ends are outlined: regulation versus taxation; strategies that require legislation versus those that do not; tax on virgin materials, taxes on nonrecycled products, rebatable taxes; improvement of solid waste management practices; incentive programs for the reprocessor; and the direct purchase of scrap by the government. (This document is retained in the SWIRS library.)
[24162]

73-4911

ARTHUR D. LITTLE, INC. Applications for scrap and nuisance plastics. *In* Incentives for recycling and reuse of plastics. Washington, Environmental Protection Agency, 1972. p. IV(1-16).

This paper describes and recommends some applications for scrap and nuisance plastics. The promotion of markets for the scrap material is essential and if reuse is not possible, then recycling should be promoted. The topics which are discussed in detail include: reuse; primary recycling; secondary recycling (equipment, recycling of monoplastics, composites, multiplastics, and the construction market); tertiary recycling (pyrolysis and other conversions); and the present state of the art. The following data are also included: a comparison of properties of injection moldings from virgin and waste high-density polyethylene; and the physical properties of actual plastic scrap with increasing levels of chlorinated polyethylene (compression molded

samples). (This document is retained in the SWIRS library.)
[24163]

73-4912

ARTHUR D. LITTLE, INC. General properties of plastics. *In* Incentives for recycling and reuse of plastics. Washington, Environmental Protection Agency, 1972. p. I(11-18).
This paper reviews the important properties of plastic compositions related to their end-use application and introduces some of the properties that make plastics useful. The properties which are discussed in detail include: appearance; hardness; density; mechanical properties (tensile strength, elongation, compressive strength, flexural and fatigue strength, impact resistance, creep, and dimensional stability); thermal properties (conductivity, specific heat, heat-distortion temperature, heat resistance, flammability, and coefficients of expansion); electrical properties; chemical resistance; and flow properties. Data are provided on the effect of temperature on polymers (graph) and the comparative heat resistance of plastic materials. (This document is retained in the SWIRS library.)
[24169]

73-4913

ARTHUR D. LITTLE, INC. Incentives for recycling and reuse of plastics. Washington, Environmental Protection Agency, 1972. 308 p.
The technical, socioeconomic, and legal aspects of the recycling and reuse of plastics are discussed in this document. The following topics are discussed in detail: the technology of plastics and the structure of polymers; general properties of plastics; additives; selected polymers; processing; the economics of the plastic industry--growth, price trends, and markets; major thermoplastic resins; the resin producer; the compounder; the reprocessor/compounder; the fabricator; the converter; the manufacturer/packager; the wholesaler/retailer; the consumer; the disposer; scrap and nuisance plastics0 isolation, applications, and markets; and tactics and strategies for recycling plastics0 legislation, taxation, and educational, research, and information programs. A glossary of special terms, extensive data in the form of 59 tables, and 38 figures are included. (This document is retained in the SWIRS library.)
[24170]

73-4914

ARTHUR D. LITTLE, INC. Industry economics. *In* Incentives for recycling and reuse of plastics. Washington, Environmental Protection Agency, 1972. p. II(23-42).
Plastic industry economics are discussed in terms of monomers, resins, plastic products, and major companies which are producing resins and fabricating plastic products. Extensive market, cost, and profit data are provided. It is concluded that over the next 5-year period the new fixed capital expenditures required for resin manufacture alone will approximate $2 billion and possibly another $4 billion will be needed for related petrochemical raw materials, monomers, and fabrication facilities. (This document is retained in the SWIRS library.)
[24171]

73-4915

ARTHUR D. LITTLE, INC. Major thermoplastic resins. *In* Incentives for recycling and reuse of plastics. Washington, Environmental Protection AGgency, 1972. p. II(15-22).
Over 24 different chemical types of resin are commercially important; however, this paper limits itself to a discussion of four major families of thermoplastic resin--polyethylene, styrene plastics, polyvinyl chloride, and polypropylene. Polyethylene is mainly used for packaging; styrene plastics for packaging, toys, housewares, appliances, automotive parts, pipe, telephones, and luggage; polyvinyl chloride for building and construction, automotive and other transportation equipment, and packaging; and polypropylene for molded products, thermoplastics, textile fibers, monofilaments, and packaging. Extensive data are also included. (This document is retained in the SWIRS library.)
[24172]

73-4916

ARTHUR D. LITTLE, INC. Processing. *In* Incentives for recyling and reuse of plastics. Washington, Environmental Protection Agency, 1972. p. I(50-100).

This paper discusses the transforming of a polymer or compound into a useful plastic item. This processing is divided into three types of activities: compounding0 mixing the polymer with additives or colorants; fabricating0 transforming the resulting compound or uncompounded polymer to a finished or semifinished plastic, such as film; and converting-modifying a fabricated plastic product by decorating, cutting, or sealing it. Each of these activities is described in detail along with reprocessing0 converting scrap plastic into a useful material. The following data and illustrations are included: reciprocating screw injection molding machine; single screw vented extruder; blown film processes; film and sheet chill casting; extrusion coating; extrusion blow molding; injection blow molding; rotational molding; compression molding; transfer molding; calendering; thermoforming; high-pressure laminating; and knife coating. (This document is retained in the SWIRS library.)

[24174]

73-4917

ARTHUR D. LITTLE, INC. Recycling programs. *In* Incentives for recycling and reuse of plastics. Washington, Environmental Protection Agency, 1972. p. IV(16-22).

Recovery of plastic wastes from consumers must involve some form of interception of these wastes before they reach the disposal site for the following reasons: economies in recycling and reuse of certain materials may be achieved through segregated collection; where municipal facilities are only designed for a nonreclamatory type of operation, interception provides the only means for recovering materials that may have salvage values; and interception may be selectively mandated for certain materials deemed to be environmentally more damaging than others. This paper summarizes some of the details of various interception programs for plastics, aluminum, steel, and glass. (This document is retained in the SWIRS library.)

[24175]

73-4918

ARTHUR D. LITTLE, INC. Selected polymers. *In* Incentives for recycling and reuse of plastics. Washington, Environmental Protection Agency, 1972. p. I(30-49).

This paper discusses the following polymers in detail: polyethylene; polypropylene; and styrene polymers. The primary objective of this study is recycling and it is primarily concerned with thermoplastics and includes a description of the major features of each of the polymers cited in terms of raw materials, manufacuring process, structure, properties, and applications. The following data are included: plastics production in 1969; production of major thermoplastics in 1969; density of polyethylenes; the high-pressure process for low-density polyethylene (flow chart); the low-pressure processes for manufacturing high density polyethylene; polyethylene-specification requirements; polymerization of a vinyl chloride-suspension system (flow chart); and polyvinyl chloride-specification requirements. (This document is retained in the SWIRS library.)

[24176]

73-4919

ARTHUR D. LITTLE, INC. Separation at the intermediate disposal site, and at the final disposal site. *In* Incentives for recycling and reuse of plastics. Washington, Environmental Protection Agency, 1972. p. IV(22-29).

The following plastic reclamation procedures are discussed in detail: metal wire recovery systems; the separation of plastic from plastic-coated paper and paperboard; and separation equipment and processes (the specific-gravity separator, the hydropulper separation system, and Riverside Paper Corp.'s Polysolv system). The Bureau of Mines at College Park, Maryland, is developing a process which would separate plastics and yet leave the plastic-coated paper with the remainder of the wastes. Air-classification systems and the Black Clawson process are also detailed. MIT is working on the two following systems: an inverted cone vortex chamber that reduces the size of waste materials by means of cutters mounted in the walls and then

classifies them by specific gravity; and a laser beam that identifies waste materials which are then sorted automatically by selective switching. (This document is retained in the SWIRS library.)
[24177]

73-4920

ARTHUR D. LITTLE, INC. Strategies that do not require legislation. *In* Incentives for recycling and reuse of plastics. Washington, Environmental Protection Agency, 1972. p. V(36-39).
The Federal Government can institute various programs that will not require Congressional action in the area of environmental protection. These programs are discussed and come under the categories of education, information, and research. Educational programs should be directed at both the consumer and industry. In the area of information, the Federal Government together with the plastics industry should develop a clarification program so that standard grades of secondary resins will become available similar to those for the virgin products. In effect, the secondary resins would have to meet new industrial standards. There should also be an inventory of all scrap plastics sources. Another approach should be the initiation of research programs directed at developing new applications for scrap materials and new technology for collecting and disposing of scrap plastic. By specifying the use of secondary materials in their purchases, the Federal Government would not only open up a new market by its own purchases, but many would tend to follow its lead. (This document is retained in the SWIRS library.)
[24178]

73-4921

ARTHUR D. LITTLE, INC. Tactics and strategies for recycling plastics. *In* Incentives for recycling and reuse of plastics. Washington, Environmental Protection Agency, 1972. p. V(1-7).
This paper outlines the following strategies which were developed as criteria for recycling plastics: minimize environmental damage; maximize the lb-volume of troublesome nuisance plastics recycled and/or reused as a percentage of total plastics production; minimize the sum costs of achieving the first two objectives; minimize economic disruption; minimize disposal costs; and maximize the recyclability of plastics. Methods of evaluating tactics and strategies and of developing a strategy are outlined and include no recycling, a discussion of the systematic interdependencies in our ecological and economic systems, the disposal of nonrecycled plastics, and impediments to recycling (economic, political, psychological, and technical). (This document is retained in the SWIRS library.)
[24179]

73-4922

ARTHUR D. LITTLE, INC. The compounder and the reprocessor/compounder. *In* Incentives for recycling and reuse of plastics. Washington, Environmental Protection Agency, 1972. p. III(10-18).
This paper describes compounding, which is often carried out immediately after polymerization, but can be carried out by specialists who are known as compounders. Scrap plastic generated during compounding is recycled in the compounder's facilities rather than sold to an outside reprocessor, as shown in a flow diagram. Nuisance plastic generated by compounding in 1970 amounted to about 60 million lb. About 30 companies today are involved primarily in compounding. The functions of reprocessing and compounding are also discussed. The reprocessor/compounder usually uses both scrap plastic and virgin polymer or compound as raw material. One of the major impediments to recycling is the absence of major markets for the recycled plastic; therefore, the reprocessor has to develop his own markets. (This document is retained in the SWIRS library.)
[24164]

73-4923

ARTHUR D. LITTLE, INC. The converter and the manufacturer/packager. *In* Incentives for recycling and reuse of plastics. Washington, Environmental Protection Agency, 1972. p. III(24-35).
This paper discusses the roles of the converter and the manufacturer/packager in the plastics industry. The converter transforms a fabricated

item to a finished plastic product. Ways in which he disposes of scrap plastic or recycles it are outlined and illustrated in a flow diagram. The processes he performs include decorating, sealing, cutting, and thermoforming. The tasks of the manufacturer/packager are also presented in a flow diagram. Since nuisance plastic from the manufacturer/packager segment is contaminated with quantities of nonplastic refuse, scrap generated by this segment is seldom sold to a reprocessor. Three different types of distribution conducted by the manufacturer/packager are outlined0 to the wholesaler, to the retailer, and directly to the consumer. Extensive data are provided on the nuisance plastics generated by both these segments of the plastics industry. (This document is retained in the SWIRS library.)
[24165]

73-4924

ARTHUR D. LITTLE, INC. The disposer. *In* Incentives for recycling and reuse of plastics. Washington, Environmental Protection Agency, 1972. p. III(54-72).
This paper discusses the plastics disposer which can be a public agency, a private contractor, an individual housekeeper, or an industrial firm. The discussion of the disposal of plastics is divided into industrial sources and all other sources. The other topics covered in detail follow: intermediate disposal; collection; treatment processes (salvage, baling, pulverizing, shredding, milling, composting, and incineration); final disposal (sanitary landfill and behavior of plastics); and litter. The following data and graphs are included: sources of industrial nuisance plastics, 1970; industrial wastes according to plastic type; nuisance plastics in the disposal area according to product; plastics in the disposal area from all sources, according to type of plastic; a disposal flow chart; and the estimated cost of incineration using batch incineration systems, in 1969 dollars. (This document is retained in the SWIRS library.)
[24166]

73-4925

ARTHUR D. LITTLE, INC. The economics of the plastic industry. *In* Incentives for recycling and reuse of plastics. Washington, Environmental Protection Agency, 1972. p. II(1-14).
This paper discusses economic growth and price trends for resins and plastic products. The following markets are also analyzed in detail: building and construction; packaging; transportation; furniture; housewares; appliances and toys; and exports. Data are presented on the structure of the plastics industry (flow chart), the approximate size of the plastics industry in 1970, the production value of resins, and the use of resins by markets projected for 1970 to 1975. (This document is retained in the SWIRS library.)
[24167]

73-4926

ARTHUR D. LITTLE, INC. The fabricator. *In* Incentives for recycling and reuse of plastics. Washington, Environmental Protection Agency, 1972. p. III(18-24).
This paper discusses the fabricator's role in the plastics industry. He works closely with the manufacturer/packager and the resin producer. A flow diagram is included which indicates the steps taken by the fabricator to transform polymer or compound to a finished plastic article. The following topics are discussed in detail: disposal and reclamation of scrap plastic by the fabricator; injection molding; film extrusion; blow molding; research and development; and markets. Extensive data are provided on the estimated volume of nuisance plastic which cannot be recycled which was generated by fabrication in 1970. (This document is retained in the SWIRS library.)
[24168]

73-4927

ARTHUR D. LITTLE, INC. The plastics cycle. *In* Incentives for recycling and reuse of plastics. Washington, Environmental Protection Agency, 1972. p. III(1-10).
This paper describes the plastics cycle, which includes the manufacturer/packager who assembles the plastic product or fills a plastic container; the wholesaler-retailer who distributes

the product to the consumer; and individual, industrial, and institutional consumers. Also discussed are the resin producers who convert petroleum raw materials or monomers into polymer or compound and determine the chemistry of the plastic item. A diagram is included which shows the physical flow from operation to operation, rather than between individual companies. A generalized flow diagram representing the production of the major thermoplastic resins is also provided. Data are presented on the estimated volume of nuisance (unrecyclable) plastics generated by resin production (1970) and the estimated volume of scrap plastic sold by resin producers (1970). (This document is retained in the SWIRS library.)
[24173]

73-4928

ARTHUR D. LITTLE, INC. The technology of plastics. *In* Incentives for recycling and reuse of plastics. Washington, Environmental Protection Agency, 1972. p. I(1-10).
This paper discusses the structure of polymers in terms of interchain forces, molecular-weight distribution, molecular shape, crystallinity, orientation, glass-transition temperature, and copolymers. Data and illustrations are provided on the following: the interchain forces of ethylene and polyethylene; the structure of important commercial polymers; liner, branched, and crosslinked polymer molecules; crystallinity in polymers; and the glass transition temperatures of common plastics. (This document is retained in the SWIRS library.)
[24180]

73-4929

ARTHUR D. LITTLE, INC. The wholesaler/retailer and the consumer. *In* Incentives for recycling and reuse of plastics. Washington, Environmental Protection Agency, 1972. p. III(35-54).
The roles played by the wholesaler/retailer and the consumer in the disposal and reclamation of plastics are discussed. The wholesaler purchases products in large quantities from the manufacturer, warehouses them, and ships small orders to the nearest retail outlets. His functions are illustrated in a flow diagram. The retailer's profit problems are also outlined, as are his difficulties with handling returnables. The following data re provided on the wholesaler/retailer, the consumer, and plastics: service life of various plastic products; packaging wastes; types of plastic packaging (1970); estimated volume of plastics in packaging according to type of plastic; estimated volume of nuisance plastic from consumer items other than packaging; estimated volume of nuisance plastic generated by consumer in 1970; estimated annual average national refuse composition; and bottles in plastic samples collected in a community. (This document is retained in the SWIRS library.)
[24181]

73-4930

BABCOCK, A. Fly ash achieving dramatic success in reclaiming coal waste piles. *Coal Age*, 78(4):88-89, Apr. 1973.
Coal waste piles resulting from deep mine operations are now largely devoid of vegetation and often burning. By treating these piles with fly ash from coal burning electric generating stations and seeding the areas with grasses and legumes, a lasting green will result. Such has been the experience of the Energy Research Center of the U.S. Bureau of Mines located at Morgantown, West Virginia, in its dual research for less expensive reclamation techniques in coal wastes and treatment of strip mine spoil. As a result of a number of projects, it has been found necessary to change the pH of the soil to desirable levels and to reseed when necessary. In addition, a mixture of fly ash and digested sewage sludge has also been used. The economics of using fly ash in preference to top soil can be shown by the relative cost of both to achieve a 2 ft layer of cover on a 1 acre refuse bank. The topsoil would cost about $4,000 against $300 for the fly ash.
[24182]

73-4931

BALL, B. Automated scrap handling pays off: the case for auger-feed systems. *Plastics Technology*, 18(11):46-47, Nov. 1972.

Four key steps are involved in adapting plastic injection machines to operate as an automated process system: secure automated and positive ejection from the mold, confine the parts and runners in a container as they drop from the mold, transfer finished parts from underneath the mold and separate from their runners, and move parts to packaging and the separated runners to direct grinding and recycling. By installing auger-feed granulators and parts separators, the system is automated to achieve annual cost savings.
[24183]

73-4932

BERRY, R. E., C. W. WILSON III, AND O. W. BISSETT. Recovery of natural orange pigments: an improved method applied to citrus processing wastes. *Journal of Food Science*, 37(6):809-811, Nov./Dec. 1972.
This articles discusses the use of natural orange pigments as coloring for food products. Methods for obtaining such pigments have recently been under development. Previous methods were too complex for easy commercial scale-up. A study was made to develop an improved carotenoid purification method which would be simple, require the use of little water, and result in efficient pigment yield. The new method was tested for its applicability to citrus peel from different orange cultivars, different forms of peel, and different degrees of maturity. The experiments and results are described in detail.
[24184]

73-4933

Betting on bagasse. *Chemical Week*, 111(23):16, Dec. 6, 1972.
W. R. Grace and International Paper will make investments totaling about $21.4 million over the next 5 years in their bagasse paper mill in Colombia. The funds will be used for the production of coated paper from bagasse by Grace's Peadco process, and for a chemical recovery plant, principally aimed at regaining 30,000 lb per year of caustic soda for internal use. The companies expect the mill to export up to $15 million worth of products to the United States and Andean group countries in 1975. Grace is also studying bagasse paper feasibility in Mexico, Peru, and Australia.
[24185]

73-4934

BLUM, S. L. Man-made ores and their use. *Chemtech*, 2(3):148-152, Mar. 1972.
Waste materials are compared to ores and called man-made ores. They result from changes in man's environment that yield pollution and waste along with food, energy, housing, and transportation. Pollution may be described as the product of ignorance and greed. It is the economics of location and assay which will determine when ores or wastes are to be used, not if they are to be used. As an example, titanium in its raw material source, rutile, was not produced until a use was generated for it. Similarly with man-made ores, assay, economics, and volume will determine its use. A big difference between natural and man-made ores is that the latter grow exponentially. The question arises as to how to identify, catalog, and determine ultimate use. How do we use agricultural byproducts in large volume in industry? The first step involves an understanding of where and how wastes are generated and how to conceptually handle them as a misplaced resource. The technique of high temperature (3,000 F) incineration treats refuse as ore to make salable products from it.
[24186]

73-4935

BOND, R. G., AND C. P. STRAUB. Recycling and recovery. *In* Handbook of environmental control. v. 2. Solid waste. Cleveland, Ohio, CRC Press, 1973. p. 320-358.
This paper presents data, flow charts, and graphs on recycling and recovery of wastes. The topics covered follow: processing of refuse for salvage; materials salvaging in England; flow chart of recycled nonferrous scrap metals; types of recyclable materials; nonferrous scrap recovered in the United States in 1964; partial list of precious metal scrap; U.S. recycling of paper, 1969; secondary fiber usage, paper stock grades; copper flow and recycling; municipal incinerators practicing metal salvage in 1968; waste rubber used in 1968; composition of

residues from five municipal incinerators; reclamation of municipal refuse by the Sacs process; flow charts of solid waste processing systems; equipment for anaerobic fermentation process; cost for biological fractionation process; cellulose conversion systems; summary protein costs versus alternate animal feeds; coal fly ash utilization in Germany; appliance scrap values; dismantling railroad cars; alternatives to open burning for wood separation; and estimates of equipment investment requirements for selected scrap processing methods. (This document is retained in the SWIRS library.)
[24187]

73-4936

BRANDT, G. H. Potential impact of sodium and calcium chloride de-icing mixtures on roadside soils and plants. *Highway Research Abstracts*, 42(12):46, Dec. 1972.

The quantity of salt required to maintain bare pavement can be minimized partly by applying chemicals, such as sodium chloride and calcium chloride mixtures, that melt ice faster per unit applied and by allowing adequate time between application and bare pavement. At high salt loadings, salt pollution is being traded for time to bare pavement at the rate of 2 or 3 times more salt than is required for slower de-icing. Laboratory data indicate that sodium chloride, if used between 0 and 10 F for de-icing within 1 hr, can introduce 5 times more chloride than calcium chloride and ten times more moles of sodium ion than moles of calcium ion from calcium chloride. However, both can melt roughly similar quantities of ice if sufficient time elapses to attain equilibrium. Potential salt loadings in roadside soils and drainage waters were compared with published field data by use of hypothetical constructs, and potentials for producing saline (high salt) and alkali (high sodium) soils were estimated. Although considerable de-icing salt damage to plants is reported in the literature, the damage does not appear to be so extensive as guidelines for agricultural soils in the arid West tend to suggest
[24188]

73-4937

BRIGGS, R. C. Pavement crushed, reused to strengthen runway base. *Civil Engineering-ASCE*, 43(4):82-83, Apr. 1973.

The runway pavement at Orange Municipal Airport (Orange, Massachusetts) was badly cracked. It failed to meet Federal Aviation Administration requirements and covered with oversize cobbles. The option was to remove the existing pavement and either discard or somehow reuse the old pavement material. Contractors were permitted to bid on both the imported-aggregate method and the reused-pavement method. A contract was awarded to reuse the old pavement to rebuild the base; the actual cost was 15 percent less than the bid for conventional construction.
[24189]

73-4938

BUCK, A. D. Recycled concrete. *Highway Research Abstracts*, 42(12):68, Dec. 1972.

An investigation was made to evaluate the use of crushed waste concrete aggregate. A discarded concrete driveway that contained siliceous aggregates and a laboratory concrete beam that contained limestone as coarse aggregate and natural siliceous sand as fine aggregate were selected. Portions of each kind of concrete were processed into aggregate sizes. Three test mixtures and two control mixtures were made. Specimens from each round of each mixture were tested for compressive strength at different ages up to six months, for resistance to accelerated freezing and thawing, and for volume changes due to temperature changes or to moisture effects at a constant temperature. The aggregate particles produced by crushing concrete had good particle shape, high adsorption, and low specific gravity by comparison with conventional natural mineral aggregates. It is concluded that the present results are promising for the use of recycled pavements or similar concrete as concrete course aggregate and perhaps as fine aggregate. If additional work tends to support this tentative conclusion, then existing specifications should be revised to permit and encourage the use of this material as concrete aggregate so that existing supplies of

natural aggregates are conserved and the amount of solid waste is reduced. The results in this work pertain only to waste concrete that is free of contamination by other materials such as sulfates.
[24190]

73-4939

Cambro-interests from fluorspar to stainless steel. *Materials Reclamation Weekly*, 122(2):19-21, Jan. 13, 1973.
Harry Camm heads a loosely knit series of interrelated companies which recover anything that is recyclable. Ferrous, nonferrous, and stainless steel scrap is processed with an accent on metal recovery from foundry skulls. Furnace fire bricks, when discarded, are collected from steel works and crushed to produce 'grog' which forms the base of a material used to reline furnaces. Coal is reclaimed that was ignored by miners who dug out coal from mines in the 1880's; generally prime steam coal, it is produced and sold at the rate of 500 to 600 tons a week. Clean stainless steel scrap and a valuable roadmaking material is reclaimed from slag using modern crushing machinery and vibratory containers. Starting with a site, over 20 acres in extent, and several feet deep in broken and unserviceable electrodes, graphite, metal, and electrode insulating media, reclamation of all reusable material in the site was undertaken to reclaim silicon carbide and graphite.
[24191]

73-4940

CAPORALI, G. How Montedison makes acrylo. *Hydrocarbon Processing*, 51(11):144-146, Nov. 1972.
The Montedison process for the manufacture of acrylonitrile is based upon the catalytic reaction of propylene with ammonia and air. Along with the acrylonitrile, a certain amount of waste material is produced. Aqueous liquids are the largest problem both in quantity and composition. For the most economical disposal of these wastes, both chemical and biological treatment is used. Organic waste liquids are burned. The only solid wastes are the catalysts which are scrubbed by an ammonium sulphate solution, easily settled and then filtered or centrifuged with the valuable metal components recovered. Gaseous wastes consist of off-gases from the water absorber and their residual content of nitriles. These may be burned and some of the heat recovered if economics so advise.
[24192]

73-4941

CHANDLER, P. L., AND D. S. LUOTO. Managerial aspects of a chemical reduction program. *Highway Research Abstracts*, 42(12):46, Dec. 1972.
The increasing public pressures on the use of chemicals on roadways has caused a reassessment of techniques in controlling the usage. Previous controls were designed primarily to achieve a road condition. New techniques should be designed to produce levels of service with a minimum of chemicals. The development of a reporting system to obtain this objective is discussed, and conclusions are made as to the success of the various managerial devices used. Recommendations for research and development emphasis in some of the most promising areas are given wherever possible. Full analysis of cost factors were beyond the scope of this investigation.
[24193]

73-4942

Chemical process slashes cost of treating and recovering waste soluble oils. *Process Engineering*, p.7, Oct. 1972.
The MOR Effluent Treatment Co. claims their process for treating and recovering waste soluble oils saves about 15 lb per 1,000 gal for disposal costs. The process separates insoluble mineral oils from the feed as well as soluble mineral oils and neutralizes the residual water. By avoiding payments for disposal and with the savings introduced by re-refining the separated oils, the total savings are enough to pay for the plant in less than 2 years.
[24194]

73-4943

Chicago paper mill closes. *Solid Wastes Management/Refuse*, 15(127):46, Dec. 1972.

The Lake Shore Mill in downtown Chicago was closed down for a number of reasons: increasing difficulty for recycling mills such as the Lake Shore Mill to compete with virgin fiber mills has occurred. The lower costs of virgin fiber paper products have cut sales of recycled items. The potential use of the mill's site for future high rise development, recent increases in property taxes, imposition of special sewerage surcharges, and a substantial increase in fuel costs to meet new environmental standards are additional reasons. Yet it will cost the local government $1.5 million annually to collect and dispose of the wastepaper formerly withdrawn from the urban solid waste load and consumed by the Lake Shore Mill.
[24195]

73-4944

CHURCH, F. L. Recycling cans for fun and profit. *Modern Metals*, 29(3):65-66, 68, 70, Apr. 1973.

Dan Fountain founded his National Reclamation Co. in Oct. 1971 to help bridge a widening gap in the aluminum can recycling program. The collection of cans has been, at times, an undoubted success but for many distributors the major problem has been getting rid of them at a reasonable price. Dan Fountain helps them do this by buying, shredding, and selling their cans to the aluminum companies for recycling. Presently, Dan Fountain is looking for a suitable crusher for use at the sites of the distributors. It costs as much to haul a trailer load of bulk cans, weighing 5,000 lbs,as it does a 20,000 lb load of crushed material.
[24196]

73-4945

Copper industry uses much scrap iron. *Environmental Science and Technology*, 7(2):100-102, Feb. 1973.

There are several reasons why the copper industry is using the cementation process more and more. Ever increasing strict environmental protection constraints make the roasting and smelting of copper-laden ores, at least as conventionally performed, less and less attractive. As expensive pollution control modifications are made on the conventional equipment, the hydrometallurgical process becomes increasingly competitive and therefore attractive. A more fundamental reason for wider practice of the process stems from the fact that the mine wastes which are too low in copper to justify conventional flotation techniques may often be leached and recovered by the cementation process. Basically, in the cementation process the copper-laden solution is contacted with metallic iron, usually in the form of waste scrap metal. A chemical reaction takes place, the net effect being that copper is precipitated from the solution as a red mud; the scrap iron is solubilized as an iron salt. To achieve 90 percent recovery of the copper, a resident time for the solutions must be more than 1 hr. For every lb of copper produced, 3 lb of scrap iron are needed. The scrap iron must be thin and of light gauge, shredded, clean, free of tin, coatings, and lacquers. Five-eighths of the detinned steel supply goes to the copper industry with the remainder returned to the steel industry. On an annual basis, 800,000 tons of scrap iron are needed to produce 200,000 tons of cement copper. Last year, cities sent more than 700 million scrap cans to copper mines, recognizing that the copper industry is a market for their cans.
[24197]

73-4946

Could waste solve the energy crisis? *Materials Reclamation Weekly*, 122(9):27, Mar. 1973.

Fossil fuels may be limited but organic wastes such as manure, sewerage, paper making residues, and domestic refuse are renewable and could provide a vital source of energy in the not too distant future. So concludes a U.S. Bureau of Mines report on the energy potential of organic waste. Recycling waste by converting it to oil could, the Bureau estimates, provide the United States with 1,330 million barrels of oil by 1980. The conversion process consists of essentially treating the material with carbon monoxide and water at a temperature of 250 to 400 C and a pressure of 2,000 to 5,000 psi. The oil produced is said to be a brownish-black liquid which becomes a semi-solid at room temperatures. It has a heating value of 15,000 Btu per lb. Using a continuous system, oil yields of more than 33 percent have been obtained from the dry organic waste used

in an experiment0 giving a yield of 2 barrels of oil for every ton of material processed.
[24198]

73-4947

Cryogenic hopes for rubber reclamation. *Materials Reclamation Weekly*, 122(4):20-22, Jan. 27, 1973.
Rubber tires were fragmentized by first reducing the temperature of the tire to the glass point of rubber and then subjecting it to impact in a hammermill. The tire was completely shattered, separating the rubber from the fiber. Liquid nitrogen was used to lower the temperature of the tires. A glass transition temperature in the range of minus 80 F to minus 90 F was determined. Immersion for 30 to 45 seconds was required. The reduced temperature technique is a very effective method to reclaim scrap tires. The cryogenic process could handle about 30 tires a minute. The biggest problem is to find a market for the fragmented rubber. A number of possible uses for reclaimed tires were presented and include, among others, the following: as a resilient cushioning layer between soil and concrete in road building, as a backing for turf, as fuel when mixed with coal, as a soil conditioner, as man-made reefs, as hoses, ignition wire, and toys.
[24199]

73-4948

Ecological drive in New York area is losing steam. *Solid Wastes Management/Refuse Removal Journal*, 15(5):28, May 1972.
The interest in recycling refuse in the Long Island, New York, area has fallen off except for newspaper collection. Evidently the prevalent feeling is that the effort is not worthwile. And yet the towns of Hempstead and North Hempstead insist on the compulsory separation of newspapers from other rubbish for resale to brokers. Other towns are starting to follow suit. On the other hand, a report by the Department of Urban Sciences and Engineering at the New York State University at Stony Brook concluded that the refuse recycling effort was not now economically feasible because of high operating costs, small revenues, and the instability of the market.
[24201]

73-4949

Europe offers viable technology for chlorinated hydrocarbon waste recovery processes. *Chemical Age International*, 106(2801):9-11, Mar. 1973.
A number of processes are now available on the market for the waste recovery of chlorinated hydrocarbons. Indications are that the operation of this type of waste recovery with recycling would be performed by a number of waste disposal companies contracting out services to waste producers in the chemical industry. This recovery and recycling market to produce wet and dry hydrogen chloride and chlorine is presently wide open and untapped. The recycling contractor, when he appears, will be a vital part of the chemical industry of the future, providing his services to governments in their wish to dispose of civilization's wastes.
[24202]

73-4950

Extrusion process increases steel recycling. *New Scientist*, 56(821):454, Nov. 23, 1972.
Millions of pounds worth of wasted steel may be reclaimed annually with a technique developed recently by the National Engineering Laboratory (NEL) of East Kilbride, England. Of the 110 million lb of steel swarf produced in the United Kingdom each year, only the higher grade steels are collected for recycling. The rest of the swarf usually vanishes on dumps and tips because it contains too many impurities or has too variable a carbon content to be suitable for melting down for reclamation. The new method involves first degreasing the swarf with an ordinary commercial cleaning agent, then subjecting it to a compressing force of about 6 tons per sq cm. The billets formed this way are extruded, using cold or hot metal extrusion techniques developed at the NEL to produce strong round bars. Tin cans are stripped of paint, lacquer, tin, and solder, and then shredded. Then, billets are formed under 8 tons per sq cm pressure. Most large users of steel bars are not interested because they have rigid strength specifications; however small scale users may be interested because their specifications are not as stringent.
[24203]

73-4951

FAN, L. T., D. G. RETZLOFF, AND W. O. VANDERPOOL. Solid waste - plastics composites: physical properties and feasibility for production. *Environmental Science Technology*, 6(13):1,085-1,091, Dec. 1972.

This article discusses the feasibility of producing a composite by radiation-induced polymerization using solid waste and methyl methacrylate as starting materials. Composites were prepared from the following solid wastes: used computer printout paper; newsprint; sawdust from fir lumber; cardboard; bagasse; wheat straw; dried sediment from the primary treatment of municipal sewage; sludge from secondary sewage treatment; cotton cloth; clothes lint; and human hair. It is concluded that such composites are suitable for use as wood substitute materials. Data and diagrams are included.

[24204]

73-4952

Fibre processes improved by recovery/recycle steps. *Process Engineering*, p6. Oct. 1972.

Improved technology is reported for the recovery and recycle of materials in synthetic fiber processing. In nylon-6 production, caprolactam is recovered either from extract water of the polymerization process, from the solid caprolactam waste, or from the two raw materials used for making caprolactam. The purified caprolactam is then recycled. In the production of polyesters, methanol, split from the ester interchange, is recovered; so is the glycol in the separated glycol-water mixture. Both are then recycled to the poly-condensation plant. Solid polyester waste from the spinning process can also be treated and recycled to an earlier process stage. In this way, reclamation of waste material is possible at each stage of the process.

[24205]

73-4953

FICKER, S. Ein neues Gummi-Regenerierverfahren nach dem System Lurgi-Ficker. [A new rubber reclaiming process according to the Lurgi-Ficker system.] *Kautschuk und Gummi Kunststoffe*, 25(10):481-482, Oct. 1972.

The Lurgi-Ficker process for reclaiming rubber wastes including used tires is described. The rubber wastes are fed into a crushing mill, after which the fiber content is reduced to 5 to 10 percent for fine crushing to a particle size of up to 2 mm. The particles are then mixed continuously with plasticizers and regenerating agents, and conveyed to a regenerating unit composed of hollow regenerating screw and double-walled housing to permit the circulation of a heating fluid with a temperature of 200 to 260 C. The residence time of the material to be reclaimed in the screw is about 15 minutes, during which homogeneous temperature distribution is achieved. The reclaim further passes through cooling rolls, refiners, and strainers. With equally high quality of the end product, the new procedure is more practical and economical than any other process hitherto applied. (Text in German)

[24206]

73-4954

Finding profits in chlorinated hydrocarbon wastes. *Chemical Week*, 111(23):39, Dec. 6, 1972.

Nittetu Chemical Engineering Ltd (Tokyo) entered into a licensing agreement to offer the Japanese firms chlorinated hydrocarbon recycling technology in North and Central America. In this process, the chlorinated hydrocarbons are burned with air and steam in the incineration unit at about 1,500 C, forming carbon dioxide, water, and hydrogen chloride which are then cooled. The concentrated hydrochloric acid solution is removed from the steam and 100 percent hydrochloric acid is produced. On the other hand, a dilute sodium chloride solution is prepared from the effluent and discharged into the waterways.

[24207]

73-4955

G. M. to scrap 1,000 cars. *Waste Trade Journal*, 68(42):1, Oct. 21, 1972.

The General Motors plant in Norwood, Ohio, is scrapping 1,000 Chevrolet Camaros and Pontiac Firebirds that had not been fully completed when their plant went on strike in April. Since these partially completed cars have parts which

do not meet the 1973 Federal safety standards they cannot be economically assembled into the firm's vehicles for 1973.
[24210]

73-4956

Garden State Pomona rebuild features a new press concept. *Paper Trade Journal*, 156(52):30-31, Dec. 18, 1972.
Garden State Paper Co., a world leader in utilizing waste paper fibers for the production of newsprint, has announced the successful start-up of its rebuilt No. 3 machine at the Pomona, California, mill. Production of Garden State's newsprint will have increased 30 percent from 85,000 tons per year to 110,000 tons per year by the end of 1973. The newprint is manufactured from a 100 percent furnish of deinked newspapers.
[24208]

73-4957

GELDOF, H., W. HUSTINX, J. M. RELLAGE, AND O. B. SCHRIEKE. Rubberafval in de vorm van versleten autobanden. [Rubber waste in the form of used tires.] *Plastica*, 25(9):394-401, Sept. 1972.
Problems involved in the disposal of used tires in the Netherlands and in other countries are surveyed. The amount of the used tires discarded yearly is expected to rise from 39,600 tons in 1970 to 77,000 tons in 1980. The percentage of tire regeneration lies at 25 percent for car tires, and at 50 percent for truck tires. Used tires can be used for the preparation of reclaim for the manufacturing of new tires. However, the price-quality relation for such reclaim is presently fairly unfavorable. Reclaimed rubber is also used as an ingredient for asphaltic pavements, improving their life, safety, and ultimately their cost. The imcomplete incineration of milled tires mixed with oil is suitable for the production of carbon black to be recycled in tire production. Certain chemical substances can be recovered by used tires by the destructive distillation process, and the residue can be used as valuable fuel. The Palma process, developed in Hungary, yields regenerated and fiber material to be used by jute factories. The incineration of used tires requires special air pollution control devices, and yields only thermal energy, while valuable components of the tires are lost forever. (Text in Dutch)
[24209]

73-4958

Good bricks, good waste disposal. *British Clayworker*, 81(965):28, Oct. 1972.
This article describes how a German producer of alumina and aluminum-metal has developed and successfully tested, both technically and economically, a process for low-iron red mud obtained from tropical bauxite. It is suitable for making high-quality bricks in which the red mud forms the basic component by converting the sodium oxide content into a chemical compound during processing so that it cannot cause efflorescence. At the same time this glasslike chemical compound greatly increases the compressive strength of the bricks. The composition of the red mud bricks is given, along with their characteristics and applications. It is possible to produce these bricks at the same cost as standard dry bricks now on the market, provided that the red mud is free.
[24211]

73-4959

GRATSERSHTEIN, I. M., AND L. Y. AVRASHKOV. Turnover of aluminum in the national economy of the Soviet Union. *Soviet Journal of Non-Ferrous Metals*, 11(3):71-73, Mar. 1970.
The demands by the Soviet economy for items of aluminum may be satisfied in two ways0 by expanding the production of primary aluminum and by new and more effective means of recovering and reclaiming aluminum in its various phases of processing, and use. Loss coefficients were computed assuming a straight line relationship for loss in a process phase or phases. The losses were distributed between waste and irrevocable losses. The latter category includes loss through wear, abrasion during operation, and incomplete collection of waste, scrap, and obsolescent articles. The data shows that only about 60 percent of the potentially usable aluminum would be cycled into the total circulation of the metal. The remainder would be lost due to technological and organization factors.

[24212]

73-4960

HARRIS, W. B. Aspects of a land reclamation scheme at Cwmtillery, Mon. *Civil Engineering and Public Works Review*, 67(796):1172-1173, Nov. 1972.

The project at Cwmtillery, Wales, involves taking the discarded shale from a coal recovery point being worked at the long disused Penybout tip, and placing it for approximately a mile on the valley floor between the only active mine left and the lower end of the valley at Abertillery. The intent is to build factories on the terraces which are being created in the heart of an established community. The removal of coal and shale from the Penybout Tip will make available a most suitable site for the construction of modern houses and bungalows.

[24213]

73-4961

HEROD, B. C. Granite Rock's goal--flexibility and service. *Pit and Quarry*, 65(5):92-97, Nov. 1972.

The Granite Rock Co.'s 200 tons per hr sand plant, located a few miles north of Santa Cruz, California is now in its third full production season. Wash water from all of the plant's processing system components is piped to the 100 ft Eimco plant process water thickener. As needed, a Dow AP30 flocculating agent is added to the center of the thickener, and solids are pumped to a catch basin. Possible markets for that residue are being investigated. The clear water overflow from the thickener flows to the pit and plant supply sump for use in the plant's operation.

[24214]

73-4962

Identifying plastic materials. *In* Materials Reclamation Weekly handbook and buyer's guide, 1973. Croydon, England, Maclaren & Sons Ltd., [1973]. p. 271-272.

As more plastic materials come into use, the pressure for their reclamation grows. One of the greatest problems facing the plastics reclaimer is that of identification of the plastic. Visual methods do not suffice. Characteristics based upon cutting, melting, immersion in water, and burning help in the identification, short of more sophisticated chemical testing. A table of properties of plastic materials is presented along with a few examples such as the green flame test when touching a polymer sample containing chlorine with a hot copper wire. (This document is retained in the SWIRS library.)

[24215]

73-4963

Japan's paper and board industry utilizes more board and paper waste. *Secondary Raw Materials*, 10(9):64, Sept. 1972.

Japan's pulp and paper industry has been employing more efficient recovery methods to increase the collection and utilization of paper and paperboard waste, which comprises a very important part of the raw material consumed in the local manufacture of paper and paperboard. In 1970, the local waste paper and paperboard recovery rate was 38.4 percent0 one of the highest such percentages in the world.

[24216]

73-4964

JEFFERS, P. E. World's first fly ash brick plant. *Brick and Clay Record*, 161(5):18-20, Nov. 1972.

Research at the University of West Virginia has led to the development of a process to make lightweight, accurately sized fly ash brick. Calgary Power Co. in Canada, expelling 600,000 tons of fly ash from coal furnaces of the Wabomum steam plant, has provided 7,000 tons of fly ash for the process. The wet, tempered mix containing 60 to 80 percent fly ash goes to an automatic press which delivers 40 bricks per minute. The brick is next dried and then fired for 10 to 20 hr. The finished brick is then marketed in the Edmonton area.

[24217]

73-4965

Joint mini-steel works and scrap yard venture. *Materials Reclamation Weekly*, 121(7):10, Aug. 12, 1972.

A mini-steel works is planned in Great Britain which will comprise a 30 ton electric arc furnace

and a continuous casting plant. Initial calculations show that the mini-plant will require approximately 60,000 to 70,000 tons of processed scrap a year. A shredder will process the scrap, working at the estimated rate of 50,000 cars a year.
[24218]

73-4966

KALINA, J. F. Now, recycled fiber in more of Uncle Sam's corrugated. *Modern Packaging*, 45(11):4, Nov. 1972.
The General Services Administration now requires the use of recycled fiber in all the corrugated it uses, whether purchased directly or as packaging for the items it buys. This policy is causing industry-wide consternation, especially among some food and detergent manufacturers who sell to the United States and whose suppliers traditionally use virgin fiber. They dislike maintaining separate inventories of GSA-approved boxes. A detailed account of how the new ruling evolved is presented.
[24219]

73-4967

KUMAR, S. Reclaiming amino sugars from milk and whey. *Ohio Report*, 57(6):90, Nov./Dec. 1972.
Present research seeks to recover amino sugars from skim milk powder, liquid or dehydrated whey, and deproteinized whey powder. The selected approach is to employ solvent extraction followed by precipitation. Results have indicated that 90 percent of the amino sugars can be extracted with methanol with impurities removed by concentration and selective precipitation. The fractions thus obtained are rich in minerals, lactose, and amino sugars which may be useful for food fortification and dietary supplementation.
[24220]

73-4968

LAUNDRIE, J. F., AND J. G. BERBEE. The disappearing forest0 boosting pulp yield per acre with short rotation crops. *Chem 26 Paper Processing*, 9(2):48-50, Feb. 1973.
Kraft pulps were made from hybrid poplar whole trees and components, including bark, using growth rotations of 1,3,5,11, and 24 years. The best rotation, on the basis of yield per acre per year, was 11 years. Satisfactory pulps were made from all of the materials, and the presence of bark posed no special problems in either pulping or bleaching. The 1 year old material was unique in that it was stronger than pulps made from the 3 and 5 year old trees and that little or no refining energy was required to develop the strength of the pulp.
[24221]

73-4969

LAZAR, F., B. NEMETH, AND J. KORODI. Process and apparatus for the leaching of soluble materials from slurries. Canadian Patent 924,873 owned by Almasfuzitoi Timfoldgyar, Almasfuzito, Hungary. Issued Apr. 24, 1973.
An apparatus and method for leaching dissolved quantities from slurry through counter-current flow is described. This method is particularly useful in recovering caustic soda in alumina processing or phosphoric acid in fertilizer manufacuture. Additionally, the process offers economic advantages over other known methods. The process itself involves feeding the slurry through a slurry zone under pressure. A leaching solution is fed under pressure through a solution zone. A filter surface common to the slurry zone and the solution zone is provided. Two broadly distinct stages for carrying out this process are described. Six claims are made for the invention.
[24222]

73-4970

LESHER, R. L. Tackling resource recovery. *Environmental Science and Technology*, 6(13):1078-1081, 1083, Dec. 1972.
The National Center for Resource Recovery, Inc. of Washington, D.C. has accepted the challenge of coping with the problems of municipal solid waste collection and disposal and the rapid depletion of vital natural raw materials by spurring interest in resource recovery by application of the appropriate technology. A plan for action has been developed to hasten this end. It has resulted in the National Resource Recovery Network program conceived to provide a demonstration program for displaying and evaluating

technology to recover resources from municipal refuse and to serve as a catalyst in the development of a new industry, consisting of self-sustaining resource recovery facilities for extracting raw materials from today's waste products. The National Center thus seeks to further the development of the treatment of solid wastes not as pollutants but as resources which are recoverable and reusable.
[24223]

73-4971

MARCOVITCH, S. Aspects techniques. 4. Le Pulpafiner. [Technical aspects. Part 4: The Pulpafiner.] *Revue A.T.I.P.*, 26(5):327-329, 1972.
Pulpafiner, new equipment for pulping waste paper, is described. After rocks, wires, and other large-size materials are removed from the bulk waste paper, the waste paper, still containing small-size adherent contraries, is pulped in the two-stage pulper for fibrillation and separation. The pulp obtained, of very good quality, is suitable for processing directly on a paper-making machine. The impurities, such as plastic and other coating residues, are drained off at the bottom of the second stage together with a small proportion of pulp. The discharge passes through a vibratory screen for reducing pulp losses. The equipment can produce 120 to 140 tons of pulp per day. (Text in French)
[24224]

73-4972

MARUSINOVA, S. Pevnost a nasakavost vapenopiskovych cihel vyrabenuch z flotacnich odpadu pri tezbe rud. [Strength and water adsorption of sand-lime bricks produced from flotation wastes from ore mining.] *Stavivo*, 50(7):237-239, 1972.
The mechanical properties of the newly introduced solid and hollow sand-lime bricks were tested to determine their suitability for various applications. Compression strength of solid bricks determined by standard Czechoslovak norms is 200 kilopounds per sq cm, of hollow bricks 150 kilopounds per sq cm. Strength is greatest the first 24 hours, smallest between the 25th and 30th day, then it increases to the 60th day to its original value and remains stable. Flexural tensile strength of solid bricks is 30 kilopounds per sq cm, water absorption of dry solid bricks is 15.5 percent of mass, of hollow bricks 17.00 percent. Water saturation in sand-lime bricks proceeds slower than in fired bricks, 95 percent water adsorption is not reached until after 2 hr immersion in water (1 hr for fired bricks). Compression strength of these bricks decreases with water adsorption from 195 kilopounds per sq cm for dry bricks to 150 kilopounds per sq cm for 5 percent water adsorption, to 140 kilopounds per sq cm for 10 percent water adsorption and to 120 kilopounds per sq cm for 15 percent water adsorption. (Text in Czech)
[24225]

73-4973

MASSUS, M. Aspects economiques. 1. Approche statistique et Fonctionnement du marche des vieux papiers. [Economic Aspects. 1. Statistical approach to and functioning of the market for waste paper.] *Revue A.T.I.P.*, 26(5):287-294, 1972.
From 1953 to 1970 consumption of waste paper in France has grown 3.7 times to 1,424,000 tons. During the same period paper and cardboard production increased 2.75 times and that of pulp 2.72 times. While in France in 1970 old paper consumption covered 34.2 percent of the total need for cellulose, the figure for Germany was 45 percent, for England 40 percent, for Japan 36 percent, for Holland 36 percent, for Italy 29 percent, for Austria 23 percent, and for the United States 21 percent. Per capita consumption of waste paper in 1970 in France was 28 kg against 46 kg in the United States. From 1960 to 1970 waste paper supply in France increased by 6.3 percent yearly. The largest increase in the consumption of waste paper between 1961 and 1970 was in corrugated cardboard production (11 percent), followed by Kraft paper (6 percent), newsprint (4 percent), and shredded paper (2 percent). In France the percentage of reclaimed paper in 1958 was 26 percent, in 1970 28 percent. In 1970 raw materials for the manufacture of 100 kg of paper consisted of 63.9 kg pulp, 30.7 kg waste paper, 2.3 kg rags and 14.6 kg other materials. Reclaiming of paper, stable till 1969, began rising in 1970 and 1971. Increasing demand for paper is a European phenomenon. The price of waste

paper rises and falls with demand while the price of pulp fluctuates very little. This disparity is disastrous for the paper market and has a deleterious effect on reclamation which stops whenever the market is depressed. (Text in French)
[24226]

73-4974

MAURER, T., AND H. G. RICHTER. Procede d'utilisation de calamine de laminage pour la fabrication d'oxyde ferrique (Fe2O3). [Process for the reclamation of rolling skin for the production of ferric oxide (Fe2O3).] French Patent 2,070,909 owned by Deutsche Edelstahlwerke Aktiengesellschaft. Issued Sept. 17, 1971.
Procedure for the conversion of rolling skin of non-alloyed steel, which consists mainly of ferrosoferric oxide, into ferric oxide, is described. Rolling skin, together with chips and other scrap iron or non-alloyed steel material, is first converted into ferrous chloride by the addition of water-diluted hydrochloric acid at temperatures ranging from ambient up to 100 C. The resulting ferrous chloride, together with the water and the residual hydrochloric acid is finely sprayed into an oven heated to a 800 to 900 C temperature for the recovery of ferric oxide and hydrochloric acid from the oven. The addition of iron or steel waste enables the process to be controlled. The ferric oxide is economically obtained in the form of a fine powder or granulate accumulating on the bottom of the furnace. (Text in French)
[24227]

73-4975

MCFARLAND, C. M., AND R. E. CECH. Copper recovery via sulfide-salt reduction. *Journal of Metals*, 24(10):20-29, Oct. 1972.
A process was described to convert existing forms of copper-bearing raw materials into salable purified copper. The process sequence includes flotation, reverberatory smelting, converting, fire-refining, and electrolytic refining. The key step converts cuprous sulfide to cuprous oxide so that both may yield metallic copper and sulfur dioxide. The three chief copper bearing sources for feed into this process were scrap, copper concentrates, and cementation copper. Copper ores, predominantly sulfide in nature, must be roasted for conversion to oxides, followed by leaching of copper and copper oxides with the copper ammonium carbonate complex. Heat decomposes the filtered complex to drive off ammonia, and carbon dioxide, precipitating the copper oxide, with the above key step following next.
[24228]

73-4976

MCMANUS, G. J., AND K. W. BENNETT. Furnace economics expand mini-mills. *Iron Age*, 210(24):50-51, Dec. 14, 1972.
This article discusses economic problems in the steel industry. Expansion of established companies has been curbed by price and profit problems and pollution costs. Mini-mills are tending to multiply because conditions are unfavorable for maxi-mill growth. A variety of representatives from the industry are quoted in reference to their views on the economic picture. The scrap market is also analyzed.
[24229]

73-4977

Minerals synthetiques et leur fabrication. [Synthetic raw material from scrap.] French Patent 2,081,160 owned by Societe de Travaux et de Services Industriels. Issued Dec. 3, 1971.
Process for the manufacture of synthetic raw material from scrap metal or alloys of particle size of 1 to 5 mm which are not suitable for returning to the process feed is described. The scrap particles are aggregated by means of hydraulic hardening binder, such as cement to which possibly lime is added, or pulverized or granulated slag with sodium or potassium silicate. The binder expenditure may range from 5 to 20 percent by weight. The binder also contains hardening resin, such as ethoxyline resin, added to the former at a rate of 2 to 10 percent of the weight of the binder. The agglomerates formed are crushed to a mean particle size (usually up to 80 mm) appropriate to the process requirements. The process is of particular interest for ferrous metallurgy. (Text in French)
[24230]

73-4978

Modern, fully systemized scrap handling operation. *Secondary Raw Materials*, 10(8):139-141, Aug. 1972.

At the Houston Junk Co. of Houston, Texas, 100 tons of scrap per day are apron-fed into a Pennsylvania Crusher Type DFC Non-reversible Hammermill to be reduced down to fist-size pieces. These then pass through magnetic separators. The virtually dirt and debris-free scrap products are then conveyed on to a stockpile area where they are baled, stacked, and made ready for shipment. The scrap is sold to foundries such as United States Steel and Armco where it is recycled into products such as pipe, gears, pinions, springs, and machine works.
[24231]

73-4979

Moeglichkeiten und Grenzen der Wiederverwertung industrieller Abfaelle. [Possibilities and limits of the recycling of industrial waste.] *Textil-Industrie*, 79(10):345-346, Oct. 1972.

General aspects of industrial waste recycling are outlined, with special regard to related efforts made in the United States. The necessity for waste recycling arises from the immense problem of waste disposal (about 33 percent of the raw materials are converted into products with the rest as waste material), and from the more or less imminent exhaustion of several material resources. Industries in Europe, too, should be required to recycle their wastes, whatever the price, which will, however, necessitate close cooperation of the European countries. (Text in German)
[24242]

73-4980

MUSSELMANN, W. Aspects techniques. 6. La preparation des vieux papiers dans les installations de trituration a chaud. [Technical aspects. Part 6: The preparation of waste papers in hot slushing installations.] *Revue A.T.I.P.*, 26(5):337-351, 1972.

A hot slushing installation for the processing of paper wastes is described. The pulp, obtained from the disintegrated waste paper with the coarse contraries removed, is thickened and then sent for hot slushing. The hot slushing installation comprises a stock delivery screw conveyer, a reheater provided with a conveyer screw, a slusher with a shaft, and a draw-off device. The stock is then diluted and deflaked. An established industrial installation has closely confirmed the results obtained during tests. The stock produced is free from flakes. The paraffin waxes, waxes, and tars are completely dispersed by the double thermal and mechanical action. An industrial installation produces 120 tons of stock daily under conditions which are so satisfactory both technically and economically that an installation of 200 tons per day is being considered. The slushing unit produces 100 kg of stock for a consumption of 3 to 8 kw-hr and 50 kg of steam at 135 to 150 C according to the type of waste being treated. Waste papers with high wet strength are the most difficult to treat. Although the reheater enables treatment at 150 C to be done, this temperature is in fact not used even though it allows an economy in mechanical power because it reduces very considerably the strength properties of the stock. (Text in French)
[24232]

73-4981

NEFF, N. T. Solid waste and fiber recovery demonstration plant for the City of Franklin, Ohio: an interim report. Washington, U.S. Environmental Protection Agency, Office of Solid Waste Management Programs, 1972. 83 p.

The objective of this project was to design, construct, operate, and evaluate a demonstration plant which would use an innovative system for disposal of municipal solid wastes and recovery of metals, glass, and paper fiber. The project was conducted in three phases: design; construction; and operation. This work was done under a grant from the U.S. Environmental Protection Agency's Office of Solid Waste Management Programs. The Franklin, Ohio, Solid Waste and Fiber Recovery Plant (funded under this project) has in its first 7 months of operation accomplished the following: successfully wet-ground unsorted municipal refuse; removed relatively small ungrindable items from the Hydrapulper slurry and separated them into ferrous and nonferrous fractions; reduced the quantity of non-

combustibles remaining in the slurry by inertial separation in a liquid cyclone; removed recyclable paper fiber from slurry by the fiberclaim process; and burned the unrecoverable residue in a fluid bed reactor. On the basis of data obtained in this study, the economics of a 500 ton per day, or larger, plant are indicated to be attractive, compared to an incinerator for which adequate air pollution controls are provided. (This document is retained in the SWIRS library.)
[24233]

73-4982

NETHERTON, R. D., L. B. LOVELL, J. P. MURPHY, AND L. GROSSMAN. The highway environment and recyclable resources. *Highway Research Abstracts*, 42(12):94, Dec. 1972.
Roadside visual blight is closely related to the current national problem of protecting the environment and salvaging and recycling resources. A major facet of the total environmental problem is the disposal of abandoned automobiles. Solution of the junk-car problem depends on development of new means for dealing with unique economic and legal requirements. These include creation of incentives for collection of abandoned cars, recovering salvageable materials, and utilization of scrap metal in steelmaking. The legal problems include claims of titles and registrations and the collection of cars from public and private property. Development of effective means for dealing with these matters is a prerequisite to reducing this major form of roadside blight.
[24234]

73-4983

New fibre filler board is manufactured from recycled waste paper. *Secondary Raw Materials*, 10(8):[158], Aug. 1972.
This article discusses Container Corp. of America's introduction of a filler sheet made of 100 percent recycled fibers. Designed to be used as filler for solid fiber boards, it is laminated to virgin fiber plies comprising the facings of the board. This product is intended primarily for use in returnable beer and soft drink cases. All of Container Corp.'s filler grades are described.
[24235]

73-4984

New stainless steel from scrap. *Materials Reclamation Weekly*, 121(7):20-21, Aug. 12, 1972.
APV has introduced a vacuum refining process for producing stainless steel using scrap with a carbon content as low as 0.02 percent. Scrap steel is charged into the furnace crucible and melted. For the 5 hundredweight furnace using a medium frequency, this normally takes about 30 minutes. After sampling, the vacuum chamber is sealed and using a mains frequency supply, the carbon content is reduced to the required specification. Chromium or other additions can be made during this latter operation. The lid is finally removed and the molten charge poured into moulds.
[24236]

73-4985

Old batteries generate new lead. *Material Handling Engineering*, 27(11):47, Nov. 1972.
This article discusses the Gulf Coast Lead Co.'s recycling of lead. The firm obtains old batteries from several sources, reclaims the lead, refines it, and sells it to two nearby battery manufacturers. Some of the reclaimed lead is used to make keel ballasts for local sailboat manufacturers. A Case Uni-Loader is used to move battery plates to the blast furnace for smelting, to supply the furnace with coke and limestone, and to dig mold pits in the ground for making keel ballasts.
[24237]

73-4986

ONUSCHECK, J. W., AND R. L. W. HOLMES. Oxygen and oil in a BOF. *Journal of Metals*, 24(9):26-36, Sept. 1972.
With the Monessen Works of Wheeling-Pittsburgh Steel short of hot metal producing capacity, it was decided to employ in-vessel preheating of scrap prior to charging hot metal to permit utilization of scrap in place of hot metal. As a result, hot metal consumption was reduced as much as 27 percent and scrap consumption increased 25 to 50 percent by using oxygen/fuel oil preheating of the scrap. A fuel oil/oxygen burner was chosen for the purpose for a 200-ton vessel

firing 45 gal per minute of fuel for 390 million Btu per hr.
[24238]

73-4987

Paper reclamation survey. *Materials Reclamation Weekly*, 122(11):31-36, Mar. 17, 1973.
In the United States, a country richly endowed with primary fiber, considerable attention is being given to marketing secondary fiber. The first advertisements dealing with paper recycling under a new communications program of the forest industries appeared recently in three U.S. newspapers. To handle inquiries generated by this advertisement, a booklet answering some of the common questions asked about recycling is being prepared. Potential waste paper availability, the practical supply situation, improved collection, cleaning, and processing systems, the competitiveness of waste paper with other fibers in terms of cost, prices, and fiber characteristics, the implications of product demand, new product or end use development, and general economic and social influences, are all among numerous studies that have been or are being undertaken by government agencies, trade groups, and institutions in the United States. United Paper Mills and seven other Finnish companies are to build a protein factory at Jamsankoskie in which fodder albumin will be produced from cellulose waste. Research is to continue into the production of a protein suitable for human consumption from forestry wastes.
[24239]

73-4988

Pavement is half glass and concrete waste. *Engineering News-Record*, 189(17):17, Oct. 26, 1972.
A 1.2-acre lot was paved in a Detroit suburb as a recycling demonstration by the Royal Oak Beautification Council which paid for half of the paving cost of $6,000, out of funds raised by selling waste glass, paper, and metal. The 1.5-in. bituminous binder, containing crushed glass and used concrete, was topped by a 1-in. wearing surface without the crushed concrete.
[24240]

73-4989

Plant on stream to produce sulphuric acid from gypsum waste. *Chemical Age International*, 106(2795):11, Feb. 9, 1973.
The first plant in the world designed to produce sulphuric acid exclusively from phospho-gypsum is now in full production at Phalaborwa for Chemical Industries of South Africa Ltd. (CISA). The plant produces 350 tons per day of cement clinker and 37 million standard cu ft per day of sulphur dioxide containing gases, expected to yield 350 tons per day of concentrated sulphuric acid. Feed for the plant comes from waste material discharged from the phosphoric plant operated by Bosveld Kunsmis. Phosphate fertilizers are mainly produced from phosphoric acid. The production of phosphoric acid by the wet process, of which the present world output is 12 million tons annually, in terms of phosphorus pentoxide, yields gypsum in a ratio of 1 to 5, making an annual total of 60 million tons. The practice has been to dump or pump this gypsum byproduct into rivers or the sea, with a harmful effect on ground water resources, polluting rivers, and oceans and their shores and beaches.
[24241]

73-4990

Priestman excavator helps reclaim metal. *Steel Times*, 200(9):647, Sept. 1972.
Equipped with a 1 cu yd bucket, a Priestman excavator which is crawler-mounted transfers waste from a steel factory tipping area to a hopper conveyor system at the rate of 2 cycles per min. The metal content is later extracted for reuse and the hard core recovered for use in the construction of highways. In operation at Catcliffe since 1966, the excavator has completed 15,000 hr of service giving trouble-free performance apart from replacement for normal wear.
[24243]

73-4991

PRISCO, H. A. Process for reactivating powdered carbon using vibrating bin activators. *Sugar y Azucar*, 67(11):48-49, Nov. 1972.
It was necessary to prevent flow blockages of spent carbon from the supply silo to the process

line through the use of the Vibra Screw Gyrator to generate vibratory thrusts to vibrate the entire bin bottom and its contents but not the bin itself. Next followed flash vaporization and decarbonization. Reactivation of the carbon took place at 1,750 F. The process is available in capacities of 300 to 8,000 tons per year.
[24244]

73-4992

Procede de fabrication de mousse de CPV reconstituee. [Process for the manufacture of reclaimed PVC foam.] French Patent 2,090,936 owned by General Foam Products, Ltd. Issued Jan. 14, 1972.
Process for the recovery of polyvinyl chloride (PVC) foam wastes is described. The PVC foam waste is crushed to particles with an average diameter range of 3 to 15 mm, and the resulting particles are agglomerated by means of a polyurethane resin obtained from methylene polyisocyanata, especially diphenylmethane diisocyanate, as a binding agent which latter is previously diluted with a non-inflammable diluant, exerting inflating action on the PVC. Catalysts such as amine-base or organotin compounds, can be used. The PVC foam particles mixed with the binding agent are hardened in the mold for about 45 min. The PVC thus obtained can be used, e.g., as sound insulator.
[24245]

73-4993

Procede de traitement de dechets d'origine industrielle et domestique et application du procede a certains terrains. [Procedure for the treatment of industrial and domestic wastes and their application for soil consolidation.] French Patent 2,075,354 owned by Environmental Sciences, Inc. Issued Oct. 8, 1971.
Procedure for the conversion of industrial and domestic wastes into a stable, practically insoluble material, suitable for use in soil stabilization in construction and other industrial sites, is described. The waste materials are crushed and mixed with an aqueous solution of an alkali metal silicate, preferably sodium silicate, and a curing agent for the silicate, preferably monobasic sodium carbonate or calcium chloride. The ratio of the silicate to the curing agent is such that the mixture hardens in the form of an inert, stable product which is practically insoluble in ground water. The mix contains enough water to be suitable for pumping to sites to be stabilized. The mix obtained can be used for the consolidation of low-value grounds unsuitable for agriculture, building, or recreational purposes, such as marshes, excavations, and exhausted mines. The quality of the ground can be improved at low cost using packaging wastes, plastics, household waste bins, and industrial wastes. (Text in French)
[24246]

73-4994

Procede de valorisation des residus du charbon et en particulier des cendres de centrales electriques. [Recovery of fly ash from coal fired power stations.] French Patent 2,090,813 owned by Trief Leon. Issued Jan. 14, 1972.
Recovery of coal residues and fly ash from coal fired power stations for use as a hydraulic binder especially of the pozzolanic cement type is described. Forty percent of fly ash is mixed with 60 percent of calcium carbonate, and the resulting mixture is fired at 1,300 C and then at 1,500 C to produce a molten slag. The molten slag is cooled to granulate the slag. The granules are then ground to fine powder. If the initial fly ash contains more than 4 percent ferric oxide, the molten slag is heated to a maximum temperature of 1,800 C for the separation of the heavy metal melt from the molten slag prior to rapid cooling. The fine powder to be used as hydraulic binder is mixed with 2 to 4 percent of potassium oxide, sodium oxide or sodium carbonate, or with 5 to 10 percent of sodium sulfate, calcium sulfate, or potassium sulfate. (Text in French)
[24247]

73-4995

Procede pour la recuperation de l'acier dans les ferrailes legeres. [Reclaiming low-density contaminated scrap steel.] French Patent 2,077,893 owned by Gerald Grott. Issued Nov. 5, 1971.
Procedure for the production of a homogenous, high-purity ferrous product from scrap steel containing ferrous metal, volatile organic impuri-

ties and slag-forming metallic impurities is described. The scrap is treated in a furnace composed of an upper calcining, another evaporating, and a lower refining zone in which a partially combustible fuel-oxygen mixture is burned. The products of partial combustion are sent through the evaporating and calcining zones in countercurrent, and additional oxygen is introduced into the evaporating and calcining zones to increase oxidation of the organic impurities. The temperature and oxygen concentration in the refining zone are controlled by adjusting the feed rate of the fuel-oxygen mixture to form a melt which is withdrawn as refined product. The oxygen partial pressure in the evaporating zone is maintained within a range of 0.00001 to 0.000001 bar. (Text in French)
[24248]

73-4996

Produits non colores en caoutchouc regenere et procede d'obtention de ceux-ci. [Noncolored rubber reclaim products and the process for the manufacture thereof.] French Patent 2,090,958 owned by Uniroyal, Inc. Issued Jan. 14, 1972.
Vulcanized rubber wastes are heated in autoclave in a temperature range of 148 to 215 C and in the presence of formaldehyde and resorcinol as well as of 100 to 300 parts of water per 100 parts of rubber waste. The formaldehyde and resorcinol expenditures lie at 2 to 5.5 percent and 0.01 to 0.5 percent, respectively. (Text in French)
[24249]

73-4997

Putting the closed loop into practice. *Environmental Science and Technology*, 6(13):1,072-1,073, Dec. 1972.
This article discusses Dow Chemical Co.'s recycling of its process waste water. The Dow plant under discussion manufactures styrene-butadiene latex for carpet backing and carpet construction and latex foam for carpet backing. This firm uses municipal water for makeup and sanitary water, and provides a closed-loop system for reusing process, wash, and coolant waters, thereby eliminating discharge to the river and benefiting economically. Dow is also installing a system which should prevent any overflow from entering a nearby river. The latex sludge presents some problems in landfilling, largely connected with drying.
[24250]

73-4998

RAGAN, W. J., R. W. JAMES, AND T. J. MCLEER. Environmental perspective. *In* Identification of opportunities for increased recycling of ferrous solid waste. Washington, U.S. Environmental Protection Agency, 1972. p. 43-52.
This paper discusses the environmental perspective as part of a study of ferrous solid waste. Reclamation. The environmental problems covered include pollution, land use, and natural resources. Among the causes of these problems are misplaced economic incentives, values, population, technology, mobility, limitations of government units, and information gaps. The effects of these problems follow: health; esthetics; economic costs; and natural systems. Data are presented on solid waste generation in 1969 from residential, commercial, institutional, industrial, mineral, and agricultural sources. Environmental action, economic implications of environmental quality, and solid waste alternatives are also discussed. (This document is retained in the SWIRS library.)
[24254]

73-4999

RAGAN, W. J., R. W. JAMES, AND T. J. MCLEER. Identification of opportunities for increased recycling of ferrous solid waste. Washington, U.S. Environmental Protection Agency, 1972. 391 p.
This document presents the results of a study of the recycling of ferrous solid waste which was sponsored by the U.S. Environmental Protection Agency's Office of Solid Waste Management Programs. The study examines the following: the sources, types, and quantities of iron and steel scrap; the markets for iron and steel scrap; the functions of the ferrous scrap processing industry; and the technology of iron and steel scrap utilization. Problems inhibiting greater use of iron and steel scrap are identified and discussed, and recommendations are made for

solutions to these problems. A survey of the ferrous scrap industry was the basis for many of the identified problems and proposed solutions, and also provided numerous statistics on the ferrous scrap industry. Four appendices, an extensive bibliography, and numerous tables and figures are included. (This document is retained in the SWIRS library.)
[24255]

73-5000

RAGAN, W. J., R. W. JAMES, AND T. J. MCLEER. Introduction *In* Identification of opportunities for increased recycling of ferrous solid waste. Washington, U.S. Environmental Protection Agency, 1972. p. 1-7.
This paper describes a research program undertaken by Batelle-Columbus for the Scrap Metal Research and Education Foundation of the Institute of Scrap Iron and Steel, Inc. This work was funded by a demonstration grant from the Office of Solid Waste Management Programs of the U.S. Environmental Protection Agency. The ferrous scrap industry's accomplishments in the recycling of steel and iron are outlined. The following research methods were utilized: a literature search and evaluation to assess the current documented and published information; an extensive survey of the ferrous scrap industry to identify the industry, its capabilities, and its problems; in-depth interviews, conducted in person to add detail and insight into the problems identified; and technical and economic evaluation to determine the obstacles and opportunities for increased recycling. Sunthesis and recommendations for further research and action leading to increased recycling was the final phase of the study. Numerous statistical tables are also included. (This document is retained in the SWIRS library.)
[24253]

73-5001

Recycled palm fronds. *American City*, 87(11):72, Nov. 1972.
Palm fronds, when chipped with a Wayne Chipper, are used by the Miami Seaquarium to mulch around trees and shrubs on its infertile land. Previously, the Seaquarium had to earmark a substantial amount of money for mulch that was purchased and shipped in. In addition, the Miami area receives a reduced volume of trimmings to dispose of.
[24252]

73-5002

Recycling roads and buildings with portable plants. *Pit and Quarry*, 65(7):91-92, 106, Feb. 1973.
Two Washington, D.C., firms have recognized the practical and economic implications of recycling road and building aggregates. They have installed and are operating new portable primary crushing plants designed and built by Hewitt-Robins Division of Litton Industries. The highly compact plants cost less than $80,000 and are producing usable aggregate products from demolished roads, concrete construction, and excavation material at rates varying from 100 to 200 tons per hr. Excavating and demolition contractors are major material sources. There are savings on mileage and time to have the mobile plants on site. Big slabs of asphalt and concrete are first cracked into more manageable portions by a hydraulic vibrator breaker and then fed into the portable crusher. Present plans are to use recycled concrete and asphalt in the production of road asphalt and to extensively recycle outworn construction. The efficiency and portability of the recycling equipment are important keys to long range profitability whereas down time is the biggest problem.
[24251]

73-5003

REGAN, W. J., R. W. JAMES, AND T. J. MCLEER. Other major areas. *In* Identification of opportunities for increased recycling of ferrous solid waste. Washington, U.S. Environmental Protection Agency, 1972. p. 283-321.
In this paper, some major areas of opportunity for increased recycling of ferrous solid wastes are outlined as follows: natural resource conservation, coal, and iron ore; substitution of scrap for pig iron; transportation of ferrous scrap in terms of scrap movement, economics of scrap transportation, discriminatory freight rates, problems related to transportation, and potential

solutions; governmental influence on solid waste utilization and recycling (Federal, State, and local areas of influence affecting solid waste utilization, and major problems and recommendations); research and development; and price volatility. Data are included for the following: coal consumption for pig iron production, 1970; blast furnace production; United States' iron ore production and imports for consumption; establishments using transportation mode (truck, rail, or barge); and heavy melting steel scrap annual averages and range, 1950 to 1971, in dollars. (This document is retained in the SWIRS library.)
[24256]

73-5004

REGAN, W. J., R. W. JAMES, AND T. J. MCLEER. Summary. *In* Identification of opportunities for increased recycling of ferrous solid waste. Washington, U.S. Environmental Protection Agency, 1972. p. 7-42.
This paper summarizes the following topics covered in this study of the recycling of ferrous solid wastes: environmental quality; solid waste alternatives; ferrous solid waste; markets for ferrous solid waste; and the ferrous scrap industry as the vital link between ferrous solid waste and its markets. Under the major problems and obstacles to increased recycling the following topics are included: low growth rate of consuming industries; changing iron and steelmaking technology; quality of scrap from ferrous solid waste; reduced requirements for purchased scrap of total scrap consumption; poor economics of recycling ferrous solid waste; apparent discriminatory restrictions; and the lack of public awareness of the scrap processor's role in economic recycling. There is also a discussion of the major opportunities for increased recycling of ferrous solid waste and recommendations for achieving these ends. (This document is retained in the SWIRS library.)
[24258]

73-5005

REGAN, W. J., R. W. JAMES, AND T. J. MCLEER. Technology of iron and steel scrap utilization. *In* Identification of opportunities for increased recycling of ferrous solid waste. Washington, U.S. Environmental Protection Agency, 1972. p. 239-282.
This paper outlines methods for increasing the recycling of the various forms of ferrous scrap. The following topics are discussed in detail: scrap quality; scrap charges; iron and steelmaking processes such as blast furnace practice, open-hearth steelmaking, basic oxygen steelmaking, hot-blast cupola, electric furnace steelmaking, continuous charging, preheating of scrap, increased power to electric furnaces, fuel-oxygen-scrap process, continuous-counterflow steelmaking, and the Torrax melting system; cryogenic scrap processing; reinforcement of concrete with scrap; and electrolytic processing of scrap. A summary of conclusions and recommendations and extensive data are also included. (This document is retained in the SWIRS library.)
[24257]

73-5006

Researching reclamation processes at Warren Spring. *Materials Reclamation Weekly*, 121(19):25-27, Nov. 4, 1972.
This article describes the Warren Spring Laboratory of Great Britain's involvement in reclamation research. Its interest in metals recovery is shown by the development of new processes designed to reclaim nonferrous metals from complex scrap and nonmetallic waste such as effluents, effluent sludges, spent catalysts, metallurgical fumes, drosses, and residues. Some of the topics covered in text and diagrams include: separation problems; a metals recovery system in conjunction with a refuse incinerator; hot salts; sorting out the nonferrous; and smaller particles.
[24259]

73-5007

SAVERY, C. W. Future energy sources for transportation. *Traffic Quarterly*, 26(4):485-499, Oct. 1972.
Natural energy resources are being consumed at a terrific rate. In 1960, approximately 20 percent of the total energy consumed in the United States was consumed in transportation0 126,000

Btu per capita per day. On one hand transportation fuel sources must be conserved and synthetic fuels produced. Two of these fuels would be hydrogen and ammonia. The third type of fuel would be produced by recycling waste trash, animal wastes, and crop residues. The pyrolysis of municipal refuse offers a possibility of producing fuels. It is estimated that 500 to 700 Btu per capita per day would be produced by recovering gas from the sludge digestion process in the United States. Another source of hydrocarbon fuels is the digestion of animal wastes. About 50,000 Btu per capita per day could be produced from the annual total of animal waste production. Another category of recycling waste is agricultural crop residues. Two processes are possible0 fermentation to make alcohol and anaerobic digestion to produce a combustible mixture of methane and carbon dioxide. About 25,000 Btu per capita per day could be produced. By altering the energy mix, recycling could thus produce 80,000 Btu per capita per day or about two-thirds of the amount of the transportation energy consumed in 1960.
[24260]

73-5008

SCHLEY, J. R. An economical route to hydrogen chloride by burning chlorinated wastes. *Materials Protection and Performance*, 11(12):38-42, Dec. 1972.
This article describes the operation and economics of a system in which clorinated organic wastes are burned and hydrochloric acid is recovered. Corrosion problems and restrictive pollution control legislation are also discussed. In the study outlined, a variety of materials for construction are employed, and extensive use is made of impervious graphite equipment. Data, diagrams, and equations are also provided.
[24261]

73-5009

Scrap collection in Eastern Germany. *Materials Reclamation Weekly*, 121(8):10, Aug. 19, 1972.
A law providing, for the collection, processing, and distribution of scrap iron and non-ferrous metals has been issued in the German Democratic Republic. Factories have been asked to make arrangements for the recycling of their scrap by delivering it to the authorities. Resmelting or re-utilization of scrap in the plant itself is banned. Scrap deliveries can only be carried out by firms and must be accompanied by a certificate of orgin. This is intended to prevent practice of scrap selling by factory workers who want to earn a little money on the side.
[24262]

73-5010

Scrap trade faces direct dealing. *Waste Trade Journal*, 68(42):1, Oct. 21, 1972.
This article discusses the effect of direct dealing on the scrap iron trade. Recently U.S. Steel purchased auto bundles directly from General Motors. Also, a former scrap broker has been recommending that steel mills buy their supplies directly from the producer and eliminate the scrap dealer. This is making many dealers worry since they are already having a difficult time making a profit because of the rising cost of scrap. Profit margins in the years before recycling were more substantial. The effect of aluminum can recycling on the old time aluminum scrap smelters is also discussed.
[24263]

73-5011

Segas helps free 'mini' steel mill of dirt. *Gas Journal*, 351(5,676):151-151, Sept. 6, 1972.
This article discusses the Sheerness Steel Co.'s construction of a 'mini' steel mill, the first of its kind in England's Southeast. It produces 180,000 tons of steel a year, is fed on scrap metal, and uses natural gas in the process. Production is carried out by a method known as continuous casting, using an electric arc furnace for the scrap melting process. This furnace and the process are described in detail and illustrated. The company believes it can run its works without atmospheric pollution. The entire plant will be run by about 180 to 190 people.
[24264]

73-5012

SHAW, J. M. Small foundry reclaims no-bake sand. *Foundry*, 100(11):46-48, Nov. 1972.

This article discusses no-bake molding, with sand reclamation, in the foundry industry. Essex Casting's plant is designed and equipped to produce gray and ductile iron castings for customers who need quick delivery of high-quality, complex castings for experimental purposes, service and replacement, and other limited-demand uses. Among the parts currently being produced are cylinder heads, blocks, and multicolored housings. Cost feasibility and plant layout studies are also discussed.
[24265]

73-5013

SOUCHA, A. Vyuziti prumyslovych odpadu ve vyrobe staviv a ve stavebnictvi. [Utilization of industrial wastes in the production of building materials.] *Stavivo*, 50(10):329-332, 1972.
Among industrial wastes, ash from power plants is in the first place by volume. This material can be used as an additive in brick making, as bonding material in concrete and mortar, in the manufacture of porous concrete, in road construction, in the manufacture of porous agloporite, in the manufacture of moulded brick, and in the manufacture of cement. The addition of fly ash to brick clay yields stronger and lighter bricks. Fly ash of proper quality will improve the chemical and physical properties of concrete and will save cement. Fly ash is used for the manufacture of porous concrete blocks in nine plants in Czechoslovakia. In road building fly ash is suitable as a filler, as base material, for insulation against cold, for irrigation, and for other purposes. Agloporit, a synthetic stone which is now manufactured in Czechoslovakia under licence, uses great quantities of fly ash and is suitable for the manufacture of insulation concrete, for moulding brick concrete, and for construction concrete of certain classes. Fly ash should be used in greater quantities in the manufacture of cement because of a shortage of blast furnace slag in Czechoslovakia. Up to 15 percent fly ash can be added to Portland cement. (Text in Czech)
[24267]

73-5014

SPETH, S. Aufarbeitung von polyaethylenrueckstaenden zu niedermolekukaren destillaten. [Reprocessing of waste polyethylene into low-molecular distillates.] *Chemie-Injenieur-Technik*, 45(8):526-529, 1973.
Waste polyethylene (from production and testing) can be readily converted into liquid low molecular weight distillates. The polyethylene is fed by means of a piston press into an agitator vessel previously charged with waxy waste products and heated to decomposition at about 400 C. No catalyst is required. The decomposition product is distilled off and can be further processed without difficulty. The heat required amounts to about 2 to 2.3 kw per kg of polyethylene. The results obtained with our pilot plant are in full agreement with those reported by Japanese researchers. (Text in German)
[24268]

73-5015

STRIBLING, J. B. A solution to the scrap tire problem. *Rubber Journal*, 155(3):40-42, 44-45, Mar. 1973.
Tires and tire products account for over 60 percent of the total consumption of rubber in the world. This represents a quantity of over 3 million metric tons annually. The United Kingdom produces some 30 million tires per year while in the United States, it is an astronomical 200 million. During its life of three years, the average tire loses about 15 percent of its weight, the balance being scrap at the end of this period. Linked to this industry, therefore, is a very considerable problem in scrap disposal. The continually growing dumps of scrap tires have stimulated the expenditure of much time and thought on methods of disposal. The following uses have been considered-retreading, reclaim production for new tires, use of rubber in road surfaces, as motor crash barriers, as artificial coastal reefs, and link matting. There remain two possible main alternatives- dump or destroy. Dumping requires great space; one ton of car tires occupies some 200 cu ft. Tire dumps are unsightly and house vermin. There is also a serious risk of spontaneous combustion with the corresponding difficulty of extinguishing fires once started. Tire destruction therefore becomes the only practical solution to the problem with some return on the credit side. Two conditions of incineration are possible- with sufficient and

restricted amounts of air. The Lucas furnace employs sufficient air and whole tires are fed in; rubber hydrocarbon content is quickly burned off; next the residual carbon is burned off and the bead wire and mesh skeleton is also reduced. The cyclone furnace is combined with a solid rotating refractory hearth to accept the entire tire or stack of tires, one after another. The mechanism of loading and hearth clearing is described along with the nature of the gas pattern inside the Lucas furnace.
[24269]

73-5016

SURFLEET, B., AND V. A. CROWLE. Quantitative recovery of metals from dilute solutions. *Transactions of the Institute of Metal Finishing*, 50(5):227-232, Win. 1972.
This paper describes a number of cell designs suitable for electrolytic recovery of metals from dilute solutions. The advantages include the possibility of quantitative metal recovery and the reduction of effluent treatment and sludge disposal problems and costs. Examples of available recovery systems for gold, silver, and tin are described. Extension of this principle to other metals is also discussed, using new types of cell designs. Extensive data, equations, and diagrams are provided.
[24270]

73-5017

System recovers zinc for re-use. *Water and Pollution Control*, 111(1):32-33, Jan. 1973.
Recovery and re-use of 600 lb of zinc per day is preferable to daily trucking of some 8,500 lb of zinc hydroxide sludge 160 miles. A treatment system is operated to neutralize acids and precipitate metal hydoxides from waste streams. The first step is to adjust the pH of all wastes to a uniform pH of 5.5 where zinc and other metals present remain in solution. Then the pH is raised to 8.8 to precipitate out zinc hydoxide. Because of zinc's amphoteric properties, addition of caustic beyond a pH of 8.8 would produce soluble sodium zincate and zinc would be lost from the process. An alarm is given if the pH is above 9.3 or below 8.2. In the second part of the process, filter cake is slurried with zinc chloride solution and treated with hydrogen chloride gas to convert zinc hydroxides to zinc chloride. Remaining tin, lead, and copper wil be precipitated and filtered out along with dirt particles and recovered zinc chloride solution will be returned to the plant for use in soldering flux. The second part of the process, still in the planning stage, will reduce sludge hauling and disposal costs to a bare minimum and reduce annual purchases of new zinc chloride.
[24271]

73-5018

TATE, R. C. Atchison report is a sharp-focus, wide-angle look at recycling. *Paper Trade Journal*, 157(8):41-43, Feb. 19, 1973.
The Atchison report, covering many aspects of waste paper recycling, carries out an exhaustive study of all problems related to waste paper recovery and reuse and provides a comprehensive reference to this area of interest. Some of the recommendations are: establishment of a recycling coordination center, preferably under the direction of the American Paper Institute; establishment of national recovery rate goals for future years; in depth studies to find cost saving procedures for every phase of recycling; research and development projects which might obtain federal funding; and the inclusion of paper recycling in paper technology courses. The report stresses the need for proper planning now with properly planned implementation of the plans soon. A number of systems are presented which are intended to improve the entire method of collecting and processing waste paper. The following areas are covered: economic problems, importance of price, need for reliable cost data, feasibility studies, and recycling organizations.
[24272]

73-5019

The cryogenic scrap process. *Secondary Raw Materials*, 10(11):22-23, Nov. 1972.
A scrap fragmentation process is described. It consists of a pre-pressing stage to obtain similar standard bundles with an automatic press; a tunnel stage to sprinkle the bundle with liquid nitrogen in order to bring carbon steel to its point of brittleness; the stage of fragmentation

to crush the bundle; and the sorting stage, to separate out the ferrous crushed pieces with electromagnetic equipment and foreign materials by suction, leaving non-ferrous material. Metallic refuse can be handled at the rate of 20 tons per hr. The main advantages of this cryogenic process are: the speed and cleanliness of the work; the high quality of the products obtained; the easy forwarding of old cars; the adaptability of the process for small and medium sized firms; safety; the limited attrition of equipment because of low temperatures; the low cost; and the effectiveness of the process for small mills and steel works.
[24200]

73-5020

Thermoset resins used for wood particle moulding process. *Europlastics Monthly*, 45(11):84-85, Nov. 1972.
The German Werzalit process was first introduced to the plastics industry some 15 years ago. Shredded wood particles are bonded with thermoset resins to form a variety of products-garage doors, ceiling tiles, etc., with a high technical finish to eliminate the need for repainting or revarnishing for maintenance purposes. A mixture of soft and hard woods are shredded to sliver-like particles without reducing fiber strength and then dried. Bonding of melamine and urea is used for waterproof applications. The mix is then moulded in the cold state. Final curing and surfacing is achieved at 150 C and 500-800 lb per sq m. Products are easily tailor-made and relatively cheap as the waste core material is cheap.
[24273]

73-5021

THILLAIMUTHU, J. A new solvent process for the manufacture of pulp. *Paper*, 1(12):786, Nov. 15, 1972.
A new process for manufacturing pulp from agricultural residues of the grass family is essentially a chemical solvent process, used with batch digestors, and provided with distillation units of special design. A water, miscible solvent, water, and chipped raw cellulosic materials are heated in a pressure digester. The desired cellulose is left unattacked at 100-130 C. Solvent and some water are distilled off and recovered for reuse. The residual straw is centrifuged and passed onto beaters and hydapulpers where the fibers are separated and adhering gelled constituents washed away. A patent application has been submitted for the process. Claimed advantages are: low cost of production because of the very high rate of recovery of the solvent; the solvent does not adversely affect pulp strength; the pulp is easily bleached; pulp yield varies with cooking time; solvent does not attack silica in plant tissues; recovered lignin can be utilized as fuel, plastic filler, wood adhesive, and for other uses; and recovered lignin can be used as animal feedstuff. Pretreatment may be necessary to dissolve out hydrocarbon soluble impurities that interfere with the process.
[24274]

73-5022

Voluntary recycling program succeeds at community level. *Plastics World*, 31(1):29, Jan. 1973.
The persistence of a group of concerned housewives has finally developed a voluntary recycling program with many repercussions. It has succeeded in substantially reducing the amount of a community's disposable waste. It was conceived in Wellesley, Massachusetts, as the Recycling Collection Center, spearheaded by Mrs. Martha Stone, to reuse materials to conserve resources and to reduce the load of the town's incinerator-landfill operation. Wellesley receives $20 per ton for recovered glass and $10 per ton for cans. A local firm donated a plastics grinder. The potential or recycled plastics was investigated by interested companies and institutions; soil drainage may be aided by mixed plastic wastes. A nearby firm blends plastics with metal and nonmetallics to produce several commercially successful sporting goods items and building products. Slide programs, newspaper articles, and house to house canvassing continue to spur new developments in the Wellesley program. Lunchline recycling-separation of plastics utensils, aluminum dishes, milk cartons and traysis underway at three of the community's elementary schools. Students as young as six are helping solve a community problem. Furthermore, the project is promoting

cooperation between industry and the community in the search for an ecologically acceptable solution to the solid waste problem.
[24275]

73-5023

Why swell the tide of pollution? Rheem Blagden's contribution to the environment. *Polumers, Paint and Colour Journal*, 162(3,832):508-509, Nov. 22, 1972.
This article discusses Rheem Blagden's contribution to the environment. This company is one of the major British manufacturers of new 45-gal steel drums and also the largest drum reconditioner in Europe. The drums collected by the company, which might otherwise be left to despoil and contaminate the countryside, are scrapped, crushed, baled, and returned to the steel mills. The reconditioning process for lightly contaminated tight-head drums and open-head drums is described in detail and illustrated.
[24276]

73-5024

Wood products industry established at Canberra. *Appita*, 26(2):86-87, Sept. 1972.
A full range of products is being produced at the $5 million integrated wood mill at IFPP Ltd at Canberra. The concept of full utilization of logs is employed. Each log supplies either plywood or kiln-dried sawed timber. Waste wood goes to wood chips while sawdust, plane-shavings, and other waste fire the steam boiler which provides heat for the dryers.
[24277]

73-5025

WYSOCKI, G. Recovers salable products from waste yeast. *Food Engineering*, 44(10):88-90, Oct. 1972.
Waste brewer's yeast is a valuable product handled by a recovery plant which treats 3,500 kg or 7,700 lb per hr of waste effluent with a yeast content of 13 to 16 percent solids. The system recovers ethyl alcohol, and converts a waste stream with a BOD of 200,000 mg per liter to high purity water. The recovered yeast can be used as cattle feed and the water may be used as process water or sent to the sewer or treatment plant. In the course of this process, the waste effluent passes through the plant equipment as follows from the brewery's fermenting and lager vessels, to the collection tank, to the plate evaporator, to the buffering tank now containing the yeast concentrate, to the roller dryers where the concentrate is dried to an 8 to 10 percent water content consistency. The water distillate is obtained from the plate evaporator and the water and ethyl alcohol are separated in the distillation column.
[24278]

SANITARY LANDFILL

73-5026

ARNST, F. Verfahrenstechnik Muelldeponie. [Procedure for sanitary landfill.] *Staedtehygiene*, 24(4):86-88, Apr. 1973.
The total refuse quantity in Germany amounts actually to 350 million cu m annually. Approximately 86 percent of the refuse is disposed of in sanitary landfills. There are several minimum requirements for sanitary landfills. The bottom of the site should be protected against penetration of polluted water by means of a clay layer of a thickness of up to 1 m. Bulky refuse should be compacted in such a manner that no hollow space promotes the formation of methane gas which causes bad odors and fires. Residential refuse can be deposited to a depth of 3 m without being covered by earth layers. The daily refuse layer should be 0.2 to 0.4 m thick. Fresh refuse should be mixed with already rotting refuse in order to provide for a sufficient air supply. Temperatures in the middle of the rotting refuse layer are between 50 and 60 C. The biological oxidation of the organic substances takes place not only in the surface layer but also in the inner refuse layers. Organic acids are oxidized and deodorized before being emitted into the open air. The rotting process is completed after 4 to 6 years. Then the composted substances can be separated from the unrotted material by means of screening. (Text in German)
[24279]

73-5027

BOND, R. G., AND C. P. STRAUB. Landfill. *In* Handbook of environmental control. v. 2. Solid waste. Cleveland, Ohio, CRC Press, 1973. p. 359-394.

This paper presents data, graphs, and illustrations on landfills. The topics covered follow: year of life left in landfills in 1966; sanitary landfill requirements; estimation of necessary landfill capacity; classification of disposal sites; nature of wastes acceptable for disposal; incineration and sanitary landfill volume reduction relationships; density of landfill cells; rules for construction on filled sites; operating costs of disposal by sanitary landfill; equipment required for landfill; cost of equipment operation; landfill site personnel; composition of gases produced from landfill refuse under various conditions; landfill and microorganisms; gases associated with landfills in water; materials leached from refuse and ash; leaching study of simulated landfills; and a summary of data on 51 sanitary landfills in California. Source material is provided for the data given. (This document is retained in the SWIRS library.)

[24280]

73-5028

Ein neuer Muellverdichter fuer Deponien. [New refuse compressing device for small sanitary landfills.] *U--das technische (1):47, Feb. 1973.*

A new refuse compaction device of a total weight of 12 tons has been developed which can be easily transported from one sanitary landfill to another. It is, therefore, especially adapted for utilization on several different sanitary landfills. Rammer foot rolls provide for the shredding and compressing of the refuse while a charging device can be used for distribution and grading of the refuse. As this compressing device can be transported without official authorization it is especially recommended for communities which have several sanitary landfills.

[24281]

73-5029

Sanitary landfills: the latest thinking. *Civil Engineering-ASCE*, 43(3):69-71, Mar. 1973.

An important result from the 1972 Engineering Foundation was that a documenting by research, field observations, hydrogeologists, engineers, and operators of sanitary landfills that leachate is not a significant problems in sanitary landfill management either in the United States or in Western Europe. There have been a few cases where leachate problems have occurred but the fault lay in the lack of engineer design. Soil is an excellent stabilizer of leached material, and contouring the bottom of the site and installing leachate collection devices minimize leachate problems. It is emphasized that concern must be given to handling methane gas generated in the sanitary landfills and to the milling of refuse before placing in the earth. A good public relations campaign aimed at regional public acceptance to new sanitary landfill sites and the concern regarding the handling of toxic and hazardous materials are also discussed in this article.

[24282]

73-5030

YAGOME, K., H. FUTAMI, AND S. DOBASHI. Gomi umetatechi chosa ni okeru kosatsu. [Remarks on the sanitary landfill survey.] *In* Proceedings; 16th National Environmental Sanitation Meeting, Niigata, Oct. 19-20, 1972. [Tokyo], Japan Ministry of Health and Welfare, Environmental Sanitation Center. p. 49-51.

A survey on sanitary landfill was conducted by the Japan Environmental Sanitation Center. Samples of wastes used for land reclamation were collected by pit (power shovel) method and boring method. The former was adopted for layers less than 3 m, the latter for deeper than a 5 m layer, collecting over 30 kg, or at least 10 kg samples. The result of four surveys showed that although there was no significant difference seen by the depth of layer, there were differences according to the conditions of landfill. Kitchen garbage is completely broken down after 1 to 2 years. However, if it is wrapped in plastic bags, it remains just as it was undecomposed even after 5 to 6 years, clearly recognizable as kitchen garbage. The liquid seeping out of reclaimed layers and gases issuing from them were studied also. The analysis of these samples is influenced greatly by the sample taking method, handling of earth and sand adhered to

the samples, and method of distinguishing such earth and sand. Much more research must be done on what happens to the landfilled wastes, to see what changes occur, depending upon the years, depth of layers, and utilization of such reclaimed land, as not much has been done in these areas, considering that 34 percent of wastes in Japan is dealt with by landfill. (This document is retained in the SWIRS library.) (Text in Japanese)
[24283]

SEPARATION

73-5031

BOND, R. G., AND C. P. STRAUB. Size reduction, separation, and compaction. *In* Handbook of environmental control. v. 2. Solid waste. Cleveland, Ohio, CRC Press, 1973. p. 302-319.
This paper presents data and graphs on size reduction, separation, and compaction of waste. The topics covered follow: solid waste size reduction equipment (hammermills, drum pulverizers, wet pulpers, rasp mill, shredders); effects of new equipment and potential applications to municipal solid waste; summary of compatibility of size reduction output, particle-size capabilities, and separation process particle-size requirements; summary of experimental runs milling combined refuse; adjusted cost per ton versus grate size; guide for estimating commercial grinder capacity in kitchen uses; properties of heavy organic liquids used in heavy media separation; and nominal particle size capacilities for size reduction and separation processes. Source material is provided for the data given. (This document is retained in the SWIRS library.)
[24284]

73-5032

Dispositif de traitement de dechets et de recuperation de fibres. [Apparatus for the treatment and recovery of fiber wastes.] French Patent 2,080,786 owned by Black Clawson Co., Inc. Issued Nov. 11, 1971.
Process for the recovery of fibrous materials from domestic refuse containing paper and other fibrous materials, nonfibrous organic, and inorganic materials, is described. Fragile components are comminuted to particles with sizes below a definite value by hydraulic and mechanical forces in a vat into which a mixture of the domestic waste with water is admitted. The inorganic component of the resulting sludge is quantitatively separated by centrifugation. Nonfibrous organic materials are dissolved by the addition of a chemical agent, and fiber is recovered by successive straining after which the fibrous material is deinked and sterilized. (Text in French)
[24285]

73-5033

EISENEGGER, E. B., AND H. P. HEFERMEHL. Procede pour le sechage de dechets a forte teneur en humidite provenant d'etres vivants. [Moisture extraction from high-moisture human and animal wastes.] French Patent 2,083,952 owned by Gebruder Buhler AG and H. P. Hefermehl S. A. Issued Dec. 17, 1971.
Procedure for the dehydration of human and animal sewage with an initial moisture content of 80 to 90 percent is described. The procedure is suitable for dewatering and drying material mechanically separated from liquid manure and slaughterhouse waste effluents following mechanical separation of solids. The waste water is fed into a continuously operating extraction press to reduce the water content to 40 to 50 percent. The waste is subsequently fed by conveyor belt to a hot air dryer operating with closed circuit air flow with a minimum temperature of 150 C, periodically replenished with fresh air to remove further moisture down to 8 to 20 percent, preferably to 15 percent. The inner surface of the dryer walls is scraped to remove adherent sewage particulates. The process is continuous with no time lapse between each stage. (Text in French)
[24286]

73-5034

Perfectionnements apportes au fonctionnement d'un separateur centrifuge. [Improvements on a centrifuge.] French Patent 2,090,449 owned by Alfa-Laval AB. Issued Jan. 14, 1972.

A sludge centrifuge equipped with adequate control mechanism for the gradual, partial, or total removal of sludge and liquid from the centrifuge during operation is described. The centrifuge is provided with several openings in the periphery of the rotor which can be opened and closed during operation. Sludge and liquid can be removed from the centrifuge through these openings while the centrifuge is in motion provided the rotor imbalance is kept below a certain limit. Sludge removal is instantaneously stopped by a control device as soon as rotor imbalance exceeds a certain limit. Liquid fed into the centrifuge is shut off prior to sludge removal. (Text in French)
[24287]

73-5035

Procede et appareil pour degazer les liquides. [Process and apparatus for deaeration.] French Patent 2,091,248 owned by Autometrics Co. Issued Jan. 14, 1972.

Process and apparatus for the extraction of gas from inorganic suspensions and from liquids in general are described. The apparatus is composed of a tank, and another chamber with round cross section and with one inlet and outlets for the liquid and the gas. The latter chamber, located inside the tank, is rotated around the vertical axis of the latter. The inlet of the tank communicates with the interior of the tank at a height below the normal liquid level in the tank. A vacuum system communicates with the chamber gas outlet for evacuating the gas and for maintaining reduced pressure inside the chamber. The removal of gases from the liquid is due to centrifugal forces. (Text in French)
[24288]

73-5036

VON DER CRONE, G., AND H. FRICKE. Raffinage de mitraille. [Refining scrap metal.] French Patent 2,090,120 owned by Vereinigte Deutsche Metallwerke Aktiengesellschaft. Issued Jan. 14, 1972.

Process for the recovery of high-melting alloy scrap, especially of copper and nickel, which are contaminated with weld metal such as lead, tin, and zinc, is described. The scrap is heated in vacuum furnace at a temperature sufficient for the melting and evaporation of the low-melting impurities, but not for the melting and evaporation of the scrap proper. After the oxidized impurities are eliminated, the scrap is made molten immediately, without intermediary cooling. (Text in French)
[24289]

SLUDGE

73-5037

AINSWORTH, G. Sludge treatment-the current trends. *Process Biochemistry*, 8(1):11-14, Jan. 1973.

The treatment of sewage and related organic industrial effluents consists of the separation of solids from water and the conversion of dissolved and colloidal substances to a biological sludge. Air flotation, electrolytic flotation, or disc centrifuging can improve thickening (a sludge dewatering process) which functions more efficiently at high solids concentrations. Other engineering techniques, including thermal and chemical conditioning, assist in dewatering. These two processes use belt-press filters, pressure filters, rotary vacuum filters, and centrifuges to dewater sludge. A recently published report of a government sponsored committee indicated that with proper controls, sludge disposal in deep water in one particular area was unlikely to cause unacceptable changes in the environment. To meet the problem of sludge handling the community must realize that the processes adopted by man for the treatment and the disposal of wastes will affect the environment. The community must also be prepared to pay the cost of recycling suitable organic wastes; otherwise, sludge treatment and disposal methods will increasingly be directed to destruction and/or dumping. There is a table which summarizes the methods of sludge treatment and disposal currently available.
[24290]

73-5038

Appareil servant a melanger un gaz avec un liquide. [A device for mixing a gas with a liquid.] French Patent 2,083,109 owned by Sanitary Disposal Systems, Inc. Issued Dec. 10, 1971.

Apparatus for mixing gas and liquid such as used in waste water treatment plants for aeration is described. The mixer consists of a vessel with a single continuous wall extending upwards from its bottom to above the liquid level in the vessel for dividing the liquid into an inner and an outer mass, an inlet for the liquid, and a gas inlet placed so that the gas (oxygen) is introduced into the inner liquid mass near the lower end of the wall in order to cause liquid circulation in the inner liquid. The circulating liquid moves from the bottom to the top in a first cycle, and from the top to the bottom in a second cycle. The continuous wall dividing the liquid into an inner and an outer mass tapers off conically from the bottom to the top of the vessel. (Text in French)
[24291]

73-5039

BOND, R. G., AND C. P. STRAUB. Wet-air oxidation. *In* Handbook of environmental control. v. 2. Solid waste. Cleveland, Ohio, CRC Press, 1973. p. 537-543.

This paper presents flow diagrams, graphs, and data on wet-air oxidation. The topics covered include the following: typical continuous system for liquid wastes (flow diagram); time-temperature effect on the degree of oxidation; oxidation curves of five aqueous fuels; summary of typical operating conditions for several sludge oxidation plants; equipment for wet oxidation process; U.S. wet-air oxidation installation, 1970; and typical characteristics of primary activated sewage sludge. Source material is provided for the data presented. (This document is retained in the SWIRS library.)
[24292]

73-5040

KARNOVSKY, F. Die Beseitigung des Rechengutes im Klaerwerk Muenchen-Grosslappen. [Removal of material retained on screens of the sewage treatment plant at Muenchen-Grosslappen. *Abwassertechnik*, 23(Special Issue IFAT):27-29, 1972.

It has been decided at Munich that the material which is collected on screens of the sewage treatment plant should be burnt together with domestic refuse in the incineration plant. For this purpose it is necessary to dewater the material to 50 or 60 percent water content. This is effected by means of three presses having a throughput of 2 to 2.25 cu m at a water content of 85 to 95 percent. The presses consist of a low and a high pressure bucket in which the pressure piston moves. The device is completed by a post dewatering chamber. From a feeding inlet the material to be dewatered falls into the low pressure bucket. At a pressure at 40 atmospheres the refuse is pre-dewatered and then fed into the high pressure bucket where the pressure can be raised to 200 atmospheres for about 30 seconds. In the post dewatering chamber five to six charges are compressed together so that an optimum dewatering effect is obtained. (Text in German)
[24293]

73-5041

KO, S. C., AND L. DUCKSTEIN. Cost-effectiveness analysis of wastewater reuses. *Journal of the Sanitary Engineering Division--ASCE*, 98(SA 6):869-881, Dec. 1972.

This paper applies a cost-effectiveness approach in order to compare alternative schemes for reusing treated sewage effluents. This approach was used to help solve the problems of finding alternate wastewater reuse schemes for Tucson, Arizona, and cities with similar problems. Computers were not used in this study because it was relatively simple. The step by step approach for cost-effectiveness studies is discussed in detail and seven advantages of this approach are outlined.
[24294]

73-5042

LESCHBER, R. Klaerschlammbehandlung und -beseitiqung. [Sewage sludge treatment and removal.] *Schriftenreihe des Vereins fuer Wasser-, Boden- und Lufthgiene*, (38):185-193, 1972.

Sewage sludge can be treated by four different methods. The stabilization method is based on the aeration of sludge and the decomposition of the organic substances by aerobic microorganisms. After a period of about 10 days no bad odor emissions can be noticed. Sludge conditioning is

affected by adding flocculation and filter agents like iron and aluminum salts, ash, or organic polymers. As the sludge contains about 90 percent water, a volume reduction of the sludge is a prerequisite to reduce transportation costs. The first step to reach this purpose is the thickening of the sludge by means of flotation or graviation thickening. After thickening the sludge is dewatered and dried either by natural processes like drying in lagoons or sludge deposit sites, or by artificial methods like filters, centrifuges, and drying devices. In order to destroy parasites and pathogen germs, the sludge is submitted to disinfection methods like composting or thermal drying processes. After treating the sludge in the described manner it can either be deposited together with refuse or incinerated after dewatering. Another economic method to dispose of sludge is its utilization as a soil improving agent in agriculture. (Text in German)
[24295]

73-5043

Mit Strahlen gegen Klaerschlamm. [Rays against sewage sludge.] *U--das technische Umweltmagazin*, (1):48, Feb. 1973.
In the Federal Republic of Germany the sewage sludge quantity to be disposed of annually will amount to 38 million cu m by 1985. This requires investment costs of more than five hundred million deutsche marks. Pasteurized sludge could be used as fertilizer for agricultural purposes. A new method to sterilize sludge has been developed by Siberian scientists. By means of a new type of electron accelerator whose dimensions are smaller but whose capacity is higher than that of the common accelerators which are used in food industry, about 10 cu m of sewage sludge can be sterilized per hr. Pasteurization by means of the Soviet method will cost about 2 to 4 deutsche marks per cu m, while the disposal of sludge by means of incineration or thermal sterilization costs from 10 to 70 deutsche marks per cu m. (Text in German)
[24296]

73-5044

PLOOS VAN AMSTEL, J. J. A. Slibverwerking door oxydatie bij hoge temperatuur en druk. I. Achtergronden en mogelijkheden van het hogedruk Zimmerman-procede. [Sludge treatment by high temperature oxidation under pressure. I. Background of and possibilities for the high-pressure Zimmerman process.] *DeIngenieur*, 84(47):G31-G36, Nov. 24, 1972.
The high-pressure Zimmerman sewage sludge treatment method, and related model experiments aiming at improving the above process, are described. The Zimmermann process is a method of sewage sludge treatment by which the sludge is oxidized in a liquid water phase in the presence of air at temperatures of 220 to 300 C and pressures of 60 to 125 atmospheres. The largest sludge treatment facility adopting the Zimmerman process is in Chicago. It is composed of 20 m high reactors, and has a capacity of 200 tons of dry matter daily. The residence time of the sludge in the reactor is 45 minutes. Partial heat and pressure recovery is applied. Efficiency is about 80 percent. Model experiments with small-size reactors revealed the possibility of developing much smaller reactors than those currently applied in practice, primarily through the application of counterflow, and increasing oxygen excess coefficients up to 30 percent. Decrease in the necessary residence time and the oxygen excess coefficient was established. (Text in Dutch)
[24297]

73-5045

Procede et appareillage pour le traitement des boues. [Process and equipment for sludge treatment.] French Patent 2,078,673 owned by Kurita Water Industries, Tokyo, Japan. Issued Oct. 5, 1971.
Process and equipment for treatment of sewage and industrial waste water sludge is described. The sludge is treated with anionic or cationic organic coagulants such as water-soluble polymers containing amino, imino, and quaternary ammonium radicals, polyvinyl pyridine salts, polyethylene imine, polycondensates of amine-epichlorhydrine, or aniline-formaldehyde, vinyl benzylammonium compounds, groudron, pitch, polymers and copolymers of acrylonitrile and acrylamide, or substances obtained from the partial hydrolysis of water-soluble polymers and copolymers of acrylic and methacrylic acids. The

sludge thus treated is rapidly dewatered by distribution on a filter material composed of fine sand and powdered carbon and charcoal with a particle size range of 0.1 to 10 mm. Within 40 minutes after being distributed on the filter material, the sludge is removed together with the surface layer fo the filter material. The dewatered sludge and the layer of filter medium removed can be incinerated. (Text in French)
[24298]

73-5046

Procede pour reduire la teneur en phosphore d'une boue. [Process for the reduction of the phosphorus content of sludge.] Swiss Patent 511,771 owned by FMC Corporation, San Jose, California. Issued Oct. 15, 1971.
Process for the reduction of the phosphorus content in an activated sludge to be recycled in a waste water treatment plant is described. The watery suspension of the recovered sludge concentrate is mixed with an acid to adjust the pH value between 4 and 6.5, in such a manner that the phosphorus compounds associated with solid particles in the suspension are rendered water-soluble. The acidified aqueous suspension is separated into an aqueous fraction with reduced suspended matter content and increased suspended matter content. The latter sludge suspension is mixed with at least equal volume of an aqueous medium with reduced phosphorus content. An effluent with reduced solid content and of a volume at least equal to that of the aqueous medium having been added for dilution is separated from the diluted sludge concentrate, while the remaining sludge concentrate, ready for recycling for waste water treatment, contains less than 25 percent of phosphates relative to the suspended matter content. (Text in French)
[24299]

73-5047

Reisiger Staubsauger zur Seereinigung. [Enormous vacuum cleaner for lake purification.] *Die Technik*, 28(4):271, Apr. 1973.
A new method to clean polluted lakes and rivers has been developed in Sweden. A suction dredge which works like a vacuum cleaner pumps sludge and sedimentation substances into dammed parts of the lake from where the water flows back into the lake through cleaning equipment which eliminates the phosphate. From a heavily polluted lake in Sweden of a total surface area of 700,000 sq m, more than 450,000 cu m of sludge have been removed. If the sludge does not contain mercury or other toxic substances, it can be used as soil improving agent. (Text in German)
[24300]

73-5048

STRAUCH, D. Hygienische Gesichtspunkte der klaerschlammbehandlung. [Hygienic problems of sewage sludge treatment.] *Staedtehygiene*, (1):3-8, Jan. 1973.
Despite their pretreatments, sludges0 including fresh sludge, anaerobically or aerobically stabilized sludge in liquid, dewatered, or naturally dried form, and chemically conditioned sludge-still contain pathogenic microorganisms. Therefore, such sludges have to be disinfected before they are used in agriculture, horticulture, or forestry. There are various methods to undertake a reliable sterilization. Good results have been obtained in Sweden by adding caustic lime to the sewage sludge which raises the temperature up to 70 C which guarantees a disinfection of the sludge. Also the application of the usual composting methods leads to a reliable disinfection of sludge. Drying of the sludge in rotary furnaces is not sufficient to destroy all pathogenic germs, an aim which however is achieved by applying a pasteurizing method. The sludge is heated up to 70 C and then kept for 30 minutes at this temperature, so that at the end of this period even pathogenic gut germs are destroyed. Recently tests conducted in Switzerland with gamma rays showed that sterilization can be obtained by applying a ray dose of 300 kilorads. (Text in German)
[24301]

73-5049

Surfacing helps centrifuges fight pollution. *Welding Journal*, 51(11):782-783, Nov. 1972.
This article discusses the Sanitation Districts of Los Angeles County's waste utilization program. As part of its water pollution control efforts, the

organic solids removed in its system are converted into fertilizer. The equipment and process used are described in detail. Countless gallons of effluent pour into the ocean waters off the Southern California coast daily. The fact that there are few problems with water pollution and dirty beaches can be ascribed to the removal of large solids by the centrifuges described herein, and to the surfacing process which keeps them operating at full efficiency.
[24302]

STREET CLEANING

73-5050

LEIBFRIED, T. Kleinkehrmaschinen. [Small sweeping machines.] *Staedtehygiene*, 24(4):100-101, Apr. 1973.
A new sweeping machine which is especially maneuverable has been developed for cleaning streets and squares. The rubbish from the streets is thrown into a refuse container by means of a centrifugal roll provided with brooms. A disc broom on a swivel arm serves the purpose of cleaning house walls and chutes. The swivel arm with disc broom as well as the sweep roll are operated by means of separate motors while the motor of the vehicle itself is mounted behind the driver in the highest position of the vehicles so that the combustion and cooling air for the motor is free of dust. The refuse container has a net load of 1 cu m and is closed by means of a simple cover on top. Emptying of the container is effected by means of tipping. Replacement of the ten sweeps can be done within 10 minutes. (Text in German)
[24303]

TRAINING, EDUCATION, AND PUBLIC RELATIONS

73-5051

SUTTON, G. F. Regional planning decisions: population distribution and citizen participation. *In* Proceedings; Regionalized Solid Waste Management Conference, Newton, Massachusetts, June 1-2, 1972. University of Massachusetts at Amherst, and Massachusetts Department of Community Affairs. p. 80-86.
This paper discusses the social context of regionalization of solid waste management. The points which are covered include: the urbanization of the population of the West; urban institutions having penetrated all geographic areas of the land; the expanding Federal role which comprises intervention at the local level; and the participation of citizens whose interests are affected by Federal programs. It is concluded that more effort is required at both the Federal and the State levels of government in systematic social planning to deal with the problems of regionalization. (This document is retained in the SWIRS library.)
[24304]

TRANSPORT

73-5052

Aktuelle Seite. [Refuse transportation.] *Staedtehygiene*, 23(12):VII, Dec. 1972.
A new method to transport refuse into a refuse treatment plant without using bins as storing places has been developed by Messrs Mayfran. A big hall which is open at its long side serves as the collection place, where the collection trucks empty the refuse quantities. The refuse is continuously fed onto a Mayfran line which is assembled in the bottom of the hall and which for the first ten m runs horizontally so that this whole length can be utilized for charging the line with refuse. Afterwards the line inclines by 40 degrees to the required height. From there the refuse goes to the incineration plant. If the incineration plant is completely charged the line stops and serves as storing bin for as short time. The capacity of this Mayfran line is laid out for 50 cu m per hr. (Text in German)
[24305]

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AGRICULTURAL WASTE

73-5054

BATES, D. W. Dairy waste management systems. *Journal of Dairy Science*, 56(4):495-499, Apr. 1973.

Odor control and waste disposal are the two interrelated major problems facing the dairy industry. There is no practical solution at present for odor control other than proper manure handling and disposal. Manure handling systems may range from a gutter cleaner and daily hauling with a manure spreader to extended storage in concrete tanks under slat floors. Daily hauling requires less investment but more labor. It is a practical method for a small farm. Warm or cold free-stall slat housing requires greater investment in construction of the barn and ventilation that must be provided to control odor due to manure storage. Variations of these two waste handling systems are discussed by the author. Waste heat produced in the barn or storage tank prevents the manure from freezing in cold climates.

[24306]

73-5055

CROSS, O. E., A. P. MAZURAK, AND L. CHESIN. Animal waste utilization for pollution abatement. *Transactions of the American Society of Agricultural Engineers*, 15(1):160-163, Jan.-Feb. 1973.

The objectives of this research were: 1) to determine the maximum allowable rate of applying livestock manure to cultivate crops without surface or underground water pollution; 2) to determine the magnitude of this pollution; 3) to determine the changes in the physical and chemical properties of the soil resulting from high rates of manure application; and 4) to determine the effects of very high application of manure on crop production. In conducting this experiment four rates of manure per acre were applied, and the farm was irrigated after the manure was plowed under. Pollution potential was measured in terms of nitrate nitrogen, sodium, electrical conductivity, and potassium. The result indicates that electrical conductivity and potassium levels were high enough to exclude potable use of the runoff water, while the underground water was considered safe for irrigation as well as for potable use. The physical condition of the soil may deteriorate if heavy application is done year after year. Heavy application of manure reduces crop yield compared to moderate application (e.g. 260 tons per acre decreased yield compared to 40 and 120 tons per acre.)

[24307]

73-5056

DALE, A. C. Solids-liquid separation: an important step in the recycling of dairy cow wastes. *Journal of Milk and Food Technology*, 36(5):289-295, May 1973.

Use of a solids-liquid separator in the management of dairy cattle wastes may reduce labor requirements, make mechanical handling more feasible, improve automation, produce solids with economic value, and produce a liquid that may be handled by ordinary equipment and

treated to produce potable water and fertilizer. In solids*iquid separation of dairy cattle wastes&* macro-colloidal, that is, larger than 5 microns, and larger solid particles are partially removed from the liquid portion by screens, sieves, and compressors. The two products produced are wet solids and a dilute liquid. The solids contain about 45 to 80 percent water depending on the systems used and are stable in nature. The solids have little or no odor and may be dried and used for bedding, refeeding, or mulch, thus having economic value. The liquid is dark brown in color and contains about 85 to 90 percent of the BOD and only about 1 to 3 percent suspended and dissolved solids. It may be handled by ordinary pumps and tractors and spread directly on crops and soils. There is included in the article a list of separators on the market with a brief description of each unit and suggestions for how to incorporate such equipment into existing manure handling systems.
[24308]

73-5057

SAVERY, C. W., AND D. C. CRUZON. Methane recovery from chicken manure digestion. *Journal of the Water Pollution Control Federation*, 44(12):2349-2354, Dec. 1972.
Due to the serious environment problems associated with the large concentrations of manure produced by poultry raised in confinement, the idea of being able to use chicken manure to produce methane and use it as a source of fuel is attractive. This paper discusses the design of an anaerobic chicken manure digestor and the experimental method used to produce methane from chicken manure. The result indicates that 130 liters of gas, 69 percent of which was methane, was produced per kg of wet manure. The authors conclude that due to strict pollution controls on poultry farms, it is economically feasible for a poultry farm to invest in an anaerobic digestor to produce methane to provide energy for the farm and to control pollution.
[24313]

73-5058

SHINKAWA, K., H. HOSODA, S. MITSUI, K. ISHIBASHI, Y. NODA, AND U. YAMOTO. Tonfun no ryudo tanka ni kansuru keakyu. [Converting hog manure into carbon by distillation.] *Sangyo Kogai*, 9(5):473-475, May 1973.
Hogs excrement from a feedlot was dried in a kiln so that its water content was reduced to approximately 9.3 percent; then distillation took place at over 300 C, and mixing took place at 80 rpm. The waste gas was discharged after going through a dust collection chamber. Using a heater, the kiln was heated so that inside temperature was around 200 C; then the manure0 5 to 6 kg--was charged. When it responded to the heat, the heater was turned off (at about 260 C), keeping the inside temperature with constant temperature air and controlling the temperature by adjusting the feeding of manure. Volatile matter is quickly lost. The maximum yield of carbon was more than 30 percent. Hog excrement thus carbonized in the kiln was good material for activated carbon. There is one kiln at an agricultural cooperative in Ibaragi Prefecture operating full scale. (Text in Japanese)
[24314]

73-5059

TAYLOR, J. Protein without pollution. *Engineering*, 212(11):1081-1083, Nov. 1972.
The author describes a method of drying poultry manure developed by Douglas-Rowson, Ltd. The dried manure, which is 27 percent by weight of the wet manure, is 38 percent protein, and can be used both as fertilizer and feed additive. The author claims that a new profit of 8 pounds sterling per ton can be achieved by processing the poultry manure and utilizing it by this method.
[24312]

ANALYSIS OF SOLID WASTE

73-5060

BEITZ, L., AND U. JECHT. Einsatzmoeglichkeiten der Roentgenfluoreszenzanalyse fuer den Umweltschutz. [Application of X-ray fluorescence analysis for environmental protection.] *Siemens-Zeitschrift*, 46(5):369-373, 1972.
X-ray fluorescence analysis is purely physical method. Liquid pasty or solid samples are irradiated with a high-capacity X-ray tube.

Through interaction with the atoms of the sample the primary spectrum is converted into a characteristic fluorescent line spectrum. The wave length of the spectral lines are characteristic of the various elements in the sample; the intensity of the lines yields information on the concentration. Concentrations from 100 percent to the ppm range can be determined. The detection limit for most elements is between 0.1 and 10 ppm. Through preceding enrichment trace elements in concentrations as low as about 0.1 microgram can be measured. This is a sufficiently low concentration for analyzing trace elements in air and water. The reproducibility of the method is plus or minus 0.1 percent (relative) and the accuracy is plus or minus 2 to 5 percent. Detection limit, reproducibility and accuracy depend considerably on the sampling time, which differs from element to element. On the average sampling lasts 40 seconds each time. X-ray fluorescence analysis is very suitable for the analysis of sodium, magnesium, potassium, phosphorus, calcium, copper, iron, lead, and arsenic in plant material, for sulfur, phosphorus, lead or arsenic in air samples and in waste water samples. (Text in German)
[24315]

73-5061

IWAI, S., K. HARUYAMA, H. TAKATSUKI, AND T. IRIE. Seihin seisan tokei kara mita toshi gomi sosei. [The composition of city wastes from standpoint of production statistics.] *Kankyo Gijutsu*, 2(3):162-173, Mar. 1973.

The estimation of the composition of general household wastes in Japan from the standpoint of production statistics was attempted in this study. The results were compared with actually measured waste composition in various cities. As a result, by close investigation and examination of the production statistics, the data which are useful in knowing the qualitative and quantitative tendency of wastes in Japan were obtained. Particularly in cases where the future of the changes in the amount and composition of wastes is predictable and the analytical values of the composition of wastes in each city are verified, this method is effective as a method by which approximate values are obtained. The results showed that for the whole country the percent of paper waste was 33.2, plastic waste 12.0, glass 10.7, and animal and vegetable trash 9.6. For the city of Tokyo percent of paper waste was 32.1, plastic waste 13.8, glass 11.9; and animal and vegetable trash 15.5. Although only household wastes were treated, it is believed that this method is also applicable to the estimation of the amount and the quality of industrial wastes. To more precisely make a comparison of the analytical values of wastes in each city it is necessary that the classification of the wastes disposed of by Public Cleansing Bureaus in each city be made clear. (Text in Japanese)
[24316]

73-5062

KURIHARA, S. Seikatsukei kotai haikibutsu no dejo to sono shori no kosatsu (12). [*Composition of domestic refuse and its treatment (12).*] *Yosui to Haisui*, 15(5):569-572, May 1973.

The result of survey on composition of city wastes made in eight big cities, nine medium-size cities and sixteen small cities is shown, as well as comparison between Hokkaido Prefecture, Kanagawa Prefecture, Yokohama City and Okayama Prefecture. There is no significant difference between big and medium cities, but in small cities, kitchen garbage increases slightly. The comparison among three prefectures and one city showed industrial area had the most combustible wastes (43.2 percent), followed by commercial area (37.6 percent). Fisheries area had the most putrescible wastes (58.2 percent), followed by agricultural area (50.0 percent). Residential areas were responsible for more plastic wastes (8.9 percent), followed by fisheries (8.3 percent), and commercial area (7.7 percent). Industry was responsible for most non-combustible wastes (22.0 percent), residential area (20.0 percent). Future forecast anticipates combustible wastes and plastic wastes to increase year after year, but kitchen garbage and non-combustible wastes would decrease. The trend in composition of wastes in Britain and West Germany is introduced. (Text in Japanese)
[24317]

73-5063

Protein concentrate from rape-seed. *Chemical Processing*, :15, Sept. 1972.

Alfa-Laval A.B. working in collaboration with A.B. Karlshamner Oljefabriker have developed a pilot plant in Sweden which manufactures oil and high protein concentrate from rape-seed. Rape-seed, up until now, has been grown for the extraction of nonedible oil with the result that valuable protein was being lost. The concentrate produced in the pilot plant from rape-seed contains approximately 60 percent protein. Rape-seed is a better source of protein than soya. The use of rape-seed protein could reduce the incidence of many deficiency diseases. The use of rape-seed protein is intended as an addition to the ordinary diet, not as a 'meat substitute'. Further development of the process plant and extensive testing of the protein on rats and dogs is necessary before marketing the product.
[24311]

AUTOMOBILE

73-5064

Shredder gegen autowracks. [Shredder for old cars.] *Das Technische Umweltmagazin*, (3):36-37, June 1973.

More than a million cars will have to be disposed of this year in West Germany. By 1975 the number will have risen to 1.3 million, by 1980 to 1.6 million. Bavaria possesses a larger shredder plant in Ebenhausen near Ingolstadt. Its construction was supported by state means. Bavarian authorities are aware of the fact that more shredders are required. They have asked the Battelle Institute in Frankfurt to furnish a report concerning future car junk accumulation and to pinpoint suitable erection sites for shredders. Shredder scrap consists of fist size pieces which are cleaned of all contaminants such as plastics and paint. All metal has been separated as well. The scrap can go to a furnace for melting. (Text in German)
[24318]

73-5065

TEIKOKU SANSO, K. K., AND TEZUKA KOSAN K. K. The inch scrap method--the low temperature crushing method for junk cars.] Tokyo, Jan. 12, 1973. 7p.

The 'Inch Scrap' crusher, which was developed by George (Belgium), Klockner (West Germany), and L'Air Liquide (France) Companies and which is being promoted in Japan by Teikoku Sanso K.K. and Tezuka Kosan K.K. is introduced. The method improves the manual, press, or crushing method of junk car treatment; the consumption of electricity is relatively small, and the separation of metals and waste material is easy. The system is composed of the press, the cooling tunnel, the crusher, the selector, the eliminator, and the Tezuka waste treatment system. The capacity is 20 ton per hr (20 to 25 cars per hr); the liquid nitrogen consumption is 400 liters per ton of iron scrap; electricity consumption is 830 kw per hr; the space requirement is 5,000 sq m; and the total system installation cost estimate is 440,000,000 yen. Scrap products are 720 kg of iron per 1 ton of junk car material, separated into groups by size. The copper content is less than 0.05 percent and paint or oil residue is almost none. Copper, aluminum and alloy products are 90 kg per ton of crude material, copper is approximately 5 kg. Waste produced is approximately 180 kg per crude material, and consists of rubber, plastic, glass, oil, paint, and sand. (The treatment process is not given.) Text in Japanese) (This document is retained in the SWIRS library.)
[24319]

BULKY WASTES

73-5066

GLOVER, D. E. What to do with old docks. *Institution of Civil Engineers Proceedings*, 54(Part I. Design and Construction), 221-222, Feb. 1973.

Land values might vary by a factor of 15 if the land could be used for commercial rather than residential development. The relative balance of water and land areas can influence land value or usage. The problem of how to dispose of old docks was discussed in the article. They could be converted into yacht marinas or, if a development planned for old docks demanded more land than was naturally provided, old buildings could be demolished or water areas reclaimed. If old docks are filled in, using filling directly on silt

layers which are always found at the bottom of docks, the problem of settlement occurs. Demolition of old stone or brick buildings on abandoned docks was approached from the standpoint of explosives, but much planning in the area of safety is required. In the United Kingdom, as well as in many other areas, docks are often woefully obsolete, and yet plans for their conversion are painfully slow to execute. Perhaps the sites could be used for exhibitions or other events requiring open space, until their conversion is accomplished. It was pointed out that with the current use of bulk handling and containerization, it is very difficult to reconstruct old docks for modern cargo handling methods.
[24320]

73-5067

Specially designed vehicle will take your dead yak. *Solid Wastes Management/Refuse Removal Journal*, 16(2):46, 73, Feb. 1973.
In New York a specially designed van for hauling dead animals is part of the regular sanitation fleet. The truck, designated the 'offal' truck, can handle large carcasses of such animals as horses, small whales, yaks, llamas, and other zoo, circus, draught, and pet animals that die in the city every year. The vehicle, which looks something like a moving van, is provided with a winch and steel cable. The cable is drawn around the hind quarters of the carcass, and the winch hauls the body into the truck. It is then disposed of at the Spring Creek Park landfill. Any call for the truck is checked out ahead of time to avoid answering crank calls. The only animal that cannot be handled in the truck without pretreatment is a full-grown elephant; it must be sawn in half. Most cities rely on private contractors to remove such large carcasses from streets and private properties.
[24321]

COLLECTION

73-5068

Concrete trash cans make debut in New York City. *Solid Wastes Management/Refuse Removal Journal*, 16(2):50, Feb. 1973.
Times Square in Manhattan is now adorned with 25 new concrete trash receptacles warning the populace not to write on or steal them. The local Environmental Protection Agency plans to place 60,000 of these containers throughout the city. The containers are hexagonal with a hard plastic cover which can be opened to remove a plastic bag liner. These bins are the result of a 2-year study to find a way to replace the old wire baskets, in use for 25 years. The old baskets frequently were stolen and held trash inadequately. Whereas the purchase and maintenance of the new receptacles would have cost an estimated $11.5 million over the next 5 years, the local Environmental Protection Administration expects minimal expense, because a contract has been negotiated which will provide the containers free from a Florida firm in exchange for the right to sell advertising on the sides of the containers. The city expects to receive some of the profits from this advertising, which could amount to $3.7 million in 5 years.
[24322]

73-5069

CRITES, R. R. Private collector. *Waste Age*, 4(1):67, 73, Jan./Feb. 1973.
The author contends that the basic elements of a solid waste management system are storage including prehandling, collection, interim processing, and final disposal. He directs his analysis to the effect of collection on the building system in high-rises or, inversely, the system on collection. Although the interface between the building and available utilities is a standard consideration in building design, this interface is frequently not considered in designs. Methods by which users pay for collection service varies from no direct charge regardless of the type or volume of waste produced to a direct charge based upon time and equipment required. Since there is no relationship between what is paid and the actual cost of collection, there is no economic incentive to provide processing and storage facilities to reduce collection costs. Higher charges in a given community may be the result of lower efficiency or greater profits, but the more relevant factors are labor rates, amount of franchise fees, disposal charges, and the collection effort required for particular customers.

Cost of collection is basically a function of the equipment cost, time expended, and the volume and weight of the waste collected. Reduction in volume will reduce collector costs and user charges.
[24323]

73-5070

DAVIS, P. L. Garbage grinders. *Waste Age*, 4(1):54, 56, 58, Jan./Feb. 1973.
The author contends that the household garbage grinder will be included in nearly all new construction. It is estimated that community-wide installation of grinders may reduce the amount of refuse collected by less than 10 percent. Savings in collection costs will be slight, if at all, unless removal of putrescible food wastes from refuse enables a community to discontinue the separate collection of garbage or to reduce the number of collections of combined refuse. Fly and rodent problems will be reduced with grinder installation. Garbage grinders will increase water usage by 1 or 2 percent. BOD and suspended solids in wastewater will increase by 30 percent, however. As for sewers and building drain loads, a 30 percent increase in solids will not cause difficulties in lines that are fairly trouble-free before ground garbage addition. This prediction is based on the fact that normal sewage is very dilute. Garbage solids can be handled at wastewater treatment plants as easily as sewage solids. While it is debatable whether use of garbage grinders will result in savings to the householder, it is indisputable that the grinder has resulted in better sanitation.
[24324]

73-5071

EPA study shows one-man crew more efficient than multi-man team. *Solid Wastes Management/Refuse Removal Journal*, 15(12):22-23, 26, 40, 44, 62, Dec. 1972.
This article summarizes current research into the relative functional and cost efficiencies of a one-man crew compared with two- or three-man crews for collection of refuse. It is based on an analytical study conducted by Ralph Stone and Co., of Los Angeles, and prepared for the U.S. Environmental Protection Agency. One-man pickup is probably more efficient for collecting refuse placed at the curb than larger crews. Although equipment costs for one-man crews are higher, overall costs are found to be 25 to 45 percent less than for two-man crews and 35 to 50 percent less than for three-man crews. However, for backyard pickup, larger crews are more efficient. Field studies were done to compare four municipal collection methods, and time-and-motion studies corroborated the findings. The single most important factor determining relative efficiency of different size crews is the time required to pick up wastes at each stop. Relative efficiency decreases as crew size increases. Having a man act solely or primarily as driver does not significantly reduce travel time between stops. Another way to reduce costs is to require that refuse be placed on the curb in sacks rather than returnable cans. This modification could reduce pickup time per stop by 15 to 50 percent. An experimental collection vehicle called TRAC (truck rear-actuated control) was tried in one community and requires about 26 percent fewer man-minutes per route. One-man crews are fairly popular with private contractors, but most cities do not use them. It is apparent that many municipalities have never attempted or do not know how to measure the productivity of their collection systems.
[24325]

73-5072

GORHAM INTERNATIONAL INC. Collection *In* Solid waste management: opportunities and markets for equipment products and processes. v. 1. Technology. Gorham, Maine, Oct. 1972. p. 30-43.
This paper describes the many different specific collection vehicles which have been designed and manufactured to increase collection efficiency and reduce associated costs. The following are described in detail: compaction vehicles (rear-loading, side-loading, container, front-loading, packers, nonpackers, and special collection vehicles); satellite collection vehicles; one-man collection systems; and collection network routing (the routing of solid waste collection vehicles to provide the most efficient resource allocation and its role in determining total collection costs). (This document is retained in the SWIRS library.)
[24326]

73-5073

JEWELL, R. L. One-man collection crews reduce costs in Ohio town. *Solid Wastes Management/Refuse Removal Journal*, 16(2):42-44, Feb. 1973.

Refuse collection costs in Miamisburg, Ohio, have risen phenomenally since 1970. Most of the increase can be attributed to the new county incinerator which improved air quality at great expense to the citizenry. The town found itself paying more for disposal than for wages. As a way of controlling the tonnage collected, plastic bags or tightly-sealed containers were required. It was reasoned that this would decrease the liquids content in waste and therefore lower incineration costs. Results proved satisfactory, but further efficiencies were sought by the city. In 1971, a report was received concerning use of one-man crews for collecting refuse. Miamisburg had always used the typical three-man system. A demonstration truck was brought in and drivers expressed enthusiasm for it. The principle of the truck was simple enough: it was a stand-up, right-hand-drive vehicle with the loading area directly behind the cab, thus combining the functions of driver and loader. After a great deal of indecision and doubt, the city council approved the purchase of these vehicles. A comparative analysis had shown that 176 man hr could be saved each week with the new equipment, or more than $32,000 a year in salaries. Another service provided by the city is commercial container rentals, which are collected with rear-loading trucks. This practice was continued after adopting the new packer trucks. Cost savings are still being realized by the new system.
[24327]

73-5074

License for commercial pickup and disposal. *In* 1973 Sanitation Industry Yearbook. 10th ed. New York, R.R.J. Publishing Co., 1973. p. 14, 90, 102.

This is a model license for private contractors involved in collection and disposal of commercial wastes. Fees, frequency of collection, special services such as cleaning out incinerators, and provision of the containers by the contractor are spelled out in the license. (This document is retained in the SWIRS library.)
[24328]

73-5075

PATTERSON, C. Curb service and neighborhood trash stations enable Dade County, Fla., to hold the line on refuse-collection costs. *American City*, 88(3):84, 87, Mar. 1973.

Dade County, Florida, has saved approximately $1.6 million in 1972 by changing to a new refuse collection system. Under the old system, crews collected garbage from the rear of the house twice a week, with collections limited to two containers per pickup. Vegetation debris was placed at front curbs and remained for weeks between collection times. Under the new system, homeowners carry garbage and trash by container to the curb on collection day and haul yard trash to neighborhood transfer stations. Containers may be garbage cans, plastic bags, or paper bags. Collection now occurs twice a week but with no limit on the number of containers. Crews collect yard trash from the neighborhood transfer station 6 days a week during heavy growth periods and 4 times a week otherwise. A significant reduction in crew size has resulted from the new system. Much of the grass and trimmings is now put in containers. In seeking to make it easier for residents to haul their containers to curbside, the Dade County Waste Division was attracted to an 82-gal plastic container mounted on wheels. The apparatus is designed for easy tilting. Test areas for the device were set up, in which people were asked to try the units for 1 year at an $8.50 lease price. Response was very favorable, resulting in a Roll-a-Waste system costing $30.50 per unit with a guaranteed life of 5 years. Public relations work was extensive in convincing people to try the system.
[24329]

73-5076

Personal communication. A. E. Kroger, City of Houston, Department of Solid Waste Management, to Solid Waste Information Retrieval System, May 21. 1973.

This letter, written in answer to a request for information for a SWIRS user briefly details the collection system in Houston, Texas. The City operates a municipal garbage collection system. It is funded by the real estate tax. Commercial establishments do receive collection service, but they are limited to three 30 gal refuse containers per day. All other industrial and business collection is done by private companies. The average disposal cost is $3.75 per day and the average haul distance is 12 miles. (This document is retained in the SWIRS library.)
[24330]

73-5077

PITE, J. J. Refuse and refuse collection. *Building Services Engineer*, 40:156-161, Oct. 1972.
This article draws on two reports made in 1967 and 1971, respectively, by working parties appointed by the Minister and Housing and Local Government--Refuse Storage and Collection, and Refuse Disposal. First the law concerning waste collection is reviewed; Britain has laws on the books governing collection of household refuse, trade refuse (industrial), other refuse, frequency of collection, access to premises to collect wastes, salvage storage of refuse paper sacks, and litter. Next, the various methods of onsite storage are listed and briefly described; secured-lid bins; plastic dustbins; dustless loading bins; paper sacks; bulk refuse containers; chutes with containers; waterborne systems; pneumatic systems; and metal containers. Onsite treatment systems are listed as well: incineration; compaction; and waterborne systems. Various types of collection are briefly covered. In order to design a collection system, the required types of information are indicated. General estimates of such vital figures as per capita volume to be expected are given, but it is pointed out that local statistics should be obtained before final plans are drawn up. Average composition by weight, chemical analysis and calorific value of British household refuse are given in a table. Calorific values for refuse are expected to rise, as is volume, while density will continue to decrease. Tentative projections for weekly output of refuse per household are put forth.
[24331]

73-5078

Pneumatic collection system to handle complex's trash. *Engineering News-Record*, :20, Feb. 1, 1973.
A $1.5-million contract has been awarded by New York State for installation of a pneumatic waste collection system in the huge $850-million State office building being built in Albany. The pneumatic disposal system will be completed in 1974, tentatively. It will include approximately 6,000 ft of pressurized pipe, 68 loading stations located in the various buildings of the complex, six shredders, and four compactors. The complex will be capable of housing 12,000 people who, predictably enough, will generate 50,000 lb of waste paper and other trash daily. Called the South Mall, the complex will consist of eight office buildings, an auditorium, and a library clustered on and about a five-story platform. All of the buildings will be connected to the waste disposal system, although only the 44-story main office tower will have pressurized vertical chutes.
[24332]

73-5079

POLLOCK, K. M. Snow, ice and high mountain roads present no challenge for Colorado hauler. *Solid Wastes Management/Refuse Removal Journal*, 16(2):10-11, Feb. 1973.
Aspen, Colorado, has built a refuse collection and disposal system which is for the most part containerized. The Aspen Trash Service collects and disposes of all home and commercial refuse in the city and performs a similar service for the ski mountains in the area. From the mountains, trash is transported down to the ground either by chair lifts or by vehicles normally used to groom ski runs. Restaurant refuse is likewise picked up in 1-yd detachable containers leased from the company. The company fleet consists of five Leach packers. A more recent development has been the banding together of several neighbors to lease a lidded container in order to prevent scavenging by the local German shepherds. This remedy also reduces the number of pickups required for the company. The collection rate under city franchise is $4 a month for once-a-week pickup. All establishments, includ-

ing restaurants, use clusters of containers when necessary, instead of larger single containers, because of the collection problems in snowy weather.
[24333]

73-5080

PUBLIC INFORMATION OFFICE. Sanitation: Bureau of Cleaning and Collection New York, New York, Environmental Protection Administration, Feb. 1973. 4 p.
This pamphlet is distributed by the Public Information Office of the New York City Environmental Protection Administration, 125 Worth St., New York, 10013, to describe the activities and organization of its Bureau of Cleaning and Collection. This division of the Sanitation Department comprises 85 percent of its uniformed personnel and is administered through 11 boroughs. Collection schedules, bulky wastes pickup, leaf collection, street and lot cleaning, flushing of streets to prevent litter and dust, and cleaning up after parades are all discussed in terms of the size of the job (for example, bulky wastes alone account for 143,000 tons of collected refuse per year) equipment, schedules, and special problems. There is an auxiliary field force that serves as a special snow removal battalion, removes dead animals, and tests new equipment. Costs for the operations are not given. (This document is retained in the SWIRS library.)
[24334]

COMPOST / COMPOSTING

73-5081

BODMAN, S. W., III, J. S. FREANEY, J. J. HARRINGTON, D. H. MARKS, W. NIESSEN, L. J. PARTRIDGE, A. SURAFIM, AND D. G. WILSON. Composting municipal refuse. *In* The treatment and management of urban solid waste. Westport, Connecticut, Technomic Publishing Co., Inc., 1972. p. 182-210.
This paper discusses the composting of municipal refuse in terms of the past, present, and future. The topics covered and expanded upon by the use of data and illustrations include: recent trends; economies of scale; European leadership; the biology, chemistry, and mechanics of composting (chemical composition of municipal refuse and compost products, economics of enrichment, particle size, moisture content and pH of the feed material, reaction temperature, and rate of air circulation); compost reclamation processes; the products of compost reclamation plants0 their uses and markets; and the future of composting reclamation processes. (This document is retained in the SWIRS library.)
[24335]

73-5082

Federal report pinpoints composting as economically weak and unreliable. *Solid Wastes Management/Refuse Removal Journal*, 15(5):8-9, 118, 120, 124, May 1972.
This paper considers the monetary aspects of composting. The information provided is based on surveys of composting in the United States and Europe and on composting investigations and demonstrations supported by the U.S. Environmental Protection Agency's Office of Solid Wastes Management Programs. Elements of the cost of disposal by composting, expressed as a gross cost per ton for processing raw refuse, and the credits that may accrue from salvage, the sale of compost, and other considerations are discussed and extensive data are provided. It is concluded that composting urban wastes is technically possible, but costs more than sanitary landfilling and can be more expensive than incineration.
[24336]

73-5083

FOURIE, J. M. Composting of municipal solid refuse. *Water Pollution Control 1973*, 72(2):205-208.
The article discusses the possibility of composting solid household refuse to produce an economically useful product from wastes in Cape Town, South Africa. In the Western Cape, four composting plants with different designs are being operated by municipalities. All of them are designed to accelerate the aerobic processes inherent in composting to such a point that stabilization occurs. Provision is made for pre-sorting in order to remove non-compostable matter,

such as glass, metals, paper, and plastics. Four different installations with a common purpose of stabilization are located at Worcester, Parow, Athlone, and Bellville. Stabilization is supplemented by windrowing for periods varying from 6 weeks to 6 months. In rural areas, based on successful windrowing, solid household waste may be treated by windrowing alone, combined with sorting and disintegration processes. Addition of sewage sludge to garbage prior to composting initiates heat development which inactivates organisms present in the sludge. Addition of sewage sludge improves the quality of the compost with the addition of such elements as nitrogen and phosphorus. The high moisture content of sewage sludge has created a problem when mixing with garbage. One possible solution is to filter sludge through a filter-bed of fresh compost. The municipalities involved in composting have found a great demand for compost.
[24337]

73-5084

GLYSSON, E. A., J. R. PACKARD, AND C. H. BARNES. Composting. *In* The problem of solid waste disposal. Ann Arbor, College of Engineering, University of Michigan, 1972. p. 85-95.
This article discusses the processes of composting, as well as its advantages and limitations. Composting attracts a great deal of emotional support, because it is so natural, but it is difficult to make it economically viable. Sophisticated processes for composting usually require three stages0 grinding, conditioning, and aerobic digestion. Grinding the material to be composted creates a high ratio of surface area to weight and homogenizes the waste, thus making the digestion process easier and more complete, and the finished product uniform. Conditioning the material includes moisturizing it and improving the carbon/nitrogen ratio. The latter should be at least 40 to 50. Sewage sludge is usually the chosen additive for both of these purposes. The third stage is aerobic digestion. The digestion process takes place over a period of 3 to 5 days (longer in some cases). This microbial action takes place best when the mixture is kept well mixed and thoroughly aerated. Temperatures usually reach 170 F. After digestion the compost is aged or cured for several weeks. The advantages and disadvantages of composting as compared to other disposal or volume reduction processes are presented. There are charts and diagrams showing: the composting process; a mechanized municipal composting plant; typical output of a composting and separation process; agricultural consumption of soil nutrients in Michigan0 including sewage sludge, manure, compost, and mineral soil conditioners; composting plants in the United States; economics of composting, based on 50 tons per day and 300 tons per day plants. (This document is retained in the SWIRS library.)
[24338]

73-5085

HOLZINGER, L. Edel-Kompost, Fabrikmaessig hergestellt. [Highest-quality, factory-produced compost.] *Staedtehygiene*, 24(6):148-151, 1973.
Humus produced from waste is of untold importance for animals of all species. Consequently it is superfluous to describe factory-produced humus as refuse compost; it is of far greater importance to produce it always and everywhere of the same high quality with the help of a simple testing method and as a result to make possible purely biological cultivation without the employment of noxious substances at a lower cost than employing mineral fertilizers. Carefully selected special bacteria (Eokomit) are employed for the composting process which produce fully ripe, highest quality compost in 8 to 10 weeks. Th waste is crushed, sorted, sifted, and mixed with dehydrated sewage sludge. Through addition of a cheap acid a pH between 6.2 and 6.8 must be obtained. Slowly 1 liter of Eokomit is added per cu m waste. Hydrochloric acid can be used for acidification of which about 0.3 to 0.5 liters are needed per cu m. The bacteria plus the acid cost 1.50 deutsche marks per cu m compost. The advantage of this compost is that it contains an antibioticum, Phytocillin, which helps the plant to combat its pests without requiring spraying with a pesticide. (Text in German)
[24339]

73-5086

JERIS, J. S., AND R. W. REGAN. Controlling environmental parameters for optimum compost-

ing. Part III. *Compost Science*, 14(3):16-22, May/June 1973.
This article presents findings on the effect of various factors relative to composting. Based on 4 years of controlled composting experiments, a compilation of the environmental conditions recommended for optimum composting of typical municipal refuse, newsprint, and stabilized refuse is given. A summary of the more significant parameters involved in composting included: temperature; moisture content and free air space; seed recycle; pH; nutrients (nitrogen and phosphorus); storage conditions; and paper content. Extensive data are provided in the form of tables and graphs.
[24341]

73-5087

JERIS, J. S., AND R. W. REGAN. Controlling environmental parameters for optimum composting: Part I. *Compost Science*, 14(1):10-15, Jan./Feb. 1973.
The paper deals with the results of experiments conducted over a 4-year period relating to the most important factors in composting. Experimental procedures and temperature effects are described. The three major experimental systems used include bench scale composters, shake flasks, and a Warburg respirometer. A summary of the findings is presented with the following observations. Proper temperature is needed if high rate continuous composting is to occur. Little use of continuous high temperature composting has been made heretofore. Only limited information has been obtainable concerning composting rates of refuse and solid wastes containing high concentrations of paper at a continuously maintained thermophilic temperature. Since paper resists biological degradation and is a major component of municipal refuse, the investigation herein described attempted to determine optimum conditions for composting solid wastes with a high paper content. Temperature analysis reveals that newsprint and stabilized municipal refuse have similar and low rates of degradation. For mixed refuse, very high composting rates were obtained which were much greater than previously reported rates. Part of the reason for more efficient composting rates obtained in these tests is the result of continuous closely controlled temperature. Illustrations and data showing the relationship of temperature to composting rates are included with the text.
[24340]

73-5088

KNOESEL, D., AND A. RESZ. Enzymatischer Abbau von Pekt[illegible]n und Zellulose durch waermeliebende spezies. [Pectolytic and cellulolytic activity of thermophilic fungi isolated from compost of waste material.] *Staedtehygiene*, 24(6):143-147, 1973.
Thermophilic and thermotolerant strains of fungi representing different genera and species taken from fresh compost were investigated for pectolytic and cellulolytic enzymes under defined conditions. The fungi were separated by spreading suspensions of fresh compost on various nutrient substances such as yeast extract-starch-agar, yeast extract-glucose-agar, barley flower extract-agar, and mineral salt-saccharose-agar. For incubation temperatures between 40 and 50 C were used. Most of the organisms decomposed native cellulose. Soluble cellulose was degraded within a wide range of pH. Cellobiose and glucose were the final products. Breakdown of pectin substances was obtained under acid conditions only. In the relative enzyme activities of the culture filtrates, certain differences were obtained. The enzymes exhibit a marked temperature stability. The conclusion is that in the composed material, enzymatic conversions will continue after microbial development is terminated by extreme temperatures. (Text in German)
[24342]

73-5089

LANGER, W. Aktuelle Probleme der Komposberung. [Present composting problems.] *Schriftenreihe des Vereins fuer Wasser-, Boden- und Lufthygiene*, (38):227-233, 1972.
Composting of garbage for recycling is used in Germany only little, 16 composting plants producing a total of 60,000 tons from the garbage from 2 percent of population annually. The undesirable consequences of lack of natural organic fertilizing matter in the soil are pointed out and the ways of composting garbage, together with

sewage sludge, are discussed from the technical, economic, and planning angle. The existing composting methods are briefly listed: the DANO biostabilisation process - holding uncrushed garbage in a slowly rotating drum of 3.5 m and 28 m length under controlled aeration for 6 days, then screening and, if needed, letting rot further in stacks; Pratt process - holding uncrushed garbage in cells made of wire mesh to rot, with oxygen fed into through spear pipes if desired, then crushing and screening, and subsequently letting rot in stacks; Multibacto process - passing pre-crushed garbage through 8-9 stories downward during 1 to 3 days under aeration, then disinfecting the rotten matter, and mostly letting rot in stacks afterwards; Brikolare process - first crushing the garbage with sewage sludge added, with 50 percent humidity, then pressing into small blocks and leaving to rot and mold until dried, when the dry blocks can be stored; 'breathing' process - developed in Blaubeuren, consisting of crushed raw garbage mixed with dried sewage sludge, then homogenizing in a kneading machine and subjecting to rotting in concrete cells under controlled aeration and moisture for 6 to 8 days controlling the temperature at 80 C, finally seasoning in stacks. This compost can be fed to piglets. Besides, experiments are being conducted with pressing ripe compost into boards for utilization for construction purposes. Manuals on composting are mentioned, issued by the central garbage disposal agency. (Text in German)
[24343]

73-5090

SCANLON, D. H., C. DUGGAN, AND S. D. BEAN. Evaluation of municipal compost for strip mine reclamation. *Compost Science*, 14(3):4-8, May-June 1973.

This article describes 4 years of tests of the Tennessee Valley Authority which have proven the effectiveness of composted municipal wastes in producing vegetative cover on coal strip mine sites. This study tested the effects of both heavy and light applications of municipal compost on coal strip mine sites. The heavy rates were designed to evaluate long-term effects on growth and possible toxicity responses of vegetation where unscreened compost was applied at disposal-type rates. The evaluation of light rates was to determine the minimum levels of effective compost application. The experiments are described and extensive data on pH values and density are provided.
[24344]

73-5091

TIETJEN, C. The utilization of composted domestic refuse. *In* Waste disposal; Proceedings; 4th International Congress of the International Research Group on Refuse Disposal (IRGRD), Basel, Switzerland, June 2-5, 1969. Basel, Schweizerische Zeitschrift fuer Hydrologie. p. 543-557.

The article presented the results of testing Dano-processed refuse compost on rye, oats, and potato crops. The nine year trials revealed that the increase occasioned by the addition of compost ranged from 5 to 23 percent. Figures are provided showing the yields over the years on both control and composted plots of land. Carbon, nutrients, and pH of the soil are shown as well. A literature review is given concerning the use of refuse compost on farm crops, vineyards, truck gardens, orchards, forests, and desert, mined or otherwise damaged lands. An extensive bibliography is appended. (This document is retained in the SWIRS library.)
[24345]

DISPOSAL

73-5092

[The present condition of waste treatment and the measures for the future, including the educational measures for waste treatment business operators.] 1st. ed. Tokyo, Japan, Ministry of Health and Welfare, Bureau of Environmental Health, Sept. 1972. 19p.

As of 1975, the total population of Japan is estimated to be 109,930,000; the per capita waste production will be 1,200 g; the total waste requiring treatment will be 125,316 tons per day. The total combustibles in the waste will be 83 percent (90 percent up to 1966; approximately 85 percent at present), and the total amount requiring incineration will be 104,012 tons. In addition, 3,259,100 tons per day of industrial waste will

require some form of treatment and disposal by 1975. The total number of sanitation business operators in Japan as of August 1972 is 5,595 for the treatment of night waste, domestic refuse, and waste from small businesses; the number of operators of sewage purification and sanitation business is 2,840 while those engaged in industrial waste treatment number only 154; 174 applications are pending because they have not met the strict requirements for the means of collection, transportation, treatment, or securing of long-term, low-interest loans for terminal disposal. The average number of sanitation workers per business is between 5.1 and 5.8 for sewage treatment, and the number of trucks per business is 2.3 to 2.9. For domestic waste treatment, the number of workers per business is 2.8 to 7.2 and the number of trucks, 2.8 to 5.5. As these statistics indicate, qualified business operators and workers for treatment of waste are very much in demand. The improvement of qualifications of operators by education, appropriate distribution of operators and facilities, cooperation between local government, public organizations, and sanitation business operators, securing of long-term, low-interest funds for the installation of cooperative treatment facilities, and prevention of accidents by appropriate inspections, guidance, and maintenance are some of the administrative guidelines for the future. (Text in Japanese) (This document is retained in the SWIRS library.)
[24356]

73-5093

Campground plant serves Gateshead, Felling and Washington. *Public Cleansing*, 63(5):238-241, May 1973.
This article describes Great Britain's Campground Refuse Disposal works which serve three communities--Gateshead, Felling, and Washington. This is one of five such plants to be built. The Gateshead group recognized that there could be substantial savings in construction and running costs if it were possible to adopt common plants and appoint the same consulting engineer. Investigation showed that the amount and type of refuse was similar for all three groups of authorities and this would allow for the same size and type of plant to be used. The whole project was a joint effort from conception to completion. It is anticipated that initially 170 tons of refuse a day will be dealt with, rising to 220 tons over the next few years.
[24346]

73-5094

Focus on pollution control and the Department of Defense. *Water and Sewage Works*, 120(2):42-45, Feb. 1973.
The Department of Defense has set up programs which will reduce the current pollution of sea, land, and air by defense installations and operations. These programs will incorporate environmental considerations into weapons and material design. They include consideration of possible environmental impacts in planning training exercises, compliance with Federal and State pollution control standards, and cooperation with local and regional authorities. Priorities will be established to control pollution by reducing those problems which constitute a direct hazard to the health of man, those having economic implications, and those which affect the recreational and aesthetic value of the nation's resources. The Defense Department's pollution control expenditures have grown from less than $19 million in fiscal year 1969 to $171 million being requested for fiscal 1973.
[24347]

73-5095

GORHAM INTERNATIONAL INC. Disposal. *In* Solid waste management: opportunities and markets for equipment products and processes. v. 1. Technology. Gorham, Maine, Oct. 1972. p. 109-121.
This paper discusses land and ocean disposal of residue from solid waste management operations. Land disposal equipment and the following land disposal methods are discussed in detail: sanitary landfill; open dumping; trenching; and composting. Very little technological development has gone into ocean disposal of solid or liquid wastes. The primary interest has been on transportation methods. Ocean disposal represents a small portion of today's solid waste management operations. However, with the increasing difficulties in finding suitable land

disposal sites, more emphasis will be devoted to determining appropriate and safe methods to implement ocean disposal. Data are provided on landfill equipment needs. (This document is retained in the SWIRS library.)
[24348]

73-5096

GORHAM INTERNATIONAL INC. Processing. *In* Solid waste management: opportunities and markets for equipment products and processes. v. 1. Technology. Gorham, Maine, Oct. 1972. p. 68-108.
This paper discusses solid waste processing0 the activities that alter the waste characteristics between collection and final disposal. The following procedures are discussed in detail: size reduction; separation; incineration (conventional, high temperature, pyrolysis, fluidized bed); composting; and compaction. Diagrams are provided of crushers, rasp mills, drum pulverizers, inertial separators, a rectangular furnace, a vertical circular furnace, a rotary kiln furnace, traveling grates, reciprocating grates, and rocking grates. (This document is retained in the SWIRS library.)
[24349]

73-5097

GREENLEAF, J. W. Manual-pneumatic-pulverization. *Waste Age*, 4(1):8, 10, 12, Jan.-Feb. 1973.
This article discusses a study completed for the Department of Housing and Urban Development and the Environmental Protection Agency entitled 'Solid Waste Management in Residential Complexes'. This report studies and reviews solid waste handling methods and equipment as they might be applied to housing projects0 from single family detached low rise to high-rise multifamily units. The four principal functions of a solid waste system which are discussed include waste handling, storage, processing, and disposal. The system's basic disposal components include: the unit system; the interunit system; the interbuilding system; and the off-site system. Disposal equipment is also discussed in detail.
[24350]

73-5098

HIRAYAMA, N. Daitoshi ni okeru gomi shori keikaku. [Waste disposal plans in the Metropolitan area.] *Kankyo Gijutsu*, 2(1):56-62, Jan. 1973.
It is very important to establish a future plan concerning waste disposal in the metropolitan area and to perform it exactly. In November, 1971, the Metropolitan Governor entrusted us with making a plan for the waste disposal of Tokyo, mainly a plan for the construction of cleaning factories. The work was recently completely with the cooperation of the Bureau of Public Cleansing. In this work, new data processing methods were used, such as the introduction of peak coefficient and scope coefficient. The peak coefficient is used in representing the increase in the amount of wastes during the period July through August and the value is 1.085. For the scope coefficient, if three factories of a capacity of 200 tons per day are always underutilized, the coefficient will become about 1.05. Thus, the estimation of the necessary burning capacity, N, of the incinerator can be calculated by the equation: N equals average collected quantity per day times 1.085 times 306/292 times 1.05, where 306/292 is the ratio of the working day of an incinerator to that of a waste collecting vehicle. With such an equation, the amount of wastes to be discharged, the necessary burning capacity of the incinerator, the number of factories, and the capacity of factories to be newly built were calculated up to 1980. (Text in Japanese)
[24351]

73-5099

JAAG, O. International cooperation in the field of waste disposal. *In* Waste Disposal; Proceedings; 4th International Congress of the International Research Group on Refuse Disposal (IRGRD), Basel, Switzerland, June 2-5, 1969. Basel, Schweizerische Zeitschrift fuer Hydrologie. p. 235-245.
This article traces the development of national then international bodies to deal with the problems of solid waste and water pollution problems. First the responsible federal authorities in each of the major European countries are

identified. The national associations from Great Britain, Holland and Germany were the first to cooperate on an international level. This alliance took the form of the International Committee on Public Cleansing, begun in 1928. This group, the name of which was later changed to the International Association of Public Cleansing (INTAPUC) held conferences every 3 or 4 years and publishes the widely circulated journal Public Cleansing. In 1955 experts in the solid waste field convened in Switzerland to discuss the formation of a new group dedicated to research; the outcome of this meeting was the International Research Group on Refuse Disposal (IRGRD) and the body began to issue bulletins of its research activities. To avoid duplication of efforts, INTAPUC and IRGRD merged to form ISWA, (the International Solid Waste and Public Cleansing Association). Their bulletin was first published in French and German, but later also in English and Italian with the cooperation of the U.S. and Italian governments. The World Health Organization is another international group active in the water and solid waste pollution control area. (This document is retained in the SWIRS library.)
[24352]

73-5100

KOJETINSKY, R. Duties of the state and local authorities in maintaining the cleanliness of our habitat. *In* Waste Disposal; Proceedings; 4th International Congress of the International Research Group on Refuse Disposal (IRGRD), Basel, Switzerland, June 2-5, 1969. Basel, Schweizerische Zeitschrift fuer Hydrologie. p. 271-279.
The author outlines the major areas of public cleansing that require governmental action0 solid and liquid waste disposal, street sweeping, air and water pollution control, and noise abatement. He makes a list of the ways in which government, either national or local, or both in concert, can function to alleviate the problems of public health and aesthetics. First the problems must be identified0 and all the factors contributing to a given situation recognized. For instance, air pollution in a city is the result of many activities and conditions, all of which must be located before any meaningful action can be taken. The regulations to deal with each offender or circumstance can be drawn up. Land use planning is a public responsibility that can help greatly to make regulation and control of pollution easier. Where financing pollution control is a problem, government must be willing to aid communities or industry in complying with the law. Perhaps research into ways and means of pollution control needs to be done before regulations can be enforced; both the research itself and the dissemination of the findings are public duties. Finally, the population at large must be apprised of the value of clean air, water, and land. Ultimately only public concern for health and amenities will create an atmosphere in which government, industry, and the citizen can control pollution. (This document is retained in the SWIRS library.)
[24353]

73-5101

OKI, Y. Ecological consideration of plastics waste and municipal refuse in Japan. *Japan Plastics*, 7(2):36-43, Apr. 1973.
This paper estimates the generation rates and amounts of plastics wastes in Japan now and makes projections for the future. From the figures derived the plastics waste content ratio in municipal refuse is predicted for the future. Since municipal refuse generation has a direct relationship with human living, it is necessary to understand human beings ecologically and demographically and to take into account regional geographical conditions, climate, living customs, income, and various human desires when making these projections. Graphs and extensive data are provided. The topics which are discussed in detail follow: the background of plastics waste generation (population and habitable area, change of income and consumption, change with year of waste compostion, and compositional change in foodstuff demand); estimate of plastics waste generation (relationship of product life and total demand and estimate of plastics waste generation); prediction of quantity of municipal refuse (mathematical model given); and the prospects of plastics waste in municipal refuse.
[24354]

73-5102

SEBASTIAN, F. P. Modern technology battles ancient traditions. *Water and Wastes Engineering*, 10(2):20-24, 31, Feb. 1973.
This article describes China's efforts to protect her environment while building an increasingly industrialized country. The Government is revamping its ancient nightsoil (human wastes) disposal practices for municipal wastes and applying modern techniques for industrial treatment. In rural areas, however, the peasants are still collecting and using human wastes. Doctors in Peking have reported that schistosmiasis, a parasitic disease associated with the use of human waste for fertilizer, is China's most serious health problem today. Sludge incineration is considered the practice with the brightest future. A Chinese waste water treatment plant, a process for recovering chemicals, and a method for producing cement from waste carbide lime sludge and ferrous sulfide sludge are outlined. The quality and treatment of water in Vienna are also discussed briefly.
[24357]

73-5103

The positive approach pays off. *Site Selection Handbook*, 2:206-208, 1972.
This article presents a national round-up of constructive efforts in environmental planning. Union Electric Co. has a prototype project underway to produce power from the city's refuse. The process recovers thermal energy by burning shredded solid wastes as supplementary fuel in boiler furnaces for direct production of electric power. Bunyon Enterprise is taking waste bark, pulverizing and aging it, and transforming it into a soil conditioner. Inexpensive processes to turn inorganic solid wastes into quality building bricks, and sewage sludge into molasses for animal feed are also discussed. The following environmentally helpful tasks performed by bulldozers are outlined: forest fire control; sanitary landfilling; the construction of reservoirs, dams, and channels; and reclaiming strip mines.
[24355]

73-5104

VAUGHAN, R. D. Solid waste management in the USA. *In* Waste Disposal; Proceedings; 4th International Congress of the International Research Group on Refuse Disposal (IRGRD), Basel, Switzerland, June 2-5, 1969. Basel, Schweizerische Zeitschrift fuer Hydrologie. p. 309-321.
This paper is a review of the solid waste management situation in the United States and what is being done by the Federal government to alleviate the present problem. Figures are presented on the amount and composition of the major categories of wastes--municipal, agricultural, mineral, and fossil fuel wastes and total wastes. The role of the Federal government is outlined, along with the enabling legislation that has permitted the formation of new authorities such as the Office of Solid Waste Management Programs of the Environmental Protection Agency to deal with the solid waste problem. The preliminary results of the national survey of solid waste practices are summarized; these deal with the current methods of collecting, processing, and disposing of the wastes in 33 States and the District of Columbia. Federal activity in planning, research, demonstrations, and training is reviewed, and some examples of the work being done at some of our large universities provided. (This document is retained in the SWIRS library.)
[24358]

73-5105

Waste Disposal; Proceedings; 4th International Congress of the International Research Group on Refuse Disposal (IRGRD), Basel, Switzerland, June 2-5, 1969. Basel, Schweizerische Zeitschrift fuer Hydrologie. 782 p.
This volume contains the papers presented at this conference in three languages--French, German, and English. Included in the volume are the welcoming and opening speeches, three main papers, and the activities of six working groups. The main papers are on the following topics: international cooperation in the field of waste disposal; duties of national and local authorities in maintaining the cleanliness of our habitat, and solid waste management in the United States. The working groups dealt with these subjects:

controlled tipping of solid urban refuse and industrial waste; disposal of industrial sludges; incinerator corrosion; utilization of refuse compost; pretreatment of sewage sludge; and thermal treatment of sludge. At the end of the volume there is a survey of solid waste handling practices in Switzerland and descriptions, operational data, and cost figures on refuse disposal plants in 14 Swiss cities or areas. (This document is retained in the SWIRS library.)
[24359]

ECONOMICS

73-5106

ASHCROFT, J. Value added tax. *In* Materials Reclamation Weekly Handbook & Buyers Guide. Croyden, England, Maclaren and Sons, Ltd., [1973].
This article summarizes the essentials of the Value Added Tax (VAT) in Great Britain and indicates aspects that are of special concern. VAT went into force on April 1, 1973. Anyone with a business turnover of more than 5,000 pounds sterling a year must register with the Customs and Excise. All sales will include the 10 percent VAT except for the reclamation industry. The following categories are also presented: buying regulations; tax invoices; imports and exports; accounting for VAT; the quarterly return; cost accounting; cash flow; bad debts; and implications for production.
[24360]

73-5107

Economics and resource recovery. *Materials Reclamation Weekly*, 122(1):22-23, Jan. 6, 1973.
Only 5 percent of the solid waste produced in the United States is actually collected, let alone recovered. If cost were no object almost all waste could be recycled using existing technology and separation and grading techniques. One of the factors influencing overall U.S. recovery rates has been the price of iron and steel scrap0 which declined in 1971 as domestic steel production demanded less ferrous material than in 1970. Data are provided on U.S. recycling percentages for various materials. The National Commission on Materials Policy is studying the recycling industry in relation to the needs of the United States in terms of an adequate supply of materials, and in terms of a better environment.
[24361]

73-5108

ENVIROGENICS CO. Appendix C--cost model. *In* Systems evaluation of refuse as a low sulfur fuel, a final report to the Environmental Protection Agency. v. 2. Appendices. Report No. F-1295. Washington, U.S. Environmental Protection Agency, Nov. 1971. p. C(1-54).
This appendix provides a cost model on the utilization of refuse as a fuel as part of a study sponsored by the U.S. Environmental Protection Agency's National Air Pollution Control Administration. Capital costs for a combined firing plant model are presented for: land and land rights; structures and improvements; boiler plant equipment; auxiliary boiler equipment; turbine-generator equipment; accessory electrical equipment; air pollution control equipment; waste handling equipment; and engineering and construction supervision. The following annual capital costs are outlined: amortization; Federal taxes; insurance; and State and local taxes. The operation and maintenance expenses include: basic costs; shredding costs; air pollution control costs; and residue disposal costs. Power generation credit, net solid waste disposal charges, and a transportation cost model are also provided, along with extensive data, charts, and bibliographic material. (This document is retained in the SWIRS library.)
[24362]

73-5109

FORSBERG, F. J. Concerns of State program due to Federal cutbacks. *Waste Age*, 4(3):56, 58, 60, May/June 1973.
This article describes what effects the program cutback of the U.S. Environmental Protection Agency's Office of Solid Waste Management Programs will have on Minnesota's solid waste management program. The effects will not be felt as adversely as in other States because Minnesota has been receiving technical and financial assistance since 1967 from EPA in order to establish sound State solid waste management

programs. Local public and private concerns have received instruction in the proper methods of collecting, transporting, and disposing of solid wastes; an abandoned automobile recycling program was initiated; an agricultural waste program was undertaken; and toxic and hazardous waste studies were performed. All these programs necessitated the coordinative guidance of the EPA. Although the reduction of Federal financial assistance and grant programs will be of immediate concern, of greater concern is the reduction and possible loss of the technical assistance.
[24363]

73-5110

GESCHKA, H., AND L. LICHTWER. Estimates of expenditure on environmental protection in the Federal Republic of Germany for the period 1971 to 1975. *Batelle-Institut Information*, (14):4-6, Aug. 1972.
This article estimates expenditures on environmental planning and protection in the Federal Republic of Germany for the period 1971 to 1975. A summary of the existing environmental nuisances, listed according to type of nuisance and sector causing it, served as the basis for the individual estimates. The quantities of pollution were calculated for the year 1970 and forecast for 1975. Individual estimates were made for each type of pollution in the different economic sectors. The environmental sectors discussed include: clean air; waste water disposal; fungicides, pesticides, and environmental chemicals; noise abatement; and nature conservation and preservation of the countryside. The economic sectors covered are: coal and steel industry; power production; stone, clay, glass, ceramics; chemical industry; building industry; private transport; and public authorities.
[24364]

73-5111

GORHAM INTERNATIONAL INC. Economic potential. *In* Solid waste management: opportunities and markets for equipment products and processes. v. 2. Development needs and potential. Gorham, Maine, Oct. 1972. p. 127-161.
This paper illustrates what overall economics are associated with various solid waste treatment systems. The examples presented portray the order of magnitude of projected costs for implementing solid waste management technology. The topics covered are collection, integrated resource recovery processing plant, 'Fibreclaim' applications, incinerator residue reclamation, hydrolysis and fermentation, wet oxidation, and biological processes. Based on the economic indications presented in this report, organizations can undertake to refine process design and operation to apply basic technology to a specific waste source or to optimize recovery of a specific valuable material. (This document is retained in the SWIRS library.)
[24365]

73-5112

Government ups environmental funds. *Environmental Science and Technology*, 7(3):197, Mar. 1973.
Despite cutbacks in other programs, Federal spending for environmental protection is continuing to grow. Within the U.S. Environmental Protection Agency, the largest share of the budget goes for the construction of municipal waste treatment facilities. Funds for the water activities program increased; air activity decreased a small amount; but the major decrease was in the area of solid waste. Within the nearly $25 million decrease in the solid waste effort is a $9 million reduction in the resource recovery effort. Other increases in EPA's budget request for fiscal 1974 include $4.4 million for its pesticides program, a $1.6 million increase for its noise program, and a $4 million entry for the development of a toxic substances office to handle that area as it evolves and legislation is introduced.
[24366]

73-5113

HIRST, E., AND T. J. HEALY. Electric energy requirements for environmental protection. *Public Utilities Fortnightly*, 91(10):52-58, May 10, 1973.
This article examines electric energy requirements for operation of several environmental

protection strategies and compares these with present electricity consumption. Various conservation measures which reduce adverse environmental effects are then discussed to determine levels of potential electricity savings. The strategies include: electric mass transit; waste water treatment; solid waste disposal; air pollution control; waste heat dissipation; and electricity conservation. Two conclusions are drawn from this work: the quantities of electricity required to achieve various environmental quality goals are not large; and environmental needs for electricity can be largely offset through electricity conservation measures. Such energy conservation measures would reduce pollution from power generation, conserve scarce energy resources, and save money for consumers.
[24367]

73-5114

JORDAN, G. E. Experiences in contracting for solid waste management. *Public Works*, 104(1):59-60, Jan. 1973.
This article describes how contracting for solid waste management services has saved tax dollars for Omaha, Nebraska, and avoided resident complaints. The Public Works Department has found that the key to success is the selection of a company that has experienced management, good equipment, and trained personnel. Having multiple bidders assures low budgets; however, the low bid must be supported not only by a performance bond but by a successful record of experience in municipal operations. To comply with Omaha's contract, daily collections of about 400 tons were made for 24,000 households and commercial establishments. Sanitary landfilling remained the most economical and technically acceptable means of final disposal. The landfills were located close to the city limits. The final disposal cost at the landfill was less than $2 per ton.
[24368]

73-5115

KELLER, J. B. Let's have a recovery allowance. *Industrial Finishing*, 49(1):12-14, Jan. 1973.
This article points out that the cost of recovery in most cases exceeds the cost of using freshly mined and processed material because of the depletion allowance. A depletion allowance compensates an individual or corporation for depletion of an irreplacable resource. This tax benefit encourages resource extraction and discourages resource recovery. It is recommended that a recovery allowance equivalent to the allowance for depletion be granted to the recoverer. Intangible allowances and accelerated depreciation advantages could also be applied. This kind of program would mean that a large part of the pollution control equipment installed in the future would be recovery equipment.
[24369]

73-5116

U.S. statistics show annual salaries of crewmen. *Solid Wastes Management/Refuse Removal Journal*, 16(11):34, 52, Jan. 1973.
Statistics are presented in several tables which relate to municipal refuse collector salaries. These tables show the average minimum and maximum annual salaries of refuse collectors by city size and region, the percent distribution of refuse collectors by minimum and maximum salaries, and the percent distribution of cities by minimum and maximum salaries of refuse collectors. Average first-year salary of municipal refuse collectors in cities of 100,000 or more inhabitants was $7,428 in 1972. Maximum salaries averaged $8,411 in a study of swampers' wages conducted by the Bureau of Labor Statistics. Communities of 100,000 but less than 250,000 residents have the lowest average minimum and maximum wages, while cities of a million or more have the highest. Thus, mean salary scales vary in direct proportion to city population. Wages are generally highest in the Northeast, averaging $8,765 and having a $10,016 maximum. Two major factors account for some of the inter-area discrepancies: regional cost-of-living variations and unequal distribution in larger cities. In the Northeast, 90 percent of the refuse collectors earn starting salaries of $7,000 or more compared with less than 10 percent in the South.
[24370]

HAZARDOUS WASTES

73-5117

Industrial notes. *Nuclear Engineering International*, 18(205):499-502, June 1973.

The following topics connected with hazardous wastes are discussed: Westinghouse recycle fuels plant (the manufacturing process, environmental protection, and plutonium protection); positioning system for insulating plates; construction of a heavy engineering plant in Finland; a computerized equipment quality assurance reporting system; fully automatic turbogenerator run-up; uses of epoxy resins in a nuclear power plant; detecting ocean resources; and the removal of iodine from nuclear power reactors. Some of the plants and equipment are illustrated.

[24371]

73-5118

MATHIEU, G. I. The FLPC process for cyanide destruction. *Canadian Mining Journal*, 94(6):32-33, June 1973.

This article describes a process termed the film layer purification chamber (FLPC) system which has been developed for the purification of cyanide waste as well as oils, organic matter, and some base metals. It uses the oxidizing power of ozone in a mechanical device for obtaining efficient contact of the short-lived gas with the impurities to be oxidized. Features of the process are: rapid and complete oxidation of simple cyanides; concomitant destruction of cyanates and cyanide complexes at a somehwat slower rate; and control of oxidation so that excess production of ozone is avoided. This process features the use of the spray-chamber technique. The pilot-plant system has a capacity of 2 to 7 gal per min. The installed cost of the portable field unit is $9,500. It may be rented for $1,800 per month including technical assistance.

[24372]

73-5119

SAKATA, S. [Development of waste disposal methods.] *Genshiryoku Kogyo*, 19(4):23-25, Apr. 1973.

According to the regulations for atomic reactors and other legal bases for atomic power management, the responsibility for the disposal of radioactive waste material lies with the manufacturers and operators of atomic plants. Special private disposal business operators may be engaged, but the responsibility of management is still with the manufacturers and operators. In contrast, in Europe, the responsibility is transferred from the manufacturers and operators to the state or the government, or semi-government agencies. The limit of responsibility depends on the type of waste and on the social and natural conditions of the concerned country, but usually the operator is responsible for packing radioactive waste safely, ready for transportation. In France, the Commissariat a l'Energie Atomique is responsible for the transportation and storage of waste at the storage center in La Hague. In England, the Minister of Housing and Local Governments is responsible for the control of radioactive waste, and the Minister of Agriculture, Fisheries and Food shares responsibility for burial treatment of waste. British Nuclear Fuels treats the waste and the United Kingdom Atomic Energy Association stores and manages it. The administrative responsibilities of radioactive waste in Germany, Belguim, Czechoslovakia, Holland, and Italy are briefly discussed. (Text in Japanese)

[24373]

73-5120

SICCAMA, E. H. The environmental risk arising from the bulk storage of dangerous chemicals. *Ingenieur*, 85(24):502-505, June 14, 1973.

In this article consideration is given to the nature and scope of the danger for residential areas arising from the bulk storage of dangerous chemicals. In the first section a theoretical analysis of the danger and the factors involved is given. This analysis is then applied to the bulk storage of dangerous chemicals. A method for an approach to work on the problems of storage of dangerous liquids and distance from residential areas is also discussed. As sufficient information for statistical calculations was lacking, only the order of magnitude was indicated. It is concluded that since dangerous chemicals are shipped from one country to another, agreement on criteria for these hazards is needed. Tables and graphs are included.

[24374]

73-5121

Spectrum. *Environment*, 15(3):21, Apr. 1973.
This article discusses the relationship between lead and infectious disease in human beings. That small amounts of lead in human beings may interfere with their ability to resist infectious disease is the conclusion of the comments submitted to the U.S. Environmental Protection Agency by the Environmental Defense Fund on proposed lead-in-gasoline standards. Studies of mice, rats, and baboons show that animals with body burdens of lead similar to those found in the average adult human reduced the animals' resistance to infectious disease and reduced their lifespan. Salt mine storage of low and medium radioactive wastes in West Germany is also discussed. The Germans are postponing storage of high level radioactive wastes until further testing is done on whether water is likely to enter the salt formations. The U.S. Atomic Energy Commission had planned to use a salt formation in Lyons, Kansas, as the national radioactive waste repository but abandoned the plan when questions of water penetration into the salt arose.
[24375]

73-5122

WELTY, R. K. Scrap nuclear fuel material recovery process. Canadian Patent 888,105 owned by General Electric Co., Inc., New York, New York. Issued Dec. 14, 1971.
Nuclear fuel material such as uranium dioxide or mixtures or uranium dioxide with thorium dioxide, and plutonium dioxide, scrapped during manufacture is recovered by passage through a fluidized bed reactor as a continuous flow of scrap. Particles of scrap are fed into a fluidized bed reactor into which air with a 400 to 600 F temperature is admitted at a superficial velocity of about 1.33 ft per second. The reactor is heated to a temperature of about 800 to 1,300 F for the continuous, simultaneous oxidation and comminution of the scrap particles. The air flow is controlled so that the largest particles are not fluidized, medium sized particles are fluidized, and the smallest particles are carried out at the top of the reactor. The smallest particles separated from the gas after the reactor are contacted with a hydrogen containing gas with a temperature of about 1,150 to 1,350 F to reduce the oxide back to the original oxide state, whereby finely divided, millable, sinterable particles are produced.
[24376]

73-5123

WEST, P. J. Management of radioactive wastes from nuclear fuel processing. *Atom Energy Review*, 11(1):179-184, 1973.
This article outlines some of the presentations made at a symposium on the management of radioactive wastes from fuel reprocessing which was held in Paris from Nov. 27 to Dec. 1, 1972. One paper describes the main elements of the slightly enriched water-cooled reactor fuel cycle, such as mining and milling, chemical conversion, isotopic enrichment, fuel fabrication, reactor operation, and chemical reprocessing. Another paper reviewed the radiation doses used as criteria for protecting populations for the effects of nuclear power programs. The latest available data on risks of radiation-induced biological effects were discussed. There was also a group of papers on local releases of radionuclides and their regional and global impacts. The group of papers on solidification techniques indicated a general preference for borosilicate glasses as the preferred end product for storage. The waste problem in the processing of irradiated fuel by dry methods was also presented.
[24377]

INCINERATION

73-5124

ANDERSON, J. E. Solid refuse disposal process and apparatus. U.S. Patent 3,729,298 owned by Union Carbide Corp., New York, New York. Issued Apr. 24, 1973.
This patent covers a process for disposing of refuse by thermally decomposing it in a shaft furnace and simultaneously producing a fuel or synthesis gas containing over 50 percent carbon monoxide and hydrogen. A gas containing at least 40 percent oxygen is fed into the furnace at a rate of 0.15 to 0.28 tons of oxygen per ton of refuse to create a sufficiently high thermal driv-

ing force in the hearth to melt and fluidize the non-combustible inorganic matter and to permit molten metal and slag to be tapped from the base of the furnace without causing overoxidation of the refuse. The metal and slag will solidify to an inert compact residue. The relatively small volume of gas produced from the combustible organic portion of the refuse renders it easy to clean of pollutants prior to further treatment or utilization. The process may be used in combination with an oxygen plant in an integrated system which leaves a major portion of the gas produced available for use.
[24378]

73-5125

BODMAN, S. W., J. A. FREANEY, J. J. HARRINGTON, D. H. MARKS, W. NIESSEN, L. J. PARTRIDGE, A. SAROFIM, AND D. G. WILSON. Municipal incineration. *In* The treatment and management of urban solid waste. Westport, Connecticut, Technomic Publishing Co., Inc., 1972. p 99-144.
In this paper some of the factors of design, operation, and financing which influence the overall performance of municipal incinerators are discussed. The following topics are discussed in detail: the role of incineration; refuse as a fuel; design criteria for incinerators; incinerator components; heat recovery and energy generation; air pollution control; the economics of contemporary incineration systems; and new concepts, such as slagging incinerators, fluidized bed incineration, refuse incineration by fluidized bed, pyrolysis, the current status of refuse pyrolysis technology, pyrolysis products, and an evaluation of the refuse-pyrolysis process. (This document is retained in the SWIRS library.)
[24379]

73-5126

BODMAN, S. W., J. A. FREANEY, J. J. HARRINGTON, D. H. MARKS, W. NIESSEN, L. J. PARTRIDGE, A. SAROFIM, AND D. G. WILSON. Quantitative estimates for solid waste management in Boston. *In* The treatment and management of urban solid waste. Westport, Connecticut, Technomic Publishing Co., Inc., 1972. p. 29-68.
This discussion provides a quantitative analysis of waste management in densely populated urban areas by means of a case study of the economics and performance of a specific solid waste management system, that of Boston. The types of solid waste generated in Boston are discussed under domestic refuse, bulky material, construction and demolition debris, and street sweepings. The following topics are also covered: refuse collection; street sweeping; lot and alley cleaning; the city incinerator and landfill; alternative disposal possibilities; and onsite treatment. (This document is retained in the SWIRS library.)
[24380]

73-5127

DANIELS, L. E. A report on the Dekalb County incinerator study. Washington, U.S. Department of Health, Education, and Welfare, Bureau of Solid Waste Management, 1970. 72 p.
This report is an exhaustive study of the operation and pollution potential of the Dekalb County incinerator, a rotary kiln incinerator that handles some of the wastes generated by the City of Atlanta, Georgia. The purpose of the study was to determine the various parameters of the incinerator operation such as composition and quantity of the waste, its density and other characteristics, the analysis and moisture content of the residue, the efficiency of the plant, and the composition, temperature, chemical composition, and pathogen content of the scrubber and quenching waters. Findings are also presented on the burning rate of the plant, the particulate emissions, and economic analyses. Bacteriological studies were carried out on the residue, stack gas, fly ash, and tapwater samples. In addition to the many charts presenting this information, there is a bibliography. (This document is retained in the SWIRS library.)
[24381]

73-5128

DAVIDS, P. Die Luftbelastung durch die Schadstoffemission aus Muellverbrennungsanlagen. [Air pollution through pollutant emission from incinerators.] *Muell und Afball*, 5(3):61-68, Mar. 1973.

This article was also presented as a paper at the Muelltechnische Kolloquim, Universitaet Stuttgart, Mar. 8, 1973. The incinerators in operation in the Federal Republic of Germany today are all similar in their design with the exception of individual components. For dust cleaning of the emissions, electrostatic precipitators are mostly used. A removal of gaseous pollutants is generally not undertaken. In six incinerators a 1-week measurement program was launched to determine the type and quantity of the components of trash and their distribution in the gaseous and solid combustion residues which are important for air pollution. Dust measurements were taken behind the electrostatic precipitator to determine the dust composition in the cleaned gas. Silica, aluminum, iron, alkali, and alkaline earth metals were analyzed. The measured lead concentrations were below 1 percent; the zinc concentrations were below 5.3 percent. In two samples neither of these two components could be determined. Measurements of chlorine, ammonia, hydrogen sulfide, and other pollutants showed that the concentration of these was about 1 mg per cu m (detection limit) or they were not detectable at all. Correlation of the measurement results yielded a significant relationship between hydrogen chloride and hydrogen fluoride emission. For determination of long-term changes of the pollutant emission, because of the changes of the trash composition, 500 measurement values for hydrogen chloride and sulfur dioxide were available taken in one incinerator since 1966. For the period 1966 to 1972 a steady decline of the sulfur dioxide emission by about one third was discernible. The hydrogen chloride emission rose between 1967 and the beginning of 1970 by about 100 percent. Since then it has remained about constant. (Text in German)
[24382]

73-5129

DAVIDS, P., AND W. BROCKE. Technische Moeglichkeiten zur Verminderung der Schadstoffemission aus Muellverbrennungsanlagen. [Technical possibilities for reduction of pollutant emissions from incinerators.] *Muell und Abfall.* 5(3):72-75, Mar. 1973.

This article was originally a paper presented at the Muelltechnische Kolloquium, Universitaet Stuttgart, Mar. 8, 1973. Incinerators emit hydrogen chloride, hydrogen fluoride, sulfur dioxide, and oxides of nitrogen. Since hydrogen chloride is water soluble its separation is relatively easy compared to sulfur dioxide. Through scrubbing with water, cleaned gas concentrations of less than 10 mg of hydrogen chloride per cu m can be reached. Hydrogen fluoride too is water soluble. In aluminum plants scrubbers for hydrogen fluoride which clean several million cu m per hr are in operation. The cleaned gas concentrations are in the vicinity of 1 mg hydrogen fluoride per cu m. For sulfur dioxide, alkaline absorbents must be used. For desulfurization a number of processes exist. In incinerators of the Federal Republic of Germany scrubbers for waste gas cleaning are rarely used. Extensive measurements were carried out with a scrubber in an incinerator with a throughput of 2.5 tons per hr and an emission quantity of 18,000 cu m per hr. The gas was first cooled to 70 C. Using several parallel venturi nozzles the dust was separated and the watersoluble gaseous components absorbed. After passing through a droplet separator the off-gas was heated again and blown out through the stack. An average collection efficiency for hydrogen chloride of 95 percent and for hydrogen fluoride of 96 percent was obtained. The average concentrations in the cleaned gas were 27 mg of hydrogen chloride per cu m and 0.3 mg hydrogen fluoride per cu m. The collection efficiency for sulfur dioxide was 7 percent and for the nitrous oxides 12 percent. Thermogravimetric and laboratory experiments concerning the sorption properties of comminuted slag from incinerators for hydrogen chloride and sulfur dioxide under simulated conditions revealed that at temperatures between 500 and 700 C the slag has a large binding potential for these substances. (Text in German)
[24383]

73-5130

DEFECHE, J. Corrosions produced by the incineration of domestic refuse. *In* Waste Disposal; 4th International Congress of the International Research Group on Refuse Disposal (IRGRD), Basel, Switzerland, June 2-5, 1969.

Basel, Schweizerische Zeitschrift fuer Hydrologie. p. 488-508.
This section is the proceedings of the working group of the conference concerned with incineration of refuse and corrosion. Particular attention is directed at the Issy-les-Moulineaux refuse incineration installation outside Paris, which is a large facility with steam generating capability. Pictures of corroded tubes and figures giving the thickness of tubes in various stages of corrosion are provided. There is a tentative explanation offered for the corrosion. Three main theories are discussed in some detail. The first is the theory that corrosion is a result of a reductive atmosphere in some zones of the furnace. Carbon monoxide is generated by the uneven combustion of refuse; this reductive gas increases corrosion, especially in counter-flow incinerators. The carbon oxide reacts with iron very rapidly above 400 C. Corrosion by chlorine compounds is another theory. These compounds result largely from the combustion of plastics in refuse, although there are also other sources of chlorine in wastes. Sulfur-bearing wastes are also possible sources of corrosive compounds. Suggestions are made as to how to control corrosion in plants with or without waste heat utilization equipment. Both design and operation of the plant must be considered if corrosion is to be minimized. (This document is retained in the SWIRS library.)
[24384]

73-5131

DEMARCO, J. Advanced techniques for incineration of municipal solid wastes. A Division of Processing and Disposal Open File Report (SW-38d.of). Washington, U.S. Environmental Protection Agency, 1972. 15 p.
This paper is a discussion of two demonstration projects currently funded by the U.S. Environmental Protection Agency's Office of Solid Waste Management Programs. One is the pyrolysis project in New York State, the Torrax system, designed to convert mixed municipal refuse0 including metal, glass, and garbage0 into an inert residue by completely consuming combustible material and melting noncombustible material at temperatures up to 3,000 F. The refuse is processed without any sorting or pretreatment. The major components and operation of the Torrax system are described. The second system discussed is the St. Louis incineration project, in which refuse is used as auxiliary fuel in a power generation facility. The final cost data are not in yet on either of these projects, much operational and emission data has yet to be gathered. However, it seems that these two types of plants hold promise for the near future in terms of simultaneously solving the solid waste and air pollution problems, and the shortage of energy fuels. (This document is retained in the SWIRS library.)
[24385]

73-5132

ENVIROGENICS CO. Refuse as a fuel--combustion and interactions. *In* Systems evaluation of refuse as a low sulfur fuel, a final report to the Environmental Protection Agency. v. 1. Report No. F-1295. Washington, U.S. Environmental Protection Agency, Nov. 1971. p. II(22-43).
The combustion and interactions involved in using refuse as a fuel are discussed in this study sponsored by the U.S. Environmental Protection Agency's National Air Pollution Control Administration. The following topics are discussed in detail: gaseous combustion products (major products and pollutants); and solid combustion products (residue, fly ash and suspended particles, ash deposits and corrosion, and ash fouling tendencies). The following data are included: refuse combustion products; combustion constants for refuse and coal; nitrogen oxide emissions from various types of furnaces; fly ash from refuse and coal combustion; and chloride contents of refuse and coal. (This document is retained in the SWIRS library.)
[24386]

73-5133

ENVIROGENICS CO. Refuse as a fuel--handling and processing. *In* Systems evaluation of refuse as a low sulfur fuel, a final report to the Environmental Protection Agency. v. 1. Report No. F-1295. Washington, U.S. Environmental Protection Agency, Nov. 1971. p. II(55-68).
The physical handling and processing of refuse prior to and after combustion are discussed in

this study sponsored by the U.S. Environmental Protection Agency's National Air Pollution Control Administration. The following topics are discussed in detail: size reduction (equipment characteristics, test work, and the effect of particle size on combustion); refuse transport (pipeline transfer of refuse); and separation processes (ferrous metals, nonferrous metals, and air classification). The following data are also provided: size reduction0 total capital and operating costs; particle size distributions of outputs from two different types of hammermills; and calculated burning times for various fractions of milled refuse. (This document is retained in the SWIRS library.)
[24387]

73-5134

ENVIROGENICS CO. Refuse as a fuel--potential pollutant reductions. *In* Systems evaluation of refuse as a low sulfur fuel, a final report to the Environmental Protection Agency. v. 1. Report No. F-1295. Washington, U.S. Environmental Protection Agency, Nov. 1971. p. II(44-54).
Ways of reducing pollution while utilizing refuse as a fuel are discussed in this study sponsored by the U.S. Environmental Protection Agency's National Air Pollution Control Administration. The following topics are discussed in detail: current incinerator and power plant emissions; projected reductions through use of refuse as a fuel; and the effect of refuse firing on sulfur and particulate emissions. The following data are provided: fusion temperatures of 90 percent coal ash0 10 percent refuse ash mixtures; projected power plant coal displacement by urban refuse energy; raw energy consumption for the generation of electricity in the United States; potential reductions in current sulfur and particulate emissions; and projected emissions reduction by coal displacement with refuse. (This document is retained in the SWIRS library.)
[24388]

73-5135

GARNER, F. View from abroad, night soil. *Environment*, 15(5):26-27, June 1973.
This article discusses 'night soil' which is the euphemism for human wastes in the Orient. In rural China the farmers still collect and use human and animal feces as nutrient in fish ponds and to fertilize fields. This direct recycling is unsanitary; however, the Japanese have begun to combine combustion technology and shrewd marketing techniques in recycling urban wastes. Tokyo and Osaka have started to convert sewage sludge to a sterile ash in multiple hearth furnaces. The burning process depends mostly on fuel energy in the sludge itself. Tokyo and Nagoya have sold over 50,000 tons of this ash to commercial fertilizer firms at $2.42 per ton. A more advanced waste treatment installation at South Lake Tahoe, California, is producing ash with twice as much phosphate plus 30 percent of lime.
[24389]

73-5136

GERHARDS, K. Kunstoffabfaelle im Muell und ihre Emissionen aus Muellverbrennungsanlagen. Untersuchungen und Entwicklungstendenzen. [Synthetic waste in trash and its emissions from incinerators. Studies and development trends.] *Muell und Abfall*, 5(3):68-71, Mar. 1973.
This article was also presented as a paper at the Muelltechnische Kolloquium, Universitaet Stuttgart, Mar. 8, 1973. In the year 1971 six one-week measurement series were conducted with the aim of determining, weight, type, and amount of synthetics in domestic refuse. Each resident was found to throw away 4.1 kg of synthetic wastes per year. A number of synthetics, primarily polyamides and polyurethanes contain up to 19 percent nitrogen. In domestic refuse polyamide was found to constitute 4.9 percent of the synthetic waste. Between 0.1 and 0.2 g of nitrogen per ton of refuse are added through polyamides. The contribution of synthetics to the emission of nitrous oxides is, therefore, rather insignificant. None of the more important synthetics contain sulfur. The most important fluorine containing synthetic is polytetrafluoroethylene but its fraction among the synthetics is so small that no fluorine could be detected in any case. Chlorine is an essential component of chlorinated polyethylene, polyvinyl chloride, and polyvinylidene chloride. In domestic refuse from Bochum a chlorine fraction of 5.0 percent of the synthetics was found. The

total chlorine fraction in the Bochum domestic refuse amounted to 3.45 kg per ton refuse; the fraction constituted by the synthetics alone was 0.95 kg per ton refuse. Based on this data the synthetic's share of the hydrogen chloride emission from incineration of domestic refuse is 32 percent. Based on an estimated specific domestic refuse accumulation of 256 kg per person per year by 1980, an industrial refuse quantity of 116 kg per person per year, and a bulky and communal refuse quantity of 34 kg per person per year and a synthetics quantity of 5.9 percent, the average chlorine emission will be 5.7 kg per ton waste. This is 50 percent more than in 1971. (Text in German)
[24390]

73-5137

GLYSSON, E. A., J. R. PACKARD, AND C. H. BARNES. Incineration. *In* The problem of solid waste disposal. Ann Arbor, College of Engineering, The University of Michigan, 1972. p. 65-85.
This chapter provides a basic introduction to the principles and methods of incineration. It stresses, first, that technically incineration is not a method of disposal, but rather is volume reduction. A brief history of incineration is given. A number of charts and diagrams with commentary make up the major part of the chapter. These include: a flow chart for incineration with explanations of the various stages; the incineration process; alternative charging methods; typical heating values of refuse components; temperatures of combustion air at various stages in the combustion process; standards for desirable incineration operations; types of grates; incinerator emissions for municipal and onsite incinerators; particle classification and particulate removal; diagrams of an electrostatic precipitator, a cyclonic dust collector, and a direct-contact scrubber; water-wall construction; and costs of municipal incinerators. Waste heat recovery is briefly discussed. There is explanation and discussion of each of the elements that is illustrated by these charts. The advantages and disadvantages of incineration compared to other disposal and reduction methods is discussed. (This document is retained in the SWIRS library.)
[24391]

73-5138

GOLDSTERN, W. Muellverbrennungsanlage mit Dampfspeicher. [Incinerator with steam storer.] *Brennstoff-Waerme-Kraft*, 25(5):203, May 1973.
The urban community in Quebec, Canada, is constructing an incinerator for 24 municipalities at a cost of 20 million Canadian dollars. An agreement has been reached with the neighboring Anglo-Canadian Paper Mills to supply them with steam. For compensating the fluctuating steam generation a steam storer holding 12 tons of steam is being built. With the aid of this storer the steam supply will not fluctuate by more than plus or minus 75 percent of the daily average quantity. The storer has a diameter of 3 m and a height of 12 m. (Text in German)
[24392]

73-5139

JACOBI, P., AND H. THIEME. Muellverbrennen - eine Gefahr? Zusammenstellung von Argumenten, die fuer Muellverbrennunsanlagen sprechen. [Incineration - A danger? Compilation of arguments in favor of incineration.] *VDI-Nachrichten*, 27(18):15, 1973.
According to statistics included in the environmental program of the Federal government 45 million tons of waste accumulated in 1970 in the Federal Republic of Germany. Incineration of this amount of waste would produce 30,000 to 35,000 tons of dust which would be emitted into the atmosphere. It would take 150 years of dust emissions of these proportions to deposit one mm of dust over the entire country. In urban areas the dust concentration of the air is already higher than the dust concentration in waste gases from incinerators. Apart from dust 60,000 tons of sulfur oxides, about 200,000 tons of hydrogen chloride, and about 1,000 tons of hydrogen fluoride would be emitted. These gases can be washed out and neutralized. The heat liberated at the combustion of 45 million tons would suffice to heat about 15 percent of the private households. Dumping 45 million tons of waste would require 1,000 to 1,500 hectares of land, while the slag residues from incineration would require only 100 to 150 hectares. (Text in German)
[24394]

73-5140

JOACHIM, H. Muellverbrennungsanlage Deurne--Betrachtungen zum Stand der Technik der Muellverbrennungsanlagen. Refuse incineration plant Deurne--considerations regarding the state of the art of the refuse incineration plants.] *Aufbereitungs-Technik*, 14(3):166-172, 1973.

A detailed report is given on the refuse incineration plant Deurne, Antwerp, started up in April 1972. With a population of 80,000 inhabitants, the amount of refuse is approximately 25,000 tons per year. With continuous 24-hr operation, the continuous grate capacity is higher than 3.6 tons per hr; there are two self-contained incineration grates available. For the daily starting operation and in the case of short-term throughput of refuse featuring a low calorific value, the fuel oil consumption determined is 6 liters per ton of refuse. The loss of weight involved in refuse incineration is 30 percent, the refuse volume is reduced by 90 percent. The The waste material is charged through water cooled shafts. Hydraulically operated multi-zone forward stoking grates are installed in the 50 cu m combustion chambers. The flue gases are cooled to the operating temperature of the dust collector by fresh air. Centrifugal collectors are used for dust removal. The maximum allowable dust concentration in the cleaned gas is 0.4 g per cu m. These values are based on saturated flue gas with a carbon dioxide concentration of 7 percent. The stack rises to a height of 35 m. Incineration is a solid waste disposal method which will gain further importance in the future. (Text in German)
[24393]

73-5141

KIMURA, M. Ryudoso shokaku sisutemu ni yoru toshi gomi no shori ni tsuite. [City waste treatment by circulating layer combustion system.] Presented at the 1972 National Environmental Sanitation Meeting, 16th, Niigata, Japan, Oct. 19-20, 1972. Tokyo, Japan, Ministry of Health and Welfare, Japan Environmental Sanitation Center, 1972. 2 p.

The type of incinerator used for the petroleum industry and metallurgy was adopted by Matsudo City to dispose of its wastes and to recover some usable materials. The whole system is divided into pre-treatment the process and the combustion system. Pretreatment consists of crushing and pulverizing. Between the crushing and pulverizing processes, scrap iron is recovered by magnetic separator. After pulverization, wastes are crushed to smaller than 25 mm pieces. The wastes are fed into incinerator by conveyer. Inside the incinerator, a slurry of sand is in boiling condition. Wastes are continuously fed and get in contact with sand slurry at 600 C. Most of the ash formed is taken out from the top duct, together with exhaust gas, and led to the cyclone. Non-flammables such as metal, glass, and porcelain pieces are automatically ejected, and ash is stored in an ash bunker. Waste gas goes into heat exchanger, is heated to 200 to 250 C, and is sent back to incinerator. Finally, waste gas is cooled in the cooling tower, and hydrogen chloride, sulfur dioxide, and dust are absorbed in adsorption tower, and cleaned gas is emitted by blower into the atmosphere from a stack. Water absorbed by hydrogen chloride, sulfur dioxide, and dust is neutralized by alkali, and sent to a thickener, where floating substances are separated, and reutilized. The incinerator has been in operation since Aug. 1972. Data was obtained concerning wastes of summer time only. (Text in Japanese) (This document is retained in the SWIRS library.)
[24395]

73-5142

KRAMER, R. J. Method and apparatus for waste incineration. U.S. Patent 3,722,433. Issued Mar. 27, 1973.

A waste incineration apparatus and method are provided having two serially connected combustion chambers for incineration of solid, semi-solid, and liquid waste material, each of which comprises combustible components. The combustion chambers are relatively positioned so that heated gaseous fluids produced by combustion of substantially solid and semi-solid waste are passed on to enhance combustion of liquids introduced into the second chamber. These gaseous fluids which are at a relatively high temperature include those that enable or support combustion of liquid waste and may also include those that are combustible when com-

bined with additional combustion air. These gaseous fluids intermix with liquid waste entering the second chamber thereby enhancing the combustion characteristics of the liquid waste. Preferably, combustion in the first chamber is carried out in the presence of a substantial amount of excess air resulting in complete combustion and preheating of the remaining combustion air prior to its entry into the second combustion chamber. Alternatively, combustion in the first chamber is controlled by limiting the amount of combustion air admitted to that necessary to effect burning of the solids or semi-solids, but not sufficient for combustion of the gaseous fluids evolved as a result of the combustion process thereby forming a combustible gaseous fluid.
[24396]

73-5143

ODA, T. *Kobunshikei haikibutsu nenshoro no* mondaiten. [Problems of incinerators for polymer wastes.] *Kobunshi,* 22(253):201-205, Apr. 1973.
Of the several disposal methods for high polymers, the burning system would consitute the main procedure for the present because it may be said that the burning system is the most safe and exact method. However, there are many problems with incinerator for high polymers: that is, the high exothermic amount of plastic wastes requires a great amount of air when burned. The decomposition of plastics other than vinyl chloride ends at 400 to 500 C, but the vinyl chloride produces hydrochloric acid above 300 C and begins to redecompose above 500 C. The evolution of hydrochloric acid seriously corrodes metals. The high temperatures produced when plastic wastes are burned greatly damages incinerators and black smoke due to incomplete combustion may be emitted which makes smoke a nuisance, and most thermal plastic wastes are melted or softened by heat, which often stops up or damages the fire grate of the incinerator. For these reasons, concerning the ideal conditions to solve the problems of the incinerator for high polymers, the feeding system should be an automatic and continuous one to improve the contact of air with gases. To keep the combustion condition inside the incinerator constant, the incinerator should be of the flat bed type and should have a main combustion room, secondary combustion room, and third combustion room in order to complete combustion. (Text in Japanese)
[24397]

73-5144

OSHITA, S., T. FUJITA, AND K. MURAYAMA. Sangyo haikibutsu shokyakuro ni tsuite. [Incinerators for industrial wastes.] *Nisseki Rebyu,* 15(1):24-31, Mar. 1973.
The classification of various incinerators and the comparison of their characteristics were made, and a test on an incinerator manufactured for experiment was reported. The test incinerator consists of about one sq m of fixed stage fire grate, primary and secondary combustion rooms, main and auxiliary burners, and 15 m high chimney stack. As a result of four experiments, in order to raise the efficiency of burning the wastes in powder, granular, and sludge forms the ejection and stirring of burning wastes by force ventilation and pushers and the dropping of ashes are found to be very effective means. The noncombustible sluge of the wastes from oil refinery is mixed with waste terra alba and tank sludge. The temperature of refinery wastes is low (about 250 to 460 C) because the waste is self-combustible and so no firing arch is required. The dust in exhaust gas is completely burned if an excess of air is supplied with force ventilation, and the addition of a dust-collecting cyclone reduces the amount of dust. The behavior of exhaust gas was very good, but about 100 or more ppm of sulfur dioxide were discharged. And the test incinerator could burn various kinds of wastes such as terra alba, sludges, tank sludge, waste diatomaceous earth, polymer mats, and general trash. (Text in Japanese)
[24398]

73-5145

RASCH, R. Bericht ueber die Diskussion zum 1. Teil des 24. Muelltechnischen Kolloquiums der Universitaet Stuttgart am 8.3. 1973. [Report on the discussion of Part I of the 24th Muelltechnische Kolloquium [(colloquium on waste technology)] at the University of Stuttgart,

March 8, 1973. *Muell und Abfall*, 5(3):76-77, Mar. 1973.
For the densely populated Ruhr Area incineration is the most adequate method of solid waste disposal. Doubts were expressed whether a reduction of hydrogen chloride from a maximum of 2000mg per cu m to 10mg per cu m is either feasible in practice or really necessary. With natural precipitation 50 to 60 kg per hectare per year of chlorine ions are carried into the soil; from incinerators it is only about 2 kg per hectare per year. A reduction of the maximum allowable emission concentrations for hydrogen chloride from 0.7 mg per cu m to 0.15 mg per cu m is intended. It is important to be warned against overemphasis on hydrogen chloride emissions. There was disagreement on the benefit of scrubbers for incinerators. The cold water vapor saturated flue gases leaving the scrubber are also a burden for the neighborhood. Most gaseous components in the emissions from incinerators are so low that a reduction can be achieved only by enormous expenditures. Moreover, the use of scrubbers turns the air pollution problem into a water pollution problem. (Text in German)
[24399]

73-5146

SCHENKEL, W. Grundsaetze fuer Muellverbrennungsanlagen in Ballungsgebieten. [Fundamentals for incinerators in industrial centers.] *Muell und abfall*, 5(3):59-61, Mar. 1973.
Annually, in the Ruhr area 12 million cu m of chemically and biologically nondecomposable waste accumulates. There is also 6 million cu m of putrescible waste. Incinerators are in existence in Essen-Karnap, Oberhausen, and Hagen with a joint annual capacity of 800,000 tons per year. The waste volume is reduced through incineration to between 10 and 20 percent of its original volume. Combustion of one ton of trash with a residence time of 30 minutes produces 3,000 to 5,000 cu m of flue gas. Each cu m of this contains 150 mg of dust, 103,000 mg of carbon dioxide, 43 mg of sulfur dioxide, 1 mg of sulfur trioxide, 40 mg of organic acids, and 43 mg of chlorine. Apart from this 300 to 400 kg of slag and 100 to 200 kg of fly ash are produced. The heat liberated from one ton of trash amounts presently to 1,800 kcal per kg and will further increase. This heat could be used for preventing future power shortages. The air pollution problem, however, will certainly increase through this. The best method of trash disposal would be conversion into a form which makes it feasible to localize and to monitor it. This would mean that only the sanitary landfill is an acceptable method. But it would require large areas of land which are just not available. Thus the construction of large incinerators will be unavoidable. They should be operated in as nonpolluting a manner as possible. The aim here is to achieve a maximum of cost reduction, the utilization of heat, and a reduction of emissions. (Text in German)
[24400]

73-5147

SCHOPPE, F. Apparatus for the burning of solids. U.S. Patent 3,727,565. Issued Apr. 17, 1973.
The patent concerns a system to burn waste materials with essentially complete combustion including a verticle preheating chamber with upper waste inlet and lower outlet, the outlet conducting preheated material into a furnace having a rotating frusto-conical grate with a vertix angle of between 90 degrees and 120 degrees arranged somewhat horizontal so a lowermost surface line is slightly inclined down toward the large inlet end of the grate relative to a horizontal reference. The furnace has an air inlet system which directs a controlled amount of combustion air to a specific limited zone of the grate. The grate, its disposition, and the air supply provide a waste material movement and burning to maximize effective use of combustion heat. The system also has apparatus for removing waste solids and gases from the furnace, with components to cool, wash and separate small solids from the waste gas and to utilize controlled quantities of the waste gas for introduction back into the inlet end of the preheating chamber.
[24401]

73-5148

SOUDA, R., AND H. ARITOU. Teflon netsubunkai seiseibutsu. Kanetsu joken ni yoru seiseibutsu no

henka. [Pyrolysis products of Teflon. Variations of pyrolysis products by heating conditions.] *In* Proceedings; 28th Spring Meeting of the Japan Chemical Society, Tokyo, Japan, Apr. 1-5, 1973. p. 753.

It is well known that teflon is thermally decomposed by heating and toxic compounds are formed as a result. To elucidate the effect of pyrolysis on the kind of pyrolysis products, polyfluoroethylenepropylene (PFEP) was pyrolyzed both in air and nitrogen streams. Resulting products were analyzed by alizanine complexon method for water soluble fluoride compounds, and by infrared spectra analysis for gaseous products respectively. At several temperature levels below 430 C, water soluble fluoride compounds were absorbed in air stream. In nitrogen stream, weight loss by pyrolysis was little and no water soluble fluoride compound was detected in contrast with the decomposition in air stream. Infrared spectra show that the main pyrolysis products are the same in both cases. Absorption bands of difluoro formaldehyde and tetrafluoro acetaldehyde were observed clearly in air stream decomposition, while tetrafluoro ethane and hexafluoro propene were seen in nitrogen stream decomposition. The formation of silicon fluoride (SiF) was also observed in air stream decomposition which suggests the reaction with ceramic of thermocouple occurs. On the contrary, SiF was not detected in nitrogen stream decomposition. A trace of carbon dioxide was also observed in air stream decomposition. (Text in Japanese) (This document is retained in the SWIRS library.)
[24402]

73-5149

TAKAHASHI, Y., AND T. ISHIKAWA. Purasuchikku kanryu shokyaku shisutemu. [Plastic waste incineration system.] *Hitashi Hyoron*, 55(3):95-98, Mar. 1973.

A bench scale model of a dry distillation incineration system for plastic waste was designed. The system has a pretreatment process for plastic containing hydrogen chloride. Using the thermal property of polyolefin in the absence of oxygen, polyvinyl chloride is distilled at 280 to 400 C and dehydrochlorinated. The pretreatment compartment is heated indirectly from the outside of the wall and directly by steam. Experiments with the dry distillation temperature showed that at 300 C, only 54.2 percent dehydrochlorination was achieved, and at 350 C, 98.5 percent of polyvinyl chloride was dehydrochlorinated. The gas is heat-exchanged in the boiler and part of it is recirculated by a circulation blower to the outer channel of the pretreatment kiln. The rest of the gas is cooled in the scrub tower and the dust in the gas is eliminated. The traceable amounts of hydrogen chloride and other toxic gases are absorbed in alkaline liquid. Only hydrogen chloride is absorbed in water and recovered as chlorine. Most of hydrogen chloride gas from the distillation process is sent to an incinerator and combustibles in the gas are burned. The residue plastic is incinerated by supplying combustion air in several sections until it is completely burned. The ashes contain lead, cadmium, and other heavy metals, and require an appropriate solids treatment system. (Text in Japanese)
[24403]

73-5150

TAZAKA, H. Sky-view tokushu shokyaku puranto. [Sky-view special combustion plant.] *Kagaku Kojo*, 16(7):48-52, July 1972.

The newly designed Sky-view incineration plant has a capacity for burning various plastic wastes, solid waste, highly viscous waste, waste oil and liquid, and slurry. It is a grid-type incinerator with the capacity of burning 6,000 kcal per kg, 500 kg per hr of solid containing up to 15 percent of polyvinyl chloride, or 10,000 kcal per kg, 300 kg per hr of waste liquid, or 8,000 kcal per kg, 300 kg per hr of slurry. The exhaust gas is 11,730 N cu m per hr. The basic flow chart shows a solid waste storage, a skip hoist, a double hopper, a preliminary combustion room, and a recombustion room, where waste liquid is set by a pump from another tank, and where viscous waste is also sent from still another tank. There is a supplementary burner, and a compresser attached to this unit. The combustion gas goes to a boiler where the temperature is dropped by water. The steam formed is sent to the main steam header, and the combustion gas moves onto the dust eliminator. The cleaned air is sent to the exhaust pipe by a suction fan. When the gas contains hydrogen chloride or sulfur oxide,

still another unit (scrubber) is added for detoxification. Each apparatus has an automatic control system, and when a water jet cooling system is used, an automatic temperature control and an automatic pH adjuster are installed. (Text in Japanese)
[24404]

INDUSTRIAL WASTES

73-5151

Don't get stuck with costly mud handling. *World Construction*, 26(5):52, 54, 56, May 1973.
This paper describes a new recycling system, built in part by a sand and gravel firm, which requires less than 10 percent of the space formerly needed for this operation. Most of the work is done automatically. This new vacuum filtration process eliminates the need for large settling ponds as well. Diagrams are included of the redesigned recycling system and of the sump and thickening pond. The theory has worked out quite well and has quickly paid dividends in saving crane costs, manpower, time, and money. The system is reusable and satisfies the pollution and zoning statutes of the area.
[24451]

73-5152

Ferro-Tech 'Demo-Disc' solves asbestos dust problems. *Asbestos*, 54(12):4, 6, June 1973.
This article discusses the application of agglomeration processes to fine dusty waste materials for the purpose of recycling and for disposal as plant waste or landfill. The fine dust from asbestos milling or a brake lining or insulating waste, could be pelletized on a Ferr-Tech Demo-Disc, which is described in this article. The operating costs of the pelletizing system are low since the additive is normally plain water. Should a more durable pellet be required for a lengthy storage life or for recycling, an additive such as cement will produce a pellet crushing resistance of up to 50 lb.
[24452]

73-5153

Generates sodium hypochlorite on-site. *Food Engineering*, 45(6):79, June 1973.
This article describes how sodium hypochlorite can be made as needed on site with an electrolytic system which is easily installed, maintained, and operated. The raw materials for the process are salt, electric power, and water. No special maintenance attention is required other than routine pump inspection, supervision during salt deliveries, and occasional replacement of electrode packages. Economic data are provided.
[24453]

73-5154

HAUGHEY, D. P. Chemical engineering in the meat industry. *Chemical Engineer*, (268):472-475, Dec. 1972.
In this article, a description is given of the nature of meat processing, byproduct processing, and works' services in terms of their dependence on unit operations, transport, reaction kinetics, and thermodynamics. The topics which are discussed in detail include: meat processing (product preparation, transformation, and storage and transportation); byproduct processing (offals, rendering, tallow, blood, casings, and fell-mongery); refrigeration and air conditioning; and cold water and effluent disposal.
[24454]

73-5155

HONDA, A, S. INOUE, AND K. YAMADA. Purasuchikku haikibutsu no nensho tokusei to sono shokyaku hoho. [Combustion characteristics of plastic wastes and its incineration.] *Yosui to Haisui*, 15(6):691-705, June 1973.
According to an investigation of the industrial wastes in the city of Osaka, the amount of thermal plastic wastes comes to 349 tons a day, thermal setting plastic wastes 839 tons a day, and rubber 641 tons a day. An investigation conducted by Osaka City showed that about 1,200 tons a day of plastic wastes are discharged from the manufacturing industry. In this work, the exothermic amount and differential thermal characteristic of these plastic wastes were measured. For the exothermic amount, 11 typical thermal plastic resins and 10 thermal setting resins were measured. In general, thermal setting resins, polyvinyl chloride, and polyvinyl

acetate showed a high exothermic amount of 3,000 to 6,000 kcal per kg, and thermal plastic wastes showed 9,500 to 11,400 kcal per kg. The average exothermic amount of 20 plastic wastes was 7,336 kcal per kg. As regards the differential thermal characteristic, plastic wastes can be classified into vinyl chloride, vinyl acetate, and the other plastic group. For the vinyl series resin, the change in weight showed a three-stage alternation. In vinyl chloride, for example, dechlorination takes place at 260 to 305 C; endothermic change takes place at 276 C. After this the heat decomposition of vinyl occurs, and a remarkable exothermic reaction occurs at 560 C. (Text in Japanese)
[24455]

73-5156

HONMA, T., M. YAMAMOTO, H. IWATA, AND K. MASUDA. Purasuchikku haikibutsu no funsai shori ni kansuru kenkyu (dai 2 ho)--Karyu funsaiho no tekiyosei ni tsuite. A study of the crushing of plastic wastes. 2--on the applicability of the swirl type crusher.] Presented at the Study Meeting on Mining Technology, Spring Meeting, Tokyo, Japan, Mar. 29-Apr. 1, 1973. Tokyo, Japan, The Mining and Metallurgical Institute of Japan, 1973. 2p.
Although various types of mechanical methods were recently tried, it is said that the mechanical crushing of plastics to the extent of fine powder is difficult because the destruction of plastic is accompanied by a plastic deformation and a large amount of energy absorption. In this study, the measurement of the energy absorption by tension and impact was made to determine the energy required to destruct plastic, and a swirl type crusher was manufactured to examine the relationship between the energy obtained from fundamental studies for crushing and the actual crushing effect and also to test the applicability of the crusher. The stress-strain curve obtained from tension test showed the following: ABS plastic showed the same tendency as that of the fragile destruction; polyvinyl chloride (PVC) showed properties peculiar to plastics; the stress was transformed only into plastic deformation and it was stored as absorbed energy. The speed of impact was almost in linear relation to the thickness of material. ABS and PVC, having a relatively small absorption energy, were more easily crushed than the polypropylene and polyethylene plastics with a larger absorption energy. For ABS, the crushing is possible to an extent of producing fine powder. (Text in Japanese) (This document is retained in the SWIRS library.)
[24456]

73-5157

KOBAYASHI, R. PURASUCHIKKU HAIKIBUTSU SHORI GIJUTSU. [The technology of disposing of waste plastic.] *Kogyo Gijutsu*, 14(5):24-26, May 1973.
In this report, problems of the disposal of plastic wastes which have not so far been treated in the general monthly technical magazines and a disposal technology for waste tires developed by the Hokkaido Industrial Development Lab are described. Most plastic wastes are thermoplastic and are naturally directed toward reutilization such as remolding. In the last several years, many reclaiming processes have been developed and more than twenty types of equipment are offered for sale. These techniques are mostly modifications of the conventional method of molding plastics. Most of the products of such processes are designed for public works, building, agriculture, forestry, and fishing. The problems in this method are the possibility of marketing and the recovery and disposal when the products are again discarded. The method by which plastic wastes are subject to heat decomposition processes to obtain oils and gases as chemical raw materials is one of the most important methods. This method is incorporated into the disposal technology for waste tires developed by the Hokkaido Industrial Development Lab. (Text in Japanese)
[24457]

73-5158

MATSUMOTO, K. Sangyo haikibutsu shori to kurozudu shisutemu. [Industrial waste disposal and a closed system.] *Kankyo Gijutsu*. 2(4):236-242, Apr. 1973.
According to an investigation conducted by the Ministry of International Trade and Industry in 1970, the total amount per year of industrial

wastes in Japan amounts to about 60 million tons, about 2.5 times that of city wastes. Because the investigation includes no wastes from trade, service, agriculture, the marine industry, or civil engineering and construction, the figure would become larger. It can be itemized as follows: 1) non-combustible solid waste is 57 percent of the total; 2) non-combustible liquid waste and sludge is 36 percent; 3) combustible but smoke-evoluting wastes is 2 percent; and 4) easily combustible wastes is 4 percent. The non-combustible solid wastes can be turned to reclaiming work and the easily combustible wastes are easy to process. Waste oil, waste acid, waste alkali, sludge, and plastic wastes are most troublesome. In general, the organic sludge tends to burn out after dehydration and drying. The sulfuric acid sludge can be disposed of by the circle flow type incinerator and fluidized bed type incinerator, but a great amount of sulfuric acid gas must be removed by high power absorption equipment. For the disposal of waste oil, the use of the technique by which sulfuric acid and lubricating oil can be recovered is desirable. The disposal method of plastic wastes is classified into three methods: fusion and solidification, heat cracking, and burning, but this disposal must be connected to the closed system in which raw materials' production, consumption, and elimination are being cycled. (Text in Japanese)
[24459]

73-5159

McCombs, W. H. and K. L. Van Aacken. Overcomes phosphate problem. *Food Engineering*, 45(6):72-73, June 1973.
Faced with increased cheese production which created more waste, and a change in effluent standards which required better treatment, Bongards Creameries took immediate corrective action. This article describes the biological and chemical treatment processes which have helped this firm cut BOD by 90 percent and reduce phosphorus levels by 80 to 90 percent. Phosphorus is removed from waste water by the addition of lime and polyelectrolyte. Chlorine is added to accomplish the bacterial kill. A diagram of the system and performance data are provided.
[24458]

73-5160

Minami, N. [The treatment of industrial waste in the paint industry. *Toso to Toryo*, 2(223):55-60, 1973.
Waste solvent is produced at a rate of approximately 6,500 tons per year by paint industries in Japan. Waste solvent is a mixture of various kinds of solvent, and there is no recovery value. After distilling scrubbing solvent, residue has to be burned with waste paint. Waste paint is produced at a rate of approximately 4,000 tons per year. Sludge from various processes in the paint industry is dehydrated and buried. Most of the metal waste from the industry is empty petroleum cans and about 200,000 cans must be burned a month as waste material. In treating any of these waste materials, measures must be taken to prevent secondary pollution. The Osaka Paint Solvent Cooperative Union comprises 45 large and small paint manufacturers. They began the treatment of waste oil by three distillators and three incinerators in Sept. 1969. The multichamber incinerators operate at 800 to 1,200 C, and are specially designed for effective air supply and air flow. The low-calorie incinerator for highly viscous waste is a watercooled cylinder and the air is supplied from the rotating central axis and burner arms. Viscous material is scattered over the ashes on the floor by the air and burned in the ash. Cinders are removed by the stokers on the burner arms. The Japan Association of Paint Industries is examining the possibility of waste paint and sludge incineration and sludge incineration on the ocean. (Text in Japanese)
[24460]

73-5161

Nakamura, J. [The present state of waste disposal.] *Toso to Toryo*, 2(223):61-62, 1973.
In 1969, the Osaka Paint and Solvent Cooperative Union installed a paint solvent recovery system and a paint waste incinerator for the purpose of recovery and recirculation of paint waste from local manufacturers. When the operation of these systems began, it was found that the solvent recovery operation did not thrive due to too many orders, and there was an overflow of orders for paint incineration. For seven months in

1969, the initial orders for solvent reduction were 571 tons and the orders for waste paint incineration were 295 tons; in 1970, these orders were 1,881 and 1,605 tons; in 1971, 775 and 2,792 tons; and in six months of 1972, the orders were 259 and 2,428 tons. The ratio of the recovery to incineration orders which was initially 66.34 percent reversed to 22.78 percent in 1971, and at present, 90 percent of the total orders are for incineration. In March 1972, an additional large incinerator was constructed. The total incineration capacity at the present time is over 30 tons a day. The total orders per month is approximately 500 tons per month, 470 tons of which is for incineration. (Text in Japanese)
[24461]

73-5162

NEIMITZ, W. Disposal of industrial sludges. *In* Waste disposal; Proceedings; 4th International Congress of the International Research Group on Refuse Disposal (IRGRD), Basel, Switzerland, June 2-5, 1969. Basel, Schweizerische Zeitschrift fuer Hydrologie. p. 425-443.
This article contains the introductory remarks and the final discussion of a working group on industrial sludge disposal. The introduction points out several factors that must be kept in mind when an industry is attempting to solve a sludge disposal problem. First, the cost of waste disposal must be considered from the inception of process design and various processes for the production of a product should be compared on the basis of the difficulty involved in waste disposal. As much of the waste as possible should be reused; to this end, as well as to expedite treatment and disposal, various types of waste streams should be kept separate. Since dewatering is the most difficult and costly phase of sludge handling, any step that unnecessarily raises the water content of waste, such as hydraulic transport, should be avoided. In addition to dewatering, sludge disposal should be preceded by biological stabilization to reduce the threat of environmental damage after disposal. Two graphs are presented showing the essential disposal methods for organic and inorganic sludges. If possible, it is desirable to treat industrial sludge or waste water along with municipal sewage. (This document is retained in the SWIRS library.)
[24462]

73-5163

OFFICE OF THE MINISTER OF AGRICULTURE AND FORESTRY, POLLUTION CONTROL SECTION. [The state of industrial waste (agricultural, forestry, and marine related industries).] Tokyo, Japan, Ministry of Agriculture and Forestry, July 1972. 31 p.
The following statistics are presented in tables: estimated total industrial waste effluence in Japan; the total disposal estimate for industrial waste; the total plastic film consumption for agricultural and horticulture; the total 1971 agricultural plastic waste; the projected total amount of cattle exreta; the present state of animal excreta treatment; a projection for excreta treatment required in 1977; the economy of the permanent treatment method for excreta; the projected total figure for waste from industries related to agriculture, forestry, and marine products; treatment methods for major wastes from the above industries by category; the present conditions of waste treatment facilities and installation plans; the ratio of waste production by the above industries by categories; and industrial waste production per unit cost for main food items. According to these tables, the food items which produce relatively high amounts of waste per unit are kanten (seaweed gelatin), coffee, potato chips, powdered sweet potatoes, and dried fish. Tofu (bean curd), mashed potatoes, beat sugar, canned fish and shellfish, and monosodium glutamine produce relatively small amounts of waste in the manufacturing process. (Text in Japanese) (This document is retained in the SWIRS library.)
[24463]

73-5164

Pollution control in the NZ meat industry. *Food Technology in Australia,* 24(12):642-643, Dec. 1972.
This article outlines a report from the New Zealand meat industry's Trade Wastes Committee to the Water Resources Council. The industry has spent almost $2 million in its efforts to reduce or eliminate pollution. This pollution control is being carried out in three ways: by the in-

stallation of effluent disposal and recovery plants; by experimentation and research at the Meat Industry Research Institute's research unit; and by experimentation and research by individual freezing companies in conjunction with research organizations and other interested parties. Six major studies were undertaken: acid coagulation of effluent0 pilot plant; Flocor plastic-packed biological filter pilot plant; anaerobic pilot plant; a process akin to composting; pelt house wastes0 methods for the recovery of chemicals; and a river coliform survey.
[24464]

73-5165

RANDALL, C. W., AND P. H. KING. Treating finishing waste chemically and biologically. *American Dyestuff Reporter*, 62(6):63-66, June 1973.

In this article full-scale plant operating data are presented that illustrate the efficacy of a combined chemical-biological treatment process for removal of both color and organic matter from a concentrated textile dyeing and finishing waste. Data, graphs, and diagrams are included. The topics which are discussed in detail include: waste characterization; description of treatment facilities; equalization and neutralization lagoon; chemical treatment and flocculation channel; sedimentation basin; neutralization tanks; aerated lagoons; treatment plant performance; and performance after process change.
[24465]

73-5166

RIDDLE, M. J., AND K. L. MURPHY. Treatability studies at a fish processing plant. *Water and Pollution Control*, 111(6):32-35, June 1973.

This article describes batch biological studies which were carried out on perch, smelt, and combined perch and smelt waste water. Sampling and analysis of the contents of the batch reactors were performed daily. Extensive data are presented. The characteristics of other fish processing waste water and any variations can be accounted for by the type of fish processed, the processing techniques, plant size, and water usage. It is concluded that the waste water from a fresh water fish processing plant can be characterized as of medium strength with large day to day variations in the major parameters.
[24466]

73-5167

SAKAI, H., AND M. OZAKI. Sangyo haikibutsu sogo shori shisutemu. [Total management system of industrial wastes.] *Hitachi Hyoron*, 55(3):99-104, Mar. 1973.

The functions of subsystems in a total management system of industrial waste are defined from the viewpoint of materials handling and information control. The system as conceived now consists of various subsystems which control collecting, relaying, transporting, treating, and disposing of all types of waste material. In addition, there are subsystems collecting and incorporating purely informational data such as: monitoring of emission sources; predicting the quantity, quality, and frequency of waste emission; managing the transportation system; controlling traffic; and determining the treatment and disposal methods. The collection subsystem will depend heavily on trucks operated by one man. The waste should be described when the waste source manager requests the collection. The data should be registered as digital information and the collection truck should follow a planned collection route. The intermediary or relaying subsystem should reduce the quantity of waste by crushing and compacting the waste and transfering it into a large transportation vehicle. This is also a point where pipe transportation can be applied. The transportation subsystem comprises large packers, large containers, and removable body vehicles, subterranean, or ground pipe transportation. The method used is determined by the considerations of cost, space, manageability, and loading method. The treatment subsystem comprises data on optimum treatment methods for various waste classifications and the possibility for composite processing. In this process, incineration for the purpose of energy recovery, materials recovery by crushing, classifying, and selecting, thermodegradation processes, and microbiological degradation should be considered. (Text in Japanese)
[24467]

73-5168

Sangyo haikibutsu no shori shobun no jittai. [Actual conditions of treatment and disposal of industrial wastes.] *Kinzoku Ziryo*, 13(6):59-61, June 1973.

Bureau of Public Cleansing, Tokyo Metropolitan Government, conducted a survey of industrial wastes, the result of which showed that industrial wastes would amount to 5,880,000 tons a year but only less than 20 percent, 1,090,000 tons, is disposed of by enterprises. There are 3,000 tons of industrial wastes containing heavy metals such as cadmium still undisposed, and the figure may exceed 10,000 tons, including those undisclosed by the survey of 1971. Of 5,880,000 tons, 3,580,000 tons is attributable to the manufacturing industry and 1,880,000 tons to civil engineering and construction. Construction waste material is 1,870,000 tons, followed by metal wastes of 1,260,000 tons, and sludge of 990,000 tons. The wastes disposed of by enterprises are mostly sludge (820,000 tons) and wood wastes (170,000 tons). Most of these wastes are burnt, dewatered and dried, and crushed. The rest of the wastes are commissioned to private enterprises and public organizations, except when they can be salvaged. The enterprises find it difficult to secure the land necessary for wastes disposal, but many smaller enterprises failed to even answer the questionnaires. Most of the enterprises thought it was desirable that the waste be disposed of by public agencies, and only very few thought it was desirable that the companies dispose of the wastes themselves. The enterprises commissioned with wastes disposal reutilize or sell 29.5 percent of the waste they handle. The salvagable items are: metal, textile, animal and vegetable residue, ore residue, paper waste, and waste oil; 70.5 percent of waste is taken to public disposal sites, private disposal sites, or recommissioned to other enterprises. In 1975 the wastes in Tokyo (excluding that of horticulture and livestock) will reach 7,200,000 tons. The increase in waste generation would be due to construction and manufacturing industries. (Text in Japanese)

[24468]

73-5169

SUGISHIMA, W. Sangyo haikibutsu shorikiki to shori shisutemu ni tsuite. [Industrial waste treatment apparatus and treatment system.] *Water Treatment Techniques*, 12(9):7-20, 1971.

Waste is examined in a total picture of the materials cycle system, and various treatment facilities are discussed from the standpoint of the requirements for specific industrial waste materials. For crushing of solid waste, the Hammermill crushers and Lindemann crushers are discussed. Incinerators for cellulose waste material, general miscellaneous wastes, polymer wastes, sludges, and liquid waste are discussed. Various types of incinerator, such as multichamber furnaces, rotary kilns, flush-dryers, and fluidized beds are discussed. The basic flowchart of a coordinated treatment plant shows three functions: treatment of exhaust gases, and liquid waste; landfill with prior compaction, crushing, and incineration; and recycling using an oil-water separation system and boilers. (Text in Japanese)

[24469]

73-5170

TOBIHO, S. Sangyo haikibutsu shori taisaku. [Industrial wastes disposal policy.] *Tsusansho Koho*, (6987):9-12, Mar. 5, 1973.

Although studies have been made as to disposal of city garbage, there has been no adequate technology established on disposal of industrial wastes. The ministry's survey on 5,000 factories employing more than 200 workers in manufacturing, electric, and gas industries was conducted from April to May, 1970, by questionnaires, of which 2,443 sent their replies (representing 67 percent of national manufactured goods shipment). Of 58,470,000 tons of waste produced, 36,860,000 tons are noncombustibles. Of these wastes, 12,330,000 tons are disposed of by dewatering, compression, and combustion; 81 percent being disposed of by the enterprises themselves; 17 percent commissioned to private operators; and 2 percent entrusted to public organizations. More than half is buried, 27 percent sold for recycling, 11 percent thrown away. In December, 1970, 'Law Concerning Disposal and Cleaning of Wastes' and

'Marine Pollution Control Law' were enacted and the principle that the person responsible for creating wastes should dispose of them was established; and enterprises must conform to the standards concerning collection, transportation, and disposal of industrial wastes. In the next fiscal year, lecture meetings on industrial wastes are to be held (meetings on the oil refinery and petrochemical industry were held in 1972) and the manual on disposal technology is going to be published. Systematized disposal is to be carried out at two combined areas in 1972, followed by one combined area in 1973. At about 20 factories the survey was conducted on harmful wastes. At the Agency of Industrial Science and Technology, studies are being made on crushing and pulverization of plastics, reutilization of plastics, and combustion treatment of plastics. (Text in Japanese)
[24470]

73-5171

WEBBER, C. C. B., AND L. S. DIAZ. Automatic particle size and rod mill tonnage control at Craigmont. *Canadian Mining Journal*, 94(6):36-37, June 1973.
This article discusses the wide variations in grind which occur due to the changing hardness of ores. The object of this study was to develop a control system that would: control the grinding circuit to hold a preselected particle size distribution of solids in the cyclone overflow stream within narrow limits over extended periods of time; and process rod mill tonnages at maximum practical rates at all times. A parallel objective was to establish quantitatively the performance improvement obtained. Mill tonnage and copper recovery were measured. Schematic diagrams are provided of simplified mill operations and of a grinding circuit control system.
[24471]

73-5172

YAMADA, K., J. FUKUYAMA, AND J. HONDA. Purasuchikku haikibutsu no netsu bunkai shori. [Pyrolytic treatment of plastic wastes.] *Yosui to Haisui*, 15(6):706-718, June 1973.
In this report, the pyrolytic characteristics of various plastics, the material balance during pyrolysis, the pyrolytic condition of polyethylene and other plastics, and the methods for pyrolysis are given. For eight kinds of thermal plastic resins and seven kinds of thermal setting resins, the change in weight and differential thermal characteristics were measured with nitrogen current using a differential thermal analyzer. The thermal characteristics of thermal plastic resins in the nitrogen current are classified into vinyl resins such as vinyl chloride, vinyl acetate, and the other plastics. The change in weight for vinyl resins proceeds in two stages and for the other resin the change ends in one stage. For vinyl chloride, dechlorination decomposition takes place at 260 to 280 C and endothermic change occurs at 276 C. During the temperature range up to about 410 C, the weight is considerably reduced, and the change in weight due to the pyrolysis of vinyl compound again occurs at temperatures between 410 and 478 C. In general, the change in weight for thermal setting resins is small, and no change occurs at temperatures up to 235 to 327 C. The endothermic reaction of thermal setting resins is weak, except that urea resin shows an endothermic reaction at about 260 C. (Text in Japanese)
[24472]

LAW / REGULATIONS

73-5173

[Regulations and standards for industrial waste including toxic material and treatment and disposal techniques.] Tokyo, Japanese Pollution Research and Control Center, Dec. 1972. 118 p.
The general standards for the treatment and disposal of industrial waste are spelled out in the Government Ordinance Item No. 6, Article 1. Sanitary landfill is used to prevent litter from industrial waste material and to prevent the leakage of odors; the fill area should be fenced in and the place should be clearly marked indicating that it is an industrial waste disposal ground; necessary measures should be taken to prevent the percolation and pollution of ground water from any material. Infestation of rats, mice, flies, roaches, and other undesirable vectors should be strictly avoided. General rules applicable to ocean disposal are the same as the first clause

concerning the burial, and necessary measures and considerations should be given in the choice of disposal area to prevent damage to marine animals and products. Both landfill and ocean disposal regulations concerning individual types of solid waste are spelled out separately by categories in Ordinances 1-12. Categories included are: cinder, sludge, glass and ceramics, mining waste, construction material waste, animal excreta, animal carcasses, dusts, organic waste including putrefied material, oil waste, acid waste, alkaline waste, plastic waste, paper, wooden chips, fiber and fabric waste, animal offals and plant residues, rubber, and metals. Regulations concerning the collection and transportation of industrial waste including toxic matter are designated in Ordinance Item 6, No. 2. (Text in Japanese) (This document is retained in the SWIRS library.)
[24482]

73-5174

'EPA' would require licensing of all disposal activity. *Solid Wastes Management/Refuse Removal Journal*, 16(6):42, June 1973.
This article discusses proposals by Great Britain's Department of the Environment for licensing of all disposal programs, public or private. This plan would enable counties to make their own refuse removal plans, including both domestic and industrial waste. The Department of the Environment stresses that an important part of the plan should be a statement of the relationship of landfill activities in the county to land reclamation activities. The proposed regulations would also require local authorities to collect all domestic refuse and many types of agricultural waste. Licenses would be required for all private or public incinerators and landfills and would be granted only after inspections to determine safety, pollution control, and working conditions at the site. Hazardous and other special wastes would require a special license.
[24474]

73-5175

BRYSON, D. S. Profound changes coming in pollution enforcement. *Food Engineering*, 45(6):68-69, June 1973.
This article describes the far-reaching changes in the United States' entire system of pollution control which are being brought about by the Federal Water Pollution Control Act of 1972. Precise, detailed abatement requirements will be established. They will be enforced through streamlined legal procedures and heavy penalties for violations. Specific provisions of the law and their application are outlined as follows: precise limits for waste; tough penalties (violations of requirements will be subject to civil penalities of up to $10,000 per day); and permit requirements (U.S. Environmental Protection Agency and State cooperation).
[24473]

73-5176

GORHAM INTERNATIONAL INC. Legislation. *In* Solid waste management: opportunities and markets for equipment products and processes. v. 1. Technology. Gorham, Maine, Oct. 1972. p. 134-141.
This paper discusses legislation designed specifically for solid waste management, which is relatively new at all levels of government. Ordinances and statutes governing local storage and collection procedures plus antilitter laws represent the majority of solid waste legislation. Pertinent Federal, State, and local laws are reviewed. The advantages of establishing a separate department for solid waste activities follow: separate budget; increased visibility; total attention to goals; equipment and personnel sharing; direct responsibility; and higher priority status. The disadvantages include: further government fragmentation; possible lack of coordination; and duplication of service personnel. (This document is retained in the SWIRS library.)
[24475]

73-5177

GORHAM INTERNATIONAL INC. Legislation. *In* Solid waste management: opportunities and markets for equipment products and processes. v. 2. Development needs and potential. Gorham, Maine, Oct. 1972. p. 74-83.
This paper outlines solid waste legislation, which is currently divided into categories with dif-

ferent goals and objectives. The U.S. Environmental Protection Agency currently is examining a wide range of issues and problems in order to make specific recommendations to stimulate secondary materials usage. Areas included in these efforts are: tax policy changes (tax on energy, tax on virgin materials, depletion rate changes, and tax credits to users of postconsumer waste); transportation rate changes; import-export regulations; virgin resource regulation from federally controlled land; Federal and State purchasing regulations; and national standards for waste use. Specific legislative ideas are presented for tax incentives and subsidies (recycling), transportation rates, disposal taxes, and tax exempt industrial development bonds. (This document is retained in the SWIRS library.)
[24476]

73-5178

HOSCHUETZKY, A. Der umweltbereich abfall in Umweltprogramm der Bundesregurung und das abfallbeseitigungsgesetz. [Wastes in the Federal Government's environment program, and the waste disposal law.] *Schriftenreihe des Vereins fuer Wasser-, Boden-, und Lufthygiene*, 38:201-206, 1972.

The grave situation in Germany is stated - growing masses of wastes and refuse of all kinds and of sewage sludge from ever more treatment plants, 90 percent of the refuse and wastes still being dumped randomly and without care for hygiene, many dumping grounds amid settlements in densely populated areas, the legal and administrative regulations heretofore uncoordinated and inadequate, and the governmental environment protection program, prepared in 1971, are discussed, with particular view to the wastes disposal problem. The estimated costs for the coming 15 years are 2.8 billion deutsche marks, and the general principle is that he who is producing the refuse has to bear the costs of the disposal; thus the charges will be raised. Deliberations led to the conclusion that the objectives can only be achieved if large dumping grounds are provided, with due care for prevention of ground water pollution and so planned as to become a gain for the environment after recultivation; if new collection and transportation systems are found; if composting is improved; if improved elimination and recycling processes are developed; if incineration facilities for otherwise not disposable waste are provided; and if model dumps for particular kinds of wastes are provided. The organization of a federal agency for environment protection is envisaged. The law on refuse disposal has been in force since June 7, 1972. Its essential rules, briefly listed, include punishment by imprisonment for up to five years plus fines for offenders causing danger to life or health, and fines up to 100,000 deutsche marks for other offenses. (Text in German)
[24477]

73-5179

Joint House-Senate Colloquium to Discuss a National Policy for the Environment. Hearing before the Committee on Interior and Insular Affairs, United States Senate and the Committee on Science and Astronautics, U.S. House of Representatives. 90th Cong., 2nd. sess., July 17, 1968. Washington, U.S. Government Printing Office, 1968. 233 p.

This hearing presents the views of a number of witnesses including cabinet officers, conservationists, and academic leaders. There is also an appendix of communications to the colloquium on the subject of the importance of environmental protection. A second appendix contains a special report written for the Senate Committee on Interior and Insular Affairs on the subject. The report stresses that it is no longer possible to ignore the environmental costs of our policies and actions, and that they must instead be considered equally if we are to prevent the destruction of this country's beauty, natural resources, and productivity. An environmental policy, once formed, must be implemented with relevant legislation and must be carried out in cooperation with other nations. Governmental structure for environmental control is discussed. (This document is retained in the SWIRS library.)
[24478]

73-5180

KLEE, A. J. Environmental plastics legislation in the U.S.: an overview. *S P E Journal (Society of Plastics Engineers)*, 29(5):46-48, May 1973.

This article discusses environmental protection laws enacted in Oregon and New York City which have affected the plastics industry. These laws have been challenged in regard to their constitutionality. In New York City an ordinance was passed which placed a tax solely on plastic containers on the ground that they were more harmful to the environment than other types. The Society of the Plastics Industry challenged the law on its basic premise as well as on grounds that it violated the equal protection and due process clauses of the Fourteenth Amendment and the commerce clause of the Constitution. The city argued that plastics are harmful to incinerators, that they are not biodegradable and thus not suitable for landfills, that they cause air pollution when incinerated, and that the tax on this nonrecyclable material would be used to pay for reclamation of other materials, and would consequently encourage their use. The New York County Superior Court found that the tax did not promote recycling and that it was unconstitutional in that it did not observe due process and equal protection in placing such a burden only on the plastics industry. There is also discussion on the Oregon Law which requires a deposit on all beer and soft drink containers sold whether reusable or not. The constitutionality of the this law has been challenged, but has been upheld and is presently under appeal in the Oregon Supreme Court. The constitutionality and desirability of laws affecting the container industry, and aimed at preventing litter or otherwise protecting the environment, are discussed in detail.
[24479]

73-5181

Man, materials and environment. *Professional Engineer*, 34(6):32-34, June 1973.
This article is a summary of a National Academy of Engineering/National Academy of Sciences report to the National Commission on Materials Policy. It discusses the importance of such a policy and the social consequences thereof. It recommends an amendment to the constitution that will guarantee to every citizen a safe, healthful, pleasant, and productive environment. Such an amendment would force the nation to enact public policy which would preserve natural resources and energy. The committee makes a number of recommendations for the implementation of a rational materials policy including the following: the government should use all its available instruments and power to forward this policy; economic growth should be oriented in such a way as to be consistent with environmental protection; environmental costs should always be taken into consideration when evaluating the costs and benefits of a given process; efficiency is generally highest when costs of environmental damage are borne by those who cause it; land use policy is important when creating a materials policy; and research should be encouraged in environmental science. There is also a list of the present full-scale resource revovery demonstrations projects sponsored by the U.S. Environmental Protection Agency.
[24480]

73-5182

RANDOLPH, J. Federal solid waste control policy. *Waste Age*, 4(3):4-6, May/June 1973.
This article by the senior senator from West Virginia is a broad overview of Federal policies relating to solid waste management. It stresses the important role that legislation can play in preserving our environment and resources. In 1965 Congress enacted the Solid Waste Disposal Act aimed at providing assistance to the States in their disposal plans and initiating a national research and demonstration program in solid waste management. Seeing that that law was not sufficient the Congress passed in 1970 the Resource Recovery Act. This directed the major federal emphasis toward reclamation. There is still a need for more Federal activity in the area of stimulating recycling through demonstrations, research, and financial incentives. The author discusses the dangers inherent in the proposed Federal plan to cut back on expenditures on solid waste management, especially aid to the States. The Environmental Protection Agency's budget for solid waste programs in Fiscal Year 1972 is presented.
[24481]

73-5183

Solid waste and related legislation. *Waste Age*, 4(3):30, 33, 36-37, May/June 1973.

This article lists the bills that have been introduced into the U.S. Congress since January of 1973 that relate directly or indirectly to solid waste management. Each bill is listed with its number, sponsor, and a brief description. More than 100 bills are included covering such topics as: use of recycled materials in products bought by the government; establishment of a national system of solid waste management; revision of tax laws to make them more favorable to use of recycled materials; control of ocean dumping; various controls and taxes aimed at preventing litter from soft-drink and beer bottles; hazardous waste programs; and the improvement or alteration of government structures active in solid waste management or planning, including the question of Federal/State cooperation.
[24483]

73-5184

Waste Management Research and Environmental Quality Management. Hearings before the Subcommittee on Air and Water Pollution of the Committee on Public Works, United States Senate. 90th Cong., 2nd sess., May 22, June 3, June 9 and 10, 1968. Washington, U.S. Government Printing Office, 1968. 451 p.
These hearings were held for the purpose of discussing those aspects of a national environmental quality policy which relate to waste management with a minimization of pollution. Also presented are Federal research activities in solid waste management and air and water pollution control. A number of authorities testified on the importance of waste management in environmental protection and a greater number submitted statements to the committee. An appendix contains a number of reprints of documents related to this subject. Of particular interest are: Athelstan Spilhaus, Waste management and control; Annual report on government patent policy--June 1965; Demonstration project abstracts0 Solid Wastes Program; State/Interstate solid waste planning grant listing; Summaries of research and training grants in solid waste; and National Society of Professional Engineers, The engineering challenge of pollution control. (This document is retained in the SWIRS library.)
[24484]

73-5185

YOKOTA, I. Sangyo haikibutsu shori no mondaiten--Kankei horei no kaisei ni atatte. Problems of industrial wastes disposal--in the revision of related laws.] *Kankyo Gijutsu*, 2(4):227-235, Apr. 1973.
It is one and a half years since the waste disposal law was passed and now that the law is put into practical use, it is gradually becoming clear that there is some disagreement between the policy and the actual conditions when compared with the start of enforcement. It may be therefore said that the revision of the law at this time was made to remove the difficulties in applying the law in relation to the disposal of industrial wastes containing harmful substances. Under the unrevised law, industrial wastes containing harmful matter, sludge, waste acid, waste alkali, and mineral slag were specified. In the Prime Minister's office, mercury and its compound, cadmium and its compound, lead and its compound, organic phosphoric compound, six-valent chromium compound, and arsenic and its compound are defined as harmful substances, but because there is no expression like 'containing harmful substances', they have been treated as harmful substances regardless of the composition. Therefore, as the first point that should be revised, a standard by which the content level of harmful substances can be judged objectively was established. Secondly, cyanide compound was added as a harmful substance. Third, the interpretation of No. 13 of Article I came into question. The composition of wastes rather than their name was regarded as much more important. (Text in Japanese)
[24485]

MANAGEMENT

73-5186

BODMAN, S. W., III, J. A. FREANEY, J. J. HARRINGTON, D. H. MARKS, W. NIESSEN, L. J. PARTIDGE, A. SAROFIM, AND D. G. WILSON. Operations research and solid waste collection. *In* The treatment and management of urban solid waste. Westport, Connecticut, Technomic Publishing Co., Inc., 1972. p. 69-84.

This paper deals with the application of a group of mathematical tools to the systematic analysis of the solid waste collection problem, in order to show its sensitivity to various parameters, and to predict the outcome of possible policy changes so that alternative management schemes may be evaluated. Compromise solutions are presented for the microscale subproblem as follows: simulation modeling; route-generation models; traveling-salesman problem; data and assumptions used; amount and variability of waste generated; pickup time; crew size, type of vehicle and work rules; and travel and waiting times. Macroscale models are also presented. (This document is retained in the SWIRS library.)
[24486]

73-5187

BODMAN, S. W., III, J. A. FREANEY, J. J. HARRINGTON, D. H. MARKS, W. NIESSEN, L. J. PARTIDGE, A. SAROFIM, AND D. G. WILSON. Solid waste management in homes, apartment and office buildings. *In* The treatment and management of urban solid waste. Westport, Connecticut, Technomic Publishing Co., Inc., 1972. p. 7-22.

This paper discusses the problems and some promising solutions for the management of solid wastes in private homes, hotels, apartment buildings, hospitals, and supermarkets. Some of the better approaches available at present are compaction, recycling, and tube-transport systems. Developments which are either probable or desirable for the future are discussed. The principal problems of solid wastes in buildings are insects, rats and vermin, fire, odor, volume, and hazardous wastes. The methods of solid waste management which are discussed include: pneumatic and hydraulic dust systems; pneumatic transport systems; containers; compactors and balers; shredders; incinerators for buildings; and salvage and recycling. (This document is retained in the SWIRS library.)
[24487]

73-5188

BODMAN, S. W., III, J. A. FREANEY, J. J. HARRINGTON, D. H. MARKS, W. NIESSEN, L. J. PARTIDGE, A. SAROFIM, AND D. G. WILSON. The treatment and management of urban solid waste. Westport, Connecticut, Technomic Publishing Co., Inc., 1972. 210 p.

This report provides a technical discussion of the treatment and management of urban solid waste. Extensive bibliographic material, data, tables, and figures are provided. The topics which are discussed in detail follow: the history and background of solid waste problems; solid waste management in homes and apartment and office buildings; urban refuse collection and street cleaning; quantitative estimates for solid waste collection; landfill; municipal incineration; reclamation for municipal solid waste; and composting municipal refuse. (This document is retained in the SWIRS library.)
[24488]

73-5189

BODMAN, S. W., III, J. A. FREANEY, J. J. HARRINGTON, D. H. MARKS, W. NIESSEN, L. J. PARTIDGE, A. SAROFIM, AND D. G. WILSON. Urban refuse collection and street cleaning. *In* The treatment and management of urban solid waste. Westport, Connecticut, Technomic Publishing Co., Inc., 1972. p. 23-28.

This paper presents a detailed examination of present practices in refuse collection and street cleaning in part of Boston and summarizes some of the particular changes which seem to be desirable. The possible improvements in urban refuse collection and street cleaning which are recommended include: combined collection in bags; reduction in crew size; quieter collection vehicles; continuous loaders; integrated vehicles; integrated street-cleaning and collection vehicles; automated collection vehicles; automatic loading plus home compactors; and bulky-item container collection. (This document is retained in the SWIRS library.)
[24489]

73-5190

Department of Street and Sanitation Services. [Information bulletin.] Dallas, Texas, Apr. 1973. 19 p.

This booklet, available from the issuing agency at 2721 Municipal Street, Dallas, Texas, 75215, describes the facilities, functions, and budget of

the Department of Street and Sanitation Services. This department is responsible for collection and disposal of refuse, abandoned autos, litter cleanup, street cleaning and flushing, snow removal, and emergency services such as flood cleanup. The city does not contract out its collection functions, but allows industry and commercial establishments to hire private contractors to collect their wastes. The customer pays the department a fee for sanitation as he pays his water bill. The service fee ranges from $1.50 to $5.00 a month for residences, depending on the type of service. Commercial rates are based on the amount of trash and the frequency of service. The Department's budget for the forthcoming year will be more than $7.3 million. The annual cost per ton of refuse was $10.65 for collection and $1.39 for disposal. Ten disposal sites are operated, all of which are on private property. The owner in these cases wishes to fill an old gravel pit or raise the level of his land, so that the city does not have to pay for the use of the land. At one of the disposal sites, metal recycling is taking place on a pilot scale. About $600 worth of metal was recovered in the first month of the test program. (This document is retained in the SWIRS library.)
[24490]

73-5191

ENVIROGENICS CO. Power plant design considerations. *In* Systems evaluation of refuse as a low sulfur fuel. A final report to the Environmental Protection Agency. v. 1. Report No. F-1295. Washington, U.S. Environmental Protection Agency, Nov. 1971. p. III(1-159).
The criteria to be used for designing a plant which would utilize refuse as a fuel are discussed in this study sponsored by the U.S. Environmental Protection Agency's National Air Pollution Control Administration. The following topics are discussed in detail: a survey of fossil fuel and refuse-fired boilers; fuel value; refuse charging rate; unit capacity; steam and other operating conditions; energy requirements; combustion calculations; fuel requirements; heat rate; steam flow; design data for candidate systems (design criteria, weighing stations, truck unloading, receiving pit, oversize material separation and reduction, and storage facilities); and an evaluation of selected engineering designs (cost model, optimization of selected new plant designs, and retrofit plants). Data, charts, and diagrams are also provided. (This document is retained in the SWIRS library.)
[24491]

73-5192

GLYSSON, E. A., J. R. PACKARD, AND C. H. BARNES. The problem of solid waste disposal. Ann Arbor, College of Engineering, The University of Michigan, 1972. 153 p.
This document discusses the technical and social problems involved in solid waste disposal systems. The document is part of the Ingenor series which deals with issues in which these aspects cannot be separated. The book attempts to define the nature and scope of the problem of devising the best system of solid waste management and also discusses the various types of solid waste disposal systems presently available. The disposal methods that are presented include: sanitary landfill; size reduction; incineration; composting; reclamation; and recycling. A basic introduction to each of these is given. Each chapter is accompanied by diagrams, charts, and graphs which provide a great deal of useful material. There is an extensive list of references and additional reading. (This document is retained in the SWIRS library.)
[24492]

73-5193

GLYSSON, E. A., J. R. PACKARD, AND C. H. BARNES. What's the problem? *In* The problem of solid waste disposal. Ann Arbor, College of Engineering, The University of Michigan, 1972. p. 1-32.
This chapter serves as a basic introduction to the problem of solid waste management. The social and legal aspects of the issue are discussed. There is also a definition of the terms used in discussing solid waste. Collection is dealt with briefly, but it is felt by the authors that processing and disposal are the important issues. American attitudes toward solid waste handling are presented. A number of charts give basic data on solid waste, including: types of solid waste; sources of solid waste; on-site handling

methods; off-site methods of handling; flow of solid waste in the community; present disposal alternatives; wastes acceptable for different disposal alternatives; composition and amount of solid waste in the United States, France, and Sweden; trends in solid waste collected in different cities; seasonal variations; and generation of municipal solid waste in the United States per capita over the years. The case of the problem of Rochester, New York in finding a suitable disposal alternative is discussed in detail for an example of the issue involved. (This document is retained in the SWIRS library.)
[24493]

73-5194

GORHAM INTERNATIONAL INC. [Environment.] *In* Solid waste management: opportunities and markets for equipment products and processes. v. 2. Development needs and potential. Gorham, Maine, Oct. 1972. p. 70-73.
The environmental conditions connected with solid waste management are discussed. Every solid waste management processing system must consider the following general environmental criteria: air pollution control; water quality (groundwater contamination, effluent treatment, process water reclamation, and overall water requirements); aesthetic acceptability; occupational safety and health (noise, physical dangers, work environment, and specific contaminants); thermal pollution; and final process residue disposal. (This document is retained in the SWIRS library.)
[24495]

73-5195

GORHAM INTERNATIONAL INC. Entry requirements and methods for solid waste management industry. *In* Solid waste management: opportunities and markets for equipment products and processes. v. 2. Development needs and potential. Gorham, Maine, Oct. 1972. p. 170-176.
Entry requirements and methods for the solid waste management field are outlined. Entry methods include: internal expansion and hiring of additional personnel with the specific talents needed for expansion; organizing a new company to undertake the new activities; licensing and franchising; a joint venture between two firms; and the acquisition of existing firms. Entry requirements include: developing improved technology; obtaining the capital necessary to make large equipment purchases; personnel; and service. (This document is retained in the SWIRS library.)
[24494]

73-5196

GORHAM INTERNATIONAL INC. Management systems. *In* Solid waste management: opportunities and markets for equipment products and processes. v. 1. Technology. Gorham, Maine, Oct. 1972. p. 122-133.
This paper describes solid waste management systems which cover the following basic functions: policymaking; public information; budgeting; planning and review; drafting, adopting, and enforcement of standards; and operation of actual and day-to-day systems, such as contract, turnkey, utility, municipal operations, and intergovernmental approaches. The points that are critical requirements in developing an effective solid management unit are presented along with a summary of alternative methods of financing capital requirements. (This document is retained in the SWIRS library.)
[24496]

73-5197

GORHAM INTERNATIONAL INC. Marketing. *In* Solid waste management: opportunities and markets for equipment products and processes. v. II. Development needs and potential. Gorham, Maine, Oct. 1972. p. 162-169.
This paper discusses the marketing of solid waste management equipment and processes. The purchasing sector includes purchasers of diverse characteristics and sizes; the purchasing methods and decisionmaking rationale varies greatly from purchaser to purchaser; and the various alternative processes and equipment are extremely competitive with no overriding advantages yet proven for many of the developing systems. Volumes and strategy are presented. A table includes data on the additional expenditures required to update solid waste management facilities for collection, incinerators, in-

cinerator air pollution control, land disposal, and dump closing and conversion. (This document is retained in the SWIRS library.)
[24497]

73-5198

GORHAM INTERNATIONAL INC. New equipment, product and process opportunities. *In* Solid waste management: opportunities and markets for equipment products and processes. v. 2. Development needs and potential. Gorham, Maine, Oct. 1972. p. 84-118.
This paper discusses the areas that have potential for new technological developments to improve solid waste management systems and efficiency levels. Solid waste management technology currently utilizes many techniques borrowed from other industries. A great need exists for application of other existing technology as well as totally new development efforts. The topics which are discussed in detail follow: collection; storage; handling and transportation; size reduction; compaction; incineration (energy recovery); separation; resource recovery; and ocean and land disposal. Data are provided on size reduction-separation systems compatibility. (This document is retained in the SWIRS library.)
[24498]

73-5199

GORHAM INTERNATIONAL INC. Present expenditures. *In* Solid waste management: opportunities and markets for equipment products and processes. v. 1. Technology. Gorham, Maine, Oct. 1972. p. 20-29.
This paper discusses the amount of money currently expended for solid waste management activities. Solid waste management costs are difficult to separate from overall pollution control, public works, or general expense accounts. However, by use of standard cost accounting systems and increased emphasis on solid waste management activites, more definitive costs will be available in the near future. Federal Government, State agency, and operating agency expenses are covered. The following data are provided: Federal solid waste management budget obligations; Federal solid waste management funding by agencies; legislative budget authorizations; and operating agency expenditures. (This document is retained in the SWIRS library.)
[24499]

73-5200

GORHAM INTERNATIONAL INC. Service opportunities in solid waste management. *In* Solid waste management: opportunities and markets for equipment products and processes. v. 2. Development needs and potential. Gorham, Maine, Oct. 1972. p. 119-126.
This paper discusses the provision of both direct operational services and indirect solid waste management supplemental services. While several firms are rapidly expanding to establish substantial market shares in this service industry, opportunities will expand as improved solid waste management develops. The topics covered under collection services are: private disposal sites; and solid waste collection services combined with processing and disposal operations. Under management services to the solid waste generators and to the private and public solid waste collection, processing, and disposal organizations there is also a discussion of equipment, maintenance, and service contracts. Resource recovery services are also reviewed. (This document is retained in the SWIRS library.)
[24500]

73-5201

GORHAM INTERNATIONAL INC. Solid waste management industry structure. *In* Solid waste management: opportunities and markets for equipment products and processes. v. 1. Technology. Gorham, Maine, Oct. 1972. p. 7-19.
This description of the structure of the solid waste management industry is divided into the public and private sectors. Under the public sector the following are discussed: the Federal Government (U.S. Environmental Protection Agency grants); large metropolitan areas; small cities and villages; rural areas; and regional agencies. National organizations and the organizational options and structure of the private sector are also outlined. The following data are provided: a 1968 survey of community solid waste practices; the proportion of cities of dif-

ferent sizes using different collection arrangements; and the type of collection agency used by cities in 1939, 1955, and 1964. (This document is retained in the SWIRS library.)
[24501]

73-5202

GORHAM INTERNATIONAL INC. Solid waste management: opportunities and markets for equipment products and processes. v. 1. Technology. Gorham, Maine, Oct. 1972. 151 p.
This report provides basic information on the currently available alternatives for solid waste management operations and presents a comprehensive review of today's solid waste management industry. The discussion of today's technology is categorized as follows: historical development; the structure of the solid waste management industry; present expenditures; collection; equipment; storage and handling systems; processing; disposal; management systems; and legislation. Extensive data and diagrams, bibliographic material, and an appendix containing classifications of wastes and incinerators are provided. (This document is retained in the SWIRS library.)
[24502]

73-5203

GORHAM INTERNATIONAL INC. Solid waste management: opportunities and markets for equipment products and processes. v. 2. Development needs and potential. Gorham, Maine, Oct. 1972. 181 p.
This publication highlights the operational performance and reported costs for typical waste management installations. The areas that possess potential for new and improved developments are presented. A chapter is devoted to each of the following topics: technology assessment; environmental considerations legislation; new equipment, product, and process opportunities; service opportunities in solid waste management; economic potential; marketing; and entry requirements and methods for the solid waste management industry. Conclusions, extensive data, and bibliographic material are also included. (This document is retained in the SWIRS library.)
[24503]

73-5204

GORHAM INTERNATIONAL INC. Storage and handling systems. *In* Solid waste management: opportunities and markets for equipment products and processes. v. 1. Technology. Gorham, Maine, Oct. 1972. p. 44-67.
The storage of solid waste is described as the single aspect that most significantly affects the individual homeowner, business establishment, or other refuse generating facility. Storage techniques and handling systems are discussed in detail as follows: household storage methods; commercial and industrial storage systems; combined storage and densification systems; transfer stations; pneumatic; slurry; conveyor; and rail haul. To be feasible, the rail haul alternative must provide the least costly waste disposal technique based on the following criteria: solid waste materials; volumes; environment impact; operational reliability; service; economics; organization; and implementation. (This document is retained in the SWIRS library.)
[24504]

73-5205

GORHAM INTERNATIONAL INC. Technology assessment. *In* Solid waste management: opportunities and markets for equipment products and processes. v. 2. Development needs and potential. Gorham, Maine, Oct. 1972. p. 2-69.
The economics and technology of the solid waste management industry are outlined. The topics which are discussed in detail include: collection; storage and handling; size reduction; separation; incineration and energy recovery; composting; compaction; and disposal. The U.S. Environmental Protection Agency is conducting programs aimed at providing more efficient solid waste collection utilizing available equipment and techniques. Tables providing extensive cost data are included. (This document is retained in the SWIRS library.)
[24505]

73-5206

Haikibutsu shori gijutsu. [Solid waste treatment techniques.] Tokyo, Government of Japan, Jan. 1973. 47 p.

The collection, transportation, intermediary treatment, and terminal treatment of solid waste are discussed. As an example of special waste treatment, the case of Yokohama city and its handling of plastics, large appliances, hospital waste, and waste from high rise office buildings is discussed. The history and the present condition of solid waste treatment, the future administrative policy, and the direction of research work on sanitary landfill are discussed. Between 1971 and 1975, sanitary service coverage by the municipal, township, and village governments of Japan will be increased from 85.5 percent to 95 percent. Incineration systems should be installed to treat at least 90 percent of the total combustibles in the collected waste (approximately 83 percent of all total waste). The incinerators should be able to process large amounts of plastics without creating air pollution. Crushing and compaction equipment for large waste should be installed in all cities with a population of more than 100,000 as of 1975. The basic budget for installation and furbishing of all solid waste treatment between 1971 and 1975 (including construction, land cost, incineration, residue landfill) will be 269,500 billion yen. The capacity at that time will be 58,855 tons per day. Large waste treatment facilities will be installed at 274 locations, and their installation and furbishing budget will be 21,500 billion yen. This will increase the total waste incineration capacity to 110,660 tons per day. (Text in Japanese) (This document is retained in the SWIRS library.)
[24506]

73-5207

HEIDEN, U. Teil II: Ueberregionale und regionale Planungen entsprechend der modernen Abfallgesetzgebung des Bundes und der Laender, part II. [Supra-regional and regional planning according to the modern refuse laws of the Federal Republic and the Laender, Part II.] *Muell und Abfall*, 5(3):78-79, 1973.

According to investigations conducted in Lower Saxonia in 1971 the refuse of about 86 percent of the inhabitants is collected regularly. The annual residential refuse quantity amounts to 7 million cu m, and the industrial refuse reaches nearly the same quantity. About 2,680 disposal sites are working in Lower Saxonia of which, however, only 40 are sanitary landfills. The most economic method of refuse removal for Lower Saxonia is sanitary landfill. The basic refuse disposal plan set up for Lower Saxonia provides for 1980 the construction of 144 sanitary landfills, three composting plants and two incineration plants. Each refuse disposal plant shall be laid out for 20,000 to 25,000 inhabitants and the transportation distance shall not exceed 20 to 25 km. Four plants shall provide for the detoxification, incineration and disposal of dangerous industrial refuse. (Text in German)
[24507]

73-5208

JAPAN DEVELOPMENT BANK. [Various problems surrounding plastic pollution.] Oct. 1972. 104 p.

The present state of total domestic and industrial waste production in Japan, the production in Japan, the general treatment methods, costs, and the problems in the present treatment method due to the plastic content in refuse, the administrative policy in the treatment of plastic waste and the general trends are reviewed. The ratio of plastic waste in the total amount of waste has increased from 2.0 percent by weight in 1953 to 10.3 percent of 1970 in Tokyo, from 1.4 percent to 10.1 percent in Kyoto; the ratios now are 8.5 percent in Yokohama, 8.0 percent in Nagoya, 8.0 percent in Osaka, and 9.5 percent in Kobe. These figures are high compared to large cities in other countries, which range from 2 percent (London and Chicago) to 5 to 6 percent (New York). Some ideas on the solution of the problem range from taxation of plastic industries and using the fund for the research and development of special treatment method to the construction of model recycling total system plants. The Ministry of Health and Welfare plans to continue the installation and construction of sanitary facilities for the treatment of sewage and waste materials. As of 1971, 93 percent of sewage and 62 percent of waste are being treated; by 1975, the treatment of 100 percent of sewage and 90 percent of domestic refuse will become possible on the budget of 402 billion yen. The capacity of waste incineration will be approximately a double of that of 1970, at 110,661 tons per day. The budget for the installation of industrial waste treatment

facilities is 50 million yen; this will have a 60 percent treatment capacity for industrial sludge, waste oil and plastic produced by small and medium size industries. With regard to plastics, the Metropolitan Government of Tokyo is to attain facilities for selective collection crushing, compaction, and landfill by 1975. Although this will not be the most desirable of the treatment methods, the metropolitan government will not be able to reach the point of recycling by that date. (Text in Japanese.) (This document is retained in the SWIRS library.)
[24510]

73-5209

LESSING, L. The salt of the earth joins the war on pollution. *Fortune*, 88(1):138-142, 144, 146-147, July 1973.

Anti-Pollution Systems, Inc., New Jersey, is developing a new waste-disposal system which is efficient and small. It employs molten salts to dispose of sewage and solid waste of up to 1,000 people. The system's major premise is that by passing most kinds of wastes through a searing-hot bath of molten salts, in one relatively simple, self-contained operation, it can reduce these wastes faster and more completely by catalytic action than can conventional pollution-control equipment of much larger size and complexity. The system is low in capital costs and economical in fuel consumption. Additional economies may be realized by recycling materials such as metals and glass.
[24508]

73-5210

MACKILLOP, A. Low energy building--why and how? *Building Technology and Management*, 11(1):8-9, 11-13, Jan. 1973.

The average building in Great Britain is not designed to use energy effectively and economically. If the world is not to run out of fuel within the next generation's lifetime and/or to continue to pollute the air, sea, and soil with the products of coal mining, oil refining, and electrical generation by conventional or radioactive fuels, some drastic changes must be made in the way houses and office buildings use energy. The first area where energy economies must be made is in the construction materials themselves. To produce enough conventional materials for a standard housing unit is 53,700 kilowatt per hr, whereas a comparable housing unit built with soil cement blocks, which can be made by hand on site by unskilled labor, would require only 20,450 kilowatt per hr. Also conventional building materials and regulation of their use do not always make the best use of energy. For example, vast glass-and-steel office buildings which are used only a portion of the week need much heating and cooling, much of which is lost through poorly insulated walls and ceilings. Waste materials available locally such as fly ash and demolition waste must be better utilized. Solar energy can be exploited by private homes for a relatively small investment of a flat-plate collector. The high cost of sewage treatment could be lowered by installing Clivus units in all houses, and composting would dispose of many wastes and provide soil improvement simultaneously.
[24509]

73-5211

O'BRIEN AND GERE ENGINEERS, INC. Development of a master plan. *In* Jefferson County comprehensive solid waste planning study, CSWP-15. Albany, New York, New York State Department of Environmental Conservation, June 1972.

In this paper, various collection and disposal alternatives are presented and a master plan is outlined for Jefferson County for the period 1970 to 1985. This is part of the Jefferson County Comprehensive Solid Waste Planning Study. The principal objective was to minimize costs for each municipality. The environmental impact of each system was judged, however, and convenience to residents and aesthetics were considered as well. The collection alternatives evaluated during the study were: independent collection systems for each municipality using packer-type trucks; rural containerization for unincorporated areas on an intermunicipal basis; and a centrally controlled collection service for the entire county. The disposal alternatives evaluated during this study were: incineration by each population center in the County; sanitary landfills for each of five town service areas; three sanitary landfills with direct haul to each site; one sanitary landfill with three transfer stations;

incineration followed by landfilling; and shredding followed by landfilling. (This document is retained in the SWIRS library.)
[24511]

73-5212

O'BRIEN AND GERE ENGINEERS, INC. Disposal site planning. *In* Jefferson County comprehensive solid waste planning study, CSWP-15. Albany, New York, New York State Department of Environmental Conservation, June 1972. p. 71-77.
This paper investigates the feasibility of a large number of sites throughout Jefferson County for use as disposal facilities as part of the Jefferson County Comprehensive Solid Waste Planning Study. The criteria used for disposal operations were: workability of soil; depth to bedrock; depth to ground water; distance from waste generation centers; distance from habitations; and possible contamination of streams. It was assumed in selecting sites that the method of solid waste disposal to be utilized in the County throughout the study period was sanitary landfilling without intermediate treatment. The method of site selection and 19 detailed site evaluations are also presented. (This document is retained in the SWIRS library.)
[24512]

73-5213

O'BRIEN AND GERE ENGINEERS, INC. Implementation of the master plan. *In* Jefferson County comprehensive solid waste planning study, CSWP-15. Albany, New York, New York State Department of Environmental Conservation, June 1972. p. 90-96.
This paper outlines the implementation of a master plan for Jefferson County, New York, as part of the Jefferson County Comprehensive Solid Waste Planning Study. The following alternative means of administering solid waste management activities were investigated during this study: individual municipal administration; administration through County districts; Countywide administration by an agency of County Government; or administration by an authority. Financing of capital expenditures for solid waste management activities could be accomplished by direct use of general funds or by borrowing. Annual costs for debt service, labor, and operation could be levied on County residents through the tax structure or the institution of user fees. The implementation of the master plan which occurred during the study and a 1975 timetable for further implementation of the master plan are provided. (This document is retained in the SWIRS library.)
[24513]

73-5214

O'BRIEN AND GERE ENGINEERS, INC. Physical characteristics, economy, and population and land use. *In* Jefferson County comprehensive solid waste planning study, CSWP-15. Albany, New York, New York State Department of Environmental Conservation, June 1972. p. 1-10.
This paper presents the physical, economic, and population and land use background of Jefferson County as part of the Jefferson County Comprehensive Solid Waste Planning Study. Under physical characteristics the location, climate, topography, geology, and water resources are discussed. The economic development of the county is a function of its transportation as the county has a well developed internal highway network. The industrial output of the county is diversified and includes paper, food, machinery, instrument, clothing, and transportation equipment production. Population data and projections are provided and land use and natural resources are also discussed. (This document is retained in the SWIRS library.)
[24516]

73-5215

O'BRIEN AND GERE ENGINEERS, INC. Principles of solid waste management. *In* Jefferson County comprehensive solid waste planning study, CSWP-15. Albany, New York, New York State Department of Environmental Conservation, June 1972. p. 25-42.
This paper outlines the overall management system for Jefferson County, New York, as part of the Jefferson County Comprehensive Solid Waste Planning Study. The elements of an overall solid wastes management system which are discussed in detail are: storage of wastes at

the source; collection; transportation; treatment; and ultimate disposal. A well-conceived system involves recognition of: the interrelationships between phases; the effects individual phases have on each other; and the need for a totally integrated system. Local community problems which point to the need for an organized, area-wide approach to management include: a shortage of properly operated disposal facilities; escalating costs; increases in per capita refuse production rates; a shortage of land for sanitary landfill use; and difficulty in attracting qualified personnel. (This document is retained in the SWIRS library.)
[24517]

73-5216

O'BRIEN AND GERE ENGINEERS, INC. Solid waste quantities. *In* Jefferson County comprehensive solid waste planning study, CSWP-15. Albany, New York, New York State Department of Environmental Conservation, June 1972. p. 11-15.
This paper estimates the rates at which domestic, commercial, and industrial solid wastes will be produced in the municipalities of Jefferson County, New York, from 1970 to 1985. This is part of the Jefferson County Comprehensive Solid Waste Planning Study. Population projections from a previous chapter are used and present generation rates and projections are presented in table form for the years 1970, 1975, 1980, and 1985. For the purposes of this study, the solid wastes produced in Jefferson County were classified into five principal categories0 domestic, commercial, institutional, industrial, and special. The topics which are discussed in detail follow: classification of solid wastes (glossary of terms); investigations; domestic and commercial refuse; industrial refuse; and a summary of quantities. (This document is retained in theSWIRS library.)
[24518]

73-5217

O'BRIEN AND GERE ENGINEERS, INC. Special wastes. *In* Jefferson County comprehensive solid waste planning study, CSWP-15. Albany, New York, New York State Department of Environmental Conservation, June 1972. p. 16-24.
This paper discusses the special wastes problems of Jefferson County, New York, as part of the Jefferson County Comprehensive Solid Waste Planning Study. The normal procedures for collection, transportation, compaction, and cover are inappropriate for special wastes. Each of the following special waste categories is discussed in a section of this paper: abandoned vehicles; scavenger wastes; residues from water and waste water treatment; demolition and construction materials; tires; trees and brush; agricultural wastes; hazardous wastes; and bulky wastes. (This document is retained in the SWIRS library.)
[24519]

73-5218

PUBLIC INFORMATION OFFICE. Environmental protection in New York City. New York, New York Environmental Protection Administration, Aug. 1972. 8 p.
This booklet is available from the above agency, the address of which is 125 Worth St, New York, 10013. It describes the organization and activities of the New York Environmental Protection Administration, formed in March of 1968 to comprise the Sanitation Department, the Department of Water Resources, and the Department of Air Resources, which includes the Bureau of Noise Abatement. Figures are provided on the overall budget of each department, the amount of service they provide and the aims of the department. In the case of the sanitation department, it is responsible for garbage collection, street cleaning, flushing, snow removal and pickup of bulky wastes and abandoned cars. This body is also charged with the disposal of all this waste. It is the policy of the city of New York to help to alleviate the solid waste problem in two ways0 to expedite the collection and disposal of waste and to reduce the amount generated. To the first end, productivity studies have been done to improve efficiency of collection operations; these have been markely bettered in recent years. To reduce the waste load, the city council proposed a packaging tax. In the form in which the bill was finally passed, it was declared void by the courts, but another bill covering all packaging and not just plastic will be introduced in the next session of the council. In its official

purchasing the city gives preference to recycled products, and experimental programs for the collection of newpapers are in progress. Various disposal methods are being studied to replace the soon-exhausted landfills now in use. Information is also given on plans to expand the water treatment and sewage treatment capability of the city. New laws to aid the Department of Air Resources and Bureau of Noise Abatement to lower noise and air nuisances in the city are being developed. Other programs of the New York EPA are mentioned as well, such as the campaign to promote rapid public transit at the expense of the automobile in downtown areas. (This document is retained in the SWIRS library.)
[24520]

73-5219

PUBLIC INFORMATION OFFICE. Sanitation: statistical summary. New York, New York, Environmental Protection Administration, Feb. 1973. 6 p.
This booklet is simply a collection of tables. They cover the following topics: personnel of the sanitation department; area and population density; refuse collection frequencies in various parts of the city; cost summary for collection, street cleaning, and refuse disposal; statistics on tonnages of solid wastes handled in the city; figures on abandoned automobiles; households of various types serviced in the city; numbers of accounts serviced by private cartmen; number of trucks used for collection and haul per truck; tonnages of refuse disposed of by different methods0 incineration, ocean dumping, and sanitary landfill; street cleaning data; number of litter baskets; number of summonses issued by the sanitation enforcement division; complaint calls received and what the complaints were about; data on the facilities under the jurisdiction of the Sanitation Department and their capacity; and equipment owned by the Department. (This document is retained in the SWIRS library.)
[24521]

73-5220

SHIMIZU, R. Haikibutsu shori taisaku. [Waste disposal policy.] *Kankyo Joho Kangaku*, 1(3):14-20, Dec. 1972.
The present problem of waste disposal is attributed the the fact that aftermaths of production and other activities were left with nature or as some other people's responsibility. If wastes are to be disposed of by recycling them back to resources, or through ecosystem and reproduction mechanism of resources, by individuals, industry, and local governments, the problem can be overcome. For this, all the production processes must be checked, based upon flow sheet of resources, i.e., they must be made to produce no pollution. Pollution can be controlled by a strict system of sorting and classification. Environmental problems are caused because both homes and industry are accustomed to throw out what is of no economic use to them. Enterprises must realize that throwing out is not for free any more. If industrial effluent and sewage from general households are discharged into joint sewers without pretreatment terminal treatment can be difficult and costly. New industrial values and evaluations are called for. By turning wastes back into resources, both consumption and production can be stimulated, and generation of pollution can be minimized, preventing environmental pollution and creating harmony between nature and man. (Text in Japanese)
[24522]

73-5221

Urban-rural reports; Illinois suburbs join in solid-waste study. *Compost Science*, 14(3):3, May-June 1973.
This article announces that three northern Illinois suburbs, Evanston, Niles, and Skokie, have embarked on a joint solid-waste-management study funded by a $100,000 federal grant. With the shutdown of its incinerator, Evanston's garbage disposal costs could rise $100,000 a year, since refuse must then be hauled to a landfill site. Skokie trucks its incinerated refuse to a landfill. This town paid $541,000 for refuse collection and $163,000 for disposal last year. Niles paid $200,000 in collection costs and $20,000 in

disposal fees in 1972. Pollution control standards and the shortage of space for sanitary landfills are two of the problems noted.
[24523]

OCEAN DISPOSAL

73-5222

Heavy going ahead for waste discharging at sea. *Chemical Week*, 112(6):45, 47, June 27, 1973.
This article warns that companies planning major expansions of titanium dioxide production cannot count on ocean disposal of their wastes. They now use the ocean dispose of dilute acid wastes from most of the 800,000 tons per year of pigment produced in the United States. The U.S. Environmental Protection Agency is still issuing permits for barging such wastes to sea, but the pressure which is building for plants to switch to other disposal and waste treatment methods is outlined. This pressure has come from State agencies and citizen groups. Without ocean disposal there are three routes available for the chemical industry: make something that can be marketed; make something that can be reused in its processes; or make something that can be stored on land.
[24524]

PACKAGING WASTES

73-5223

Abfall wird reduziert. [Refuse is reduced.] *Verpackungs-Rundschau*, 24(4):376, 1973.
Two new refuse removal devices have been developed basing on the shredding and pressing principle in order to reduce the refuse volume. Plastic packaging, cartons and glass up to a diameter of 165 mm are ground to 5 to 10 percent of the original volume. A hydraulic press has been developed especially for cans. By means of a pressure of 4,500 rx and 7,500 kg respectively tins up to 12 liters are compressed to five percent of the original volume. (Text in German)
[24525]

73-5224

HEISS, R. Abbaybare Kunststoffe--eine kritische Wertung ihrer Moeglichkeiten. Degradable plastics--a critical evaluation of their possibilities.0 *Verpackungs-Rundschau*, 24(5):669-670, May 1973.
The technical problems of how to decompose plastic material by means of ultra-violet light has been solved. After a first phase of chemical decomposition the plastic material is finally degraded by microorganisms. However, owing to various factors like printing and thickness and type of the plastic material which considerably influence the velocity of the degradation it is practically impossible to find a procedure which is generally applicable for all types of plastic material. The usefulness of degradable plastic seems doubtful considering the fact that in sanitary landfills the behaviour of degradable plastics does not differ from that of nondegradable material. Degradable plastics would only encourage people to throw plastic packings on the ground. Another argument against degradable plastics is the increasing shortness of fuel so that in the future it might be necessary to make use of the high heating value of the plastic material which would be impossible in the case of degradable plastics. (Text in German)
[24526]

73-5225

SACHAROW, S. Design for disposal in food packaging. *Food Engineering*, 45(6):82-84, June 1973.
This article presents guidelines for the disposal and reutilization of packaging materials. Certain materials should be avoided, overpacking eliminated, and marketing goals directly enforced. The following characteristics are described: weight; volume; combustibility; and separability. Disposal of plastics, incineration, nuclear fusion prospects for recycling, industrial reclaim, degradable plastics, and aluminum and glass are also discussed. A table on methods of degrading plastics is provided.
[24527]

73-5226

SCHULER, M. Polyvinylchlorid im Dienste des Umweltschutzes. [Polyvinylchloride serves the protection of the environment.] *Chemische Rundschau*, 25(48):1607, 1611, Nov. 1972.

Polyvinyl chloride is not so harmful as it is always said to be. Its fraction among the trash presently amounts to 0.25 percent. By 1980 it will have risen to 1 percent according to a report by the Battelle Institute. Together with other chlorine-containing substances in the trash such as salt-containing food residues, coal, chlorine bleached paper, it gives off hydrogen chloride upon incineration. The absorption of gaseous hydrogen chloride poses no difficulty. Studies have shown that the larger part of gaseous hydrogen chloride is bound to coke and ash. Moreover, the alkaline components of the combustion residues such as the calcium and magnesia compounds have the capability of neutralizing the hydrogen chloride. The chlorine bound in polyvinyl chloride stems originally from the production of a number of important substances such as sodium lye and magnesia where it develops as an unwanted byproduct. The production of polyvinyl chloride is in fact the safest and most efficient method of chlorine disposal. The product polyvinyl chloride is, moreover, a very useful material for lining refuse dumps. (Text in German)

[24528]

73-5227

SOCIETY OF PLASTICS INDUSTRY, INC. Polystyrene foam meat trays & egg cartons and environmental quality. New York, New York, 1972. 8 p.

This little booklet, available from the Society of Plastics Industry, 250 Park Avenue, is an attempt to answer the hew and cry that is raised about the pollutional potential of polystyrene foam packaging. It is pointed out that simply being biodegradable, as paper is alleged to be, is not definitely an advantage. Firstly, paper has been found in landfills after sixty years, they state, showing virtually no sign of deterioration. Also, the very biodegradation of materials in a landfill is what causes the greatest environmental threat--leachate and methane generation. It is also argued that entirely too much has been made of the problem of incinerating polystyrene foam. When burned in modern equipment, with adequate pollution control equipment, the foam does not cause either pollution or damage to the incinerator or air pollution control equipment. Finally, data is presented, taken from a Public Health Service publication, that shows the small fraction of refuse that is composed of polystyrene foam0 0.5 percent. It is not denied that there is a great solid waste problem in this country--one which packaging has gone a long way toward creating. The suggestion of the plastics industry is to take advantage of the rising calorific value of refuse by incinerating it and using the heat for heating or power generation, a solution reached by many European cities. (This document is retained in the SWIRS library.)

[24529]

73-5228

TAKEUCHI, Y. Hikari hokaisei purasuchikku no kenkyu kaihatsu doko. [Tendency of studies on light degradable plastics.] *Kankyo Sozo*, 3(3):45-55, Mar. 1973.

In Japan, the study and development of the light degradable plastics has been carried on, but it is said that the only one which is put into practical use is the foamed polystyrene product developed by Sekisui Chemical Co. The other companies which are wrestling with the development of the light degradable plastics are Chisso Corp., Fibrous High Polymer Material Research Laboratory, Nippon Synthetic Rubber Co., Kyoto University, Asahi Chemical Industrial Co., Mitsui Petrochemical Industries, Mitsubishi Chemical Industries, Sumitomo Chemical Co., Mitsubishi Petrochemical Co., Mitsui Toatsu Chemicals, Kuraray Co., and Teijin Ltd. Most of the light degradable plastics which are now studied are of the self-degradation type, or main-chain-cutting type. The external force degradable plastic and the easily crushable type are being studied only by Nippon Synthetic Rubber Co. and Kyoto University. The self-degradation type plastic, except ECOLAN introduced by Chisso Corp. and Fibrous High Polymer Material Research Lab., is a composition added with a material which promotes the oxidation of the polymer chain and the cutting of the molecular

chain by the excitation of ultra-violet rays like a sensitizer. The light degradable plastic developed by Nippon Synthetic Rubber Co. is a butadiene resin composed of syndiotactic 1.2-polybutadiene having a crystallinity of 10 to 30 percent. (Text in Japanese)
[24530]

PROCESSING / REDUCTION

73-5229

ADOLPH, M. Shreddern, die neue Methode of Schrottaufbereitung. [Shredding process, a new way of scrap preparation.] *Staedtehygiene*, 24(4):88-95, 1973.
Increasing amounts of scrap, especially car bodies, have occasioned shredding processes. Steel works are also demanding high quality scrap. The shredder is preferably used for bulky wastes such as car bodies, kitchen ranges, refrigerators, washing machines, and steel furniture. It is not suitable for steel ropes or steel bars. The operation of all shredders, with one exception, is based on the principle of the hammermill. There are three main groups of shredders: shredders with top grate, shredders with bottom grate, and special shredders. The most used charging system is that of continuous charging. Again there are three main types which all serve the same purpose of supplying an adequate amount of waste material to the shredder. Shredders are equipped with a separating system for non-ferrous metals and a dust collection system. The dust which has to be drawn off poses a particular problem. During the winter months the drawn off dust is wet and tends to agglomerate. Sparks from the shredding process should not damage the dust collection system. Sudden deflections of the dust flow are to be avoided because of the eroding effect of the steel dust particles. For dust collection in this particular case a combination of a cyclone for preliminary dust collection followed by a wet collector proved most suitable. Presently 15 shredders are in operation in West Germany with a total throughput of about 390,000 tons per annum. (Text in German)
[24531]

73-5230

DUNLEA, J. V., JR. Method of disposing bulk rubbish. U.S. Patent 3,721,183. Issued Mar. 20, 1973.
By the device covered by this patent, bulk refuse is shredded, saturated with a binding agent, compacted on a continuously extruded or piecemeal basis, reduced in size, rinsed, and disposed of either as landfill or at sea. Further steps include treatment of the rubbish to kill bacteria, drying prior to compaction and cutting or chipping the compacted rubbish into small pieces.
[24532]

73-5231

GLADWIN, F. R. Trash compactor. U.S. Patent 3,726,211. Issued Apr. 10, 1973.
This invention comprises a trash compactor formed of a cabinet having a raised support floor upon which an open trash bag is rested in an upright position beneath a compacting ram, and a movable dolly formed of a roller supported frame arranged beneath the support floor and locked thereto by a releasable locking means. A cabinet door is hingedly connected to the frame and has a bag support means upon which the bag is mounted. The door is arranged to tilt forwardly to the cabinet for raising the bag above the floor, for thereby removing the bag, door, and frame as a unit from the cabinet. The door hinge includes a locking means which releasably locks the door in tilted position and simultaneously causes the frame locking member to unlock. A manual control unlocks the door for swinging upright thereby permitting the frame locking member to re-engage the cabinet door. In this compactor a trash bag is arranged within a cabinet, compacting ram or piston, and is periodically lowered into the bag compact trash thrown therein. When the bag is filled it is removed and replaced. These bags are usually heavy, so in this invention the bags are mounted on removable dollys.
[24533]

73-5232

GLYSSON, E. A., J. R. PACKARD, AND C. H. BARNES. Size reduction. *In* The problem of solid waste disposal. Ann Arbor, College of En-

gineering, The University of Michigan, 1972. p. 54-64.
This chapter discusses the use of volume reduction in processing and disposing of solid waste. Two basic processing methods are discussed0 grinding and high-pressure baling. Grinding is further divided into wet and dry grinding. The advantages of using one of these methods in addition to some other disposal method are presented. The major disadvantages are cost and the energy requirements for operation of these enormous pieces of equipment. The applications of seven basic types of grinders are shown; these are: hammermills; chippers; wet pulpers; grinders; jaw crushers; shears; and rasp mills. Diagrams show the operation of grinders, hammermills, chippers, and hydrapulpers. This last had its origins in the paper industry; it is a wet-grinding system which is primarily used in small scale operations--such as food handling and document destruction--but has been applied by Black-Clawson to a municipal scale operation. A schematic of large-scale size-reduction units is provided. The costs of grinding refuse as established by the Madison, Wisconsin milling/landfill project are presented. The working of a three-stage baling process is illustrated. A chart is given which compares the costs of handling unprocessed, shredded, and baled waste for transfer stations, rail haul, and landfill. (This document is retained in the SWIRS library.)
[24534]

73-5233

INOUE, S., AND J. HONDA. Ekijo oyobi deijo no kanensei sangyo haikibutsu no nenryo kagakuteki seishitsu to sono shoriho. [Liquid and muddy industrial wastes0 fuel chemical properties and treatment.] *Yosui to Haisui*, 15(4):442-461, Apr. 1973.
With the premise that liquid and muddy industrial wastes be burnt, their fuel chemical properties were examined to see whether or not it is possible to treat them by combustion. How much gas was generated and composition of such gas was also determined. The conditions under which such wastes of low calorific value can burn by themselves and the best method of self combustion were considered with more than 60 industrial waste samples, such as waste oil, oily waste liquid, waste solvent, sulfuric acid pitch, organic waste liquid, tar chloride, organic sludge or its cake, paint waste and waste clay. Generally, it is possible for waste oil, sulfuric acid pitch, waste clay, and chloride tar, since they are of high calorific value, to burn by themselves. However, sulfuric acid pitch and tar chloride cannot be treated by ordinary combustion method, as they generate much sulfuric acid gas and hydrogen chloride. Waste solvents can mostly burn by themselves, and care must be taken in storing and handling them. Pretreatment such as dewatering, condensation, or drying is necessary for treating sludge, sludge cake, organic waste liquid, or paint waste, with high water content, as they require much supplementary fuel. Wastes of high calorific value may be burnt together with them. It would be necessary to develop combustion technology to burn such wastes of high water content. By examining combustion conditions (air, gas for combustion required) of wastes and composition of combustion gas, the degree of necessity of waste gas treatment, such as desulfurization, was clarified. Relationship between volatile element and chemical oxygen demand (COD) with generated heat was analyzed. It was concluded that what is volatile, caused by oil, can be regarded as 10,000 kcal per kg, such as heavy oil, and that of natural organic material and chemically synthetized ones, as 8,000 kcal per kg. Special care must be taken in case of special organic substances containing chlorine, or low calorific value materials. (Text in Japanese)
[24535]

73-5234

KOANA, K. Koatsu gasuboube o mochiite hishoributsu no koketsu jotai ni henka o ataeru hoho. [A method of crushing inorganic solids using high pressure bomb.] Japanese Patent Sho 48-2151. Issued Jan. 23, 1973.
This invention relates to a method changing the solid state of a material to be treated, such as crystallized quartz, granite, glass, diatomaceous earth, bricks, concrete, rocks, or the refractory substance adhered to a blast furnace using the expansion power of a compressed inert gas such as carbonic acid gas. The operation is as follows:

A bomb filled with a compressed inert gas is inserted into a hole bored in the material to be treated, tightly sealed, and then the gas in the bomb is injected into the hole using an appropriate method. At this time, the expansion power of the gas makes the solid state of a hard inorganic object weak. This method is much safer than the former method which uses the explosion of gunpowder, and it also has a dynamically efficient destructive power the same as that of the blasting method. When the object to be treated is crushed by this method the extent of scattering of broken pieces is much smaller as compared with the former blasting method. (Text in Japanese)
[24536]

73-5235

MOON, J. W. Refuse compactor. U.S. Patent 3,722,404. Issued Mar. 27, 1973.

A refuse compactor including a receptacle removably contained within a cabinet wherein refuse is compacted by a ram to a fraction of its normal volume is shown. The refuse is compacted within a specially constructed bag supported by the receptacle and cabinet, permitting the compacted refuse to be removed as a wrapped package for convenient and tidy disposal. The ram includes a refuse-compressing platen actuated through a toggle linkage to which force is applied by a single screw driven by an electric motor coupled to the screw through a reduction drive. The screw and its motor drive train are carried as a unit by the toggle linkage and move bodily therewith to provide a very compact and high ratio force multiplication system of reliable and inexpensive construction. Additional features relating to control circuitry, a safety lock, and bag, receptacle and drawer construction are also disclosed.
[24537]

73-5236

NAKAMURA, K., T. YAMADA, AND K. HONDA. Hikaribunkaisei porisuchiren no kenkyu (daiyonpo.) [Study on photodegradative polystyrene, 4.] *In* Proceedings; 28th Spring Meeting of the Japan Chemical Society, Tokyo, Japan, Apr. 1-5, 1973. p. 750.

Discussed herein is the photodegradation mechanism of polystyrene. The degradation of polystyrene can be pursued quantitatively by infrared analysis, following the formed carbonyl group at the wave length of 1735 cm. As photosensitizer 5 percent by weight of chloroanthraquinone was added to polystyrene and its cast film was irradiated using a 1 KW xenon-mercury lamp. The formation speeds of hydroxyl group (-OH) and carbonyl group (-CO) were sought by adsorption bands at 3450 and 1735 cm respectively. It was clarified that in the degradation of polystyrene the formation ratio of hydroxyl and carbonyl groups was constant. As reported previously, under perfect evacuation, polystyrene film does not show degradation at all even by photoirradiation, which suggests the photodegradation of polystyrene is based on the oxidation reaction. The photodegradation mechanism of polystyrene when a photosensitizer of quinone family is added is also studied. Radical catcher is an effective means to examine whether a degradation proceeds by radical mechanism or not. The degradation rate decreases as the dose level of diphenyl picryl hydrazl (DPPH) increases since the formed radical is trapped by DPPH. (Text in Japanese) (This document is retained in the SWIRS library.)
[24538]

73-5237

Scrap processing machinery. *British Steelmaker*, 39(3):17-18, 21, Mar. 1973.

Current scrap processing machinery being used in Great Britain is described. The minishear for smaller scrapyards, a comparatively small hydraulic shear, has brought sophisticated scrap processing within the financial range of many small scrapyards. A metal reclaimer, the Coreco metal separator, will automatically recover a desired metal from unsorted metallic scrap. Also described are: magnetic lifting, separating, and handling equipment; a scrap fragmentation plant near London; briquetting presses; and a metals separator which sorts and separates ferrous and nonferrous metals.
[24539]

73-5238

SEIDL, F., AND P. UEBEL. U.S. Patent 3,727,890 owned by Wacker Werke KG, Munich, Germany. Issued Apr. 17, 1973.

A vibrator for and a mtheod for compacting concrete and like material is presented in which the vibrator has a housing and an eccentric mass therein, a fluid supply leads into the chamber in which the mass is located for actuating the mass by fluid pressure and an exhaust lead from the chamber. The rate of supply of fluid to the chamber is regulated by a control sensitive to the amplitude of movement of the eccentric mass so that when the vibrator is engaged with the material to be compacted there is a maximum fluid flow to the chamber and when the vibrator to the chamber is reduced.

[24540]

73-5239

YOSHINAGA, J., M. MATSUMOTO, T. NAGAI, Y. HARA, AND H. OSADA. Porienkabiniru no nenshosei ni kansuru kenkyu. 5. Porienkabiniru to daiichi sankasuzu (II) no hanno. [Study on combustion of polyvinyl chloride (PVC). 5. Reaction of PVC with tin monoxide.] *In* Proceedings; 28th Spring Meeting of the Japan Chemical Society, Tokyo, Japan, Apr. 1-5, 1973. p. 754.

Some information concerning the mechanism of dehydrochlorination and flame retardance of tin monoxide added polyvinyl chloride (PVC) is reported. Differential thermal analysis of tin monoxide added PVC indicates an exothermic peak at 210 C, which is assigned to the formation of stannous chloride by the reaction of hydrogen chloride with tin monoxide. The formation of tin chloride is also confirmed by X-ray analysis. The formed tin chloride is considered to have a fire retardance effect due to an endothermic peak of fusion near 250 C and that of vaporization near 600 C, thus lowering the ambient temperature. An excess of hydrogen chloride suppresses the oxidation of a part of the tin chloride into tin dioxide. It is observed that as the dose level of tin monoxide increases, the generated hydrogen chloride amount decreases and the formed tin chloride increases. Thermogravity shows the reverse phenomenon, probably due to the vaporization of the formed tin chloride. The ignition starting time measurement by the Krupp method indicates at the elevated temperature above 700 C, tin monoxide added PVC reveals flame retardant effect. According to the analysis of pyrolysis gas chromatography, it is observed that tin monoxide added PVC gives birth to less carbon dioxide, benzene, toluene, and chlorobenzene together with lower hydrocarbons such as methane, ethane, and ethylene. (Text in Japanese) (This document is retained in the SWIRS library.)

[24541]

RECYCLING

73-5240

A new method of reclaiming waste paper. *Svensk Papperstidning*, 76(5):192-194, Mar. 25, 1973.

This article describes and illustrates a system for the processing of recycled paper which is now being marketed by Calor-Celsius of Stockholm. This system, which is characterized by its great simplicity, centers around the Frotapulper. Other pieces of equipment are of the conventional type although carefully selected or modified to suit their purpose in harmony with the process. There is a decided increase in the strength of the paper board produced from the same raw material as compared to using a previous system with more beating tackle.

[24408]

73-5241

Abfallglass im Strabenbau und in der Bauindustrie Glasphalt aus alten Flaschen. [Waste glass in road construction and the construction industry. Glasphalt from old bottles.] *Umwelt*, 3(3):21-22, June/July 1973.

Glasphalt may contain up to 17 percent of old glass waste. Glasphalt was applied to a 300 m long section of a street leading through the city of Toledo, Ohio. About 1,500 tons of waste glass was worked into this road section. One lane received a glasphalt cover, the other lane received four supporting layers of glass. An average of 10,000 vehicles pass daily over this

section 20 percent of which are trucks. Over one year of use no more wear was observed than with conventional asphalt pavements. The road roughness was found to be even better. Glasphalt stores more heat and gives it off more slowly. Ground glass can also be added to concrete building blocks, cement, and concrete. As much as 35 percent by weight of building blocks can be constituted of waste glass. The small smooth glass pieces have a decorative effect. (Text in German)
[24405]

73-5242

Advanced technique costs in reducing bleached kraft pollution. *Paper Trade Journal*, 157(26):32-36, June 25, 1973.
In this article results are forecast for what may be achieved by applying various combinations of new pollution abatement techniques and processes to a conventional bleached kraft pulp mill. The hypothetical mill considered here produces 500 tons of bleached pulp per day from softwood. This mill uses conventional equipment of the type prevalent in mills constructed during the period 1960 to 1965. Extensive data are provided and the topics covered include: the cost of external and internal treatment; barking; cooking and washing; screening; bleaching; BOD reduction by ion exchange; BOD effect of oxygen bleaching; counter-current washing effect on BOD; and evaporating.
[24406]

73-5243

American materials commission pinpoints scrap growth. *Materials Reclamation Weekly*, 122(19):12, May 12, 1973.
In this article the U.S. National Commission on Materials Policy concludes that the increased scrap supply situation will in turn change the pattern of steelmaking processes. The trends indicate that increased recycling is likely to alter the balance of raw materials economics and place a greater emphasis on the efficient processing of scrap and reduce the pressure on the need for ore. The Commission emphasized that the United States is depending increasingly on foreign iron ore which raises the average cost of American pig iron. In an examination of copper demand and supply, the Commission records that more than half the copper flowing into the U.S. economy has come traditionally from secondary sources. The most dramatic aspect of the Commission's report on zinc concerns the drop in the U.S. share in world production from 26 percent in 1950 to only 9 percent in 1970.
[24407]

73-5244

ARAKIDA, Y., H. TOKUSHIGE, T. SAKAI, AND A. KOSAKI. Haiki purasuchikku saisei shori pranto. [Waste plastics recycling plant.] *Nihon Seikosho Siho*, (32):22-32, Nov. 1972.
Prior to designing a waste plastic recycling plant, the Japan Steel Works conducted thorough research on the physical and mechanical properties of waste plastics. All the possible variations and possible property changes caused by proportions of various different plastics in waste mixtures were studied. Tensile strength, impact strength, effects of additives, weatherability, workability, extrusion workability, melt flow index, and thermal stability were checked. The plant consists of the following processes: rough crushing, air separation, shredding, magnetic metal separation, scrubbing, drying, powdering, melting, pellet forming (hot-cut), and final storage for molding of new products. The characteristics of the plant are: any kind of plastic waste can be recycled into highly valuable products; the entire plant is operated below the temperature of polyvinyl chloride processing or order to avoid the formation of toxic gases; nonsoluble material and plastic with high melting points are powderized; and new products have a smooth surface and excellent quality. Some samples of recycled products are flower pots, dust bins and garbage containers, and water and drain pipes. (Text in Japanese)
[24409]

73-5245

ASHIDA, S. Gosei kobunshi haikibutsu no yuko riyo. [Effective use of synthetic polymer waste.] Tokyo, Japanese Government Ministry of International Trade and Industry, 6 p. [1973].

The classification of polymer waste, and solidification and degradation methods of polymer waste are briefly discussed. Industrial waste involving polymers can be classified into 1) a homogeneous type of synthetic polymer which can be recycled; 2) two or more kinds of reusable or non-reusable polymers, which cannot be recycled without some treatment; 3) the first two types plus combustibles other than synthetic polymers; 4) a mixture of all these. Simple polyvinyl chloride (PVC) can be crushed, rolled, and mixed, and processed into sheet material. PVC and thermoset resins can be crushed, heated, melted, filtered, cooled, cut, and pelletized, or further extruded and injected into mold products or construction board. A variety of other types of polymers can be crushed, pressed, heated, and molded into sheet material. Mixture with other material have also been tried. These methods are all relatively simple only when the waste material consistency is homogeneous. Chemical degradation into gas and liquid fuel is also being studied. Addition of catalysis, solvent, hydrogen, or hydrogenation and oxidation are some other methods of chemical degradation. (Text in Japanese) (This document is retained in the SWIRS library.)
[24410]

73-5246

AUCHTER, R. J., AND R. A. HORN. Economics of kraft pulping of unbarked wood. *Paper Trade Journal*, 157(26):38-39, June 25, 1973.

Data are presented in this article which show economic advantages in the production of both bleached and unbleached pulps from rough wood chips in addition to conservation of wood resources. In a recent study covering 12 West Coast wood species, basic data were established for the kraft pulping of wood chips with and without bark. A mill design was set and the order of magnitude of capital costs was developed for a 750-ton per day bleached draft mill, Raw material costs and energy requirement costs are detailed. Tables provide the following data: basic data for mill design for southern pine kraft pulp; pulp costs for bleached southern pine kraft pulp; and manpower requirements for bleached kraft pulp mill
[24411]

73-5247

BAYER, G. Gips, Stahl und mauerziegel. [Gypsum, steel, and bricks.] *U-das technische Umweltmagazin*, (1):24-26, Feb. 1973.

A new method has been developed to clean waste gypsum from impurities. Water is added to the waste gypsum and the suspension is pumped into the flotation plant where organic and mucous inorganic substances as well as soluble impurities are separated. In subsequent autoclaves the dehydrate crystallizes and forms a semihydrate which is then cooled down and separated from the residue. After drying it can be processed into powder gypsum or after adding water it can be cast thus forming prefabricated gypsum parts. New methods for the removal of red sludge, a waste product of the aluminum oxide production, have been recently developed. The first method is most suitable for red sludges containing at least 45 percent ferric oxide in the dry substance and bases on the smelting of the sludge. The wet red sludge is mixed with carbon and fine-grained lime stone and then pumped into a rotary shaft furnace where it is dried and forms a granulate with grain sizes of 2 to 15 mm. The sinter material still contains a certain percentage of carbon. The granulate is then heated up to 1,000 C whereby at least 80 percent of the ironoxide is reduced to metallic iron particles. Smelting is effected in a special oil-heated smelting furnace where a direct incineration of the carbon residue in the sinter granulate takes place which provides for a very rapid melting. The iron separates from the slag and is cast into raw iron pigs. The slag can be used in road construction. The second process is recommendable for red sludges with small ferric oxide contents. The sludge is mixed with special additives and dried for a determined period. Then it is fed into a press and formed into bricks which are hardened at 1,000 C. During this process the sodium oxide contained in the red sludge reacts with the additives and provides for an improved brick stability. (Text in German)
[24412]

73-5248

BODMAN, S. W., III, J. A. FREANEY, J. J. HARRINGTON, D. H. MARKS, W. NIESSEN, L. J. PAR-

TRIDGE, A. SAROFIM, AND D. G. WILSON. Reclamation from municipal solid waste. *In* The treatment and management of urban solid waste. Westport, Connecticut, Technomic Publishing Co., Inc., 1972. p. 145-181.
The incentives promoting, and the barriers restricting, greater reclamation of valuable components from mixed municipal refuse are briefly reviewed in this paper. Existing methods of sorting refuse into its useful and other components are described, and some of the major components of domestic refuse are bright. The topics which are discussed in detail follow: the economics of purity; separation and transportation; the economics of central-station reclamation; a review of separation approaches; machine separation; the utilization of reclaimed materials; and legislation encouraging reclamation. (This document is retained in the SWIRS library.)
[24413]

73-5249

British papermakers review status of waste paper utilization. *Paper Trade Journal*, 157(19):43-45, May 7, 1973.
This article reviews a British technical conference on secondary fiber utilization. It discussed the situation regarding waste paper reuse and defines three incentives: economics of the industry; national economics in regard to balance of payments, which depends heavily on trading; and environmental considerations. The following problems are outlined: collection; market influences; contraries; fiber degradation; and effluent. Waste paper merchants, waste paper treatment, new equipment designed for processing various grades of waste paper, and user experience with waste papers are also discussed.
[24414]

73-5250

CHIBA, K. Haiyu ni yoru kobunshikei gosei jushi no shoriho. [A method of treating polymerized synthetic waste oil.] Japanese Patent Sho 47-35143 owned by K. Chiba and T. Obara, Nagoya, Japan. Issued Sept. 4, 1972.
This invention relates to a method of treating various polymerized resins using the waste oil obtained from the processing stages and the refining process of crude oil. The polymerized resins which are applicable to the method under this invention must be the oil-soluble ones, and ethylenic synthetic resin, among others, is most suitable. the polymerized resin wastes are formed into a solid shape by heating or compression and then mixed with the waste oil heated to a temperature of about 180 C. The desirable proportion of the resin is 20 to 50 percent. In this case, the resin wastes are completely dissolved in the heated waste oil by stirring, and it is then added with an adhesive resin such as rosin, ester gum, terpene resin, and cumarone resin, or turpentine oil, and plasticizer such as diphenyl chloride by 5 to 20 percent of the weight of the resin-dissolved oil. The resin-oil solution with a high viscosity and adhesive property, prepared in such a manner, is mixed with heated asphalt and is ground into pieces after cooling. The ground mixture can be used for the pavement of road. If the mixture have no asphalt, it can be used as building materials, after being molded into a block or floor form. (Text in Japanese)
[24415]

73-5251

COMBUSTION POWER CO., INC. Introduction. *In* Turbine compatibility test program. Technical proposal 69-8. v. 1. Palo Alto, California. Aug. 1969. p. 2(1-17).
This paper outlines the development program for the turbine compatibility test (TCT) for a system capable of producing electrical power with a gas turbine cycle directly from the combustion of municipal solid wastes. The TCT package will culminate in the demonstration of continuous operation or combined systems testing for a period of 6 hr. It is expected that the system would subsequently be operated for extended periods to obtain maintenance and life data. The advantage of the subscale or pilot plant approach over initial fullscale prototype equipment is to identify and correct any development problems at the lowest cost. The TCT package has been divided into four major areas, as follows: development support subsystem; solid waste handling subsystem; hot gas subsystem;

and the turboelectric subsystem. Subsystem schematics and extensive data are provided. (This document is retained in the SWIRS library.)
[24416]

73-5252

COMBUSTION POWER CO., INC. TCT package program plan. *In* Turbine compatibility test program. Technical proposal 69-8. v. 1. Palo Alto, California, Aug. 1969. p. 4(1-37).
The objectives, criteria, and technical aspects of developing a pilot plant, designated the turbine compatibility tests (TCT) are summarized. The following discussions are provided: program summary; work statement (including 18 design, fabrication, integration, installation, and testing tasks); organization; personnel allocations; program controls; status reporting; and data handling and submittals. The following flow charts are provided: TCT package; TCT development support subsystem; TCT solid waste handling subsystem; TCT hot gas subsystem; and the TCT turboelectric subsystem. (This document is retained in the SWIRS library.)
[24417]

73-5253

COMBUSTION POWER CO., INC. Technical discussion--TCT turboelectric subsystem. *In* Turbine compatibility test program. Technical proposal 69-8. v. 1. Palo Alto, California, Aug. 1969. p. 3(61-67).
The objective of the tests described in this paper is to verify normal specification performance of all components of the turbine compatibility test (TCT) turboelectric subsystem including the gas turbine, the electrical generator, and the electrical load absorbing resistance bank. The tests will demonstrate electrical power generation with a gas turbine using solid wastes as a fuel. The turboelectric subsystem hardware consists of the gas turbine, the generator, turbine silencers and controls, the electrical dissipation system, all the associated system controls, and instrumentation and support hardware. Subsystem diagrams and illustrations are provided. (This document is retained in the SWIRS library.)
[24423]

73-5254

COMBUSTION POWER CO., INC. Technical discussion--TCT development support subsystem. *In* Turbine compatibility test program. Technical proposal 69-8. v. 1. Palo Alto, California, Aug. 1969. p. 3(3-38).
This paper contains a general description of the turbine compatibility test (TCT) development support subsystem, along with explanations of what was accomplished during the key subscale experiments and what needs to be accomplished during the TCT package. Detailed descriptions of the hardware comprising this sytem are also provided. The following topics are covered in detail: pressure performance data; slagging condition data; fluid bed combustor hydrochloric acid suppression; dual fluid bed operation tests; inertial separator performance; regenerative mat filter performance; fluid bed start and shutdown sequence; fluid bed elutriation investigations; municipal solid wastes combustion corrosive effects tests; air pollution control compliance; hardware description; and development support tests. (This document is retained in the SWIRS library.)
[24419]

73-5255

COMBUSTION POWER CO., INC. Technical discussion--TCT hot gas subsystem. *In* Turbine compatibility test program. Technical proposal 69-8. v. 1. Palo Alto, California, Aug. 1969. p. 3(48-60).
The basic objective of the turbine compatibility test (TCT) hot gas subsystem tests described in this paper is to verify proper subsystem operation prior to integration with a turboelectric subsystem. Test conditions and instrumentation will be selected to verify these characteristics of the hot gas subsystem: combustion efficiency in excess of 95 percent at nominal solid waste feed rates; particle collection devices functioning such that the gases leaving the subsystem contain less than .01 grain of particulate matter per actual cu ft; a start-stop sequence for the combustor that is consistent with gas turbine start-stop requirements shall be consistent with continuous runs of 6 hr. The subsystem consists of the fluid bed combustor, the particle collectors, and support

apparatus. Diagrams are provided of the subsystem and hardware. (This document is retained in the SWIRS library.)
[24420]

73-5256

COMBUSTION POWER CO., INC. Technical discussion--TCT objectives and criteria. *In* Turbine compatibility test program. Technical proposal 69-8. v. 1. Palo Alto, California, Aug. 1969. p. 3(1-3).
The primary objectives of the turbine compatibility test (TCT) package is to demonstrate the successful operation of a gas turbine generating electric power, using municipal solid wastes as fuel. The secondary objectives are: to measure the performance of a fluid bed combustor operating with a gas turbine; to measure the performance of a particulate collector to clean up the combustor effluent gases; to investigate system dynamic response and the start/shutdown sequences for the design; to investigate methods of processing, storing, and handling municipal solid wastes; and to verify operation of the solid wastes combustor feed mechanism. (This document is retained in the SWIRS library.)
[24421]

73-5257

COMBUSTION POWER CO., INC. Technical discussion--TCT solid wastes handling subsystem. *In* Turbine compatibility test program. Technical proposal 69-8. v. 1. Palo Alto, California, Aug. 1969. p. 3(39-47).
The primary objective of the turbine compatibility test (TCT) solid wastes handling subsystem is to feed shredded solid wastes fuel to a high pressure, high temperature environment. Secondary objectives are to evaluate specific designs that have been incorporated in the TCT package and to obtain additional knowledge concerning the mechanical processing of typical municipal solid wastes. The solid waste subsystem description consists of three basic groups of equipment0 shredding, transfer, and combustor feed equipment. Testing of the subsystems is also discussed and diagrams and illustrations of the systems and equipment are provided. (This document is retained in the SWIRS library.)
[24422]

73-5258

COMBUSTION POWER CO., INC. Technical discussion-TCT design analysis. *In* Turbine compatibility test program. Technical proposal 69-8. v. 1. Palo Alto, California, Aug. 1969. p. 3 (68-81).
This paper presents the preliminary design analysis which has been accomplished to illustrate the feasibility and basic sizing of the turbine compatibility test (TCT) hardware and procedures for use with a gas turbine to generate electric power using municipal solid wastes as fuel. The topics which are discussed in detail follow: gas turbine selection; fluid bed design; insulation design; particle collection design; and analysis for hydrogen chloride in combustion gases. Graphs, diagrams of the systems, and data on the composition of municipal refuse are provided. (This document is retained in the SWIRS library.)
[24418]

73-5259

COMBUSTION POWER CO., INC. Turbine compatibility test program. Technical proposal 69-8. v. 1. Palo Alto, California, Aug. 1969. 137 p.
This report presents the turbine compatibility test (TCT) which is a comprehensive package of development experiments and hardware designs, culminating in the production and testing of a system capable of producing electrical power with a gas turbine cycle directly from the combustion of municipal solid wastes. Technical discussions are presented of: the solid waste handling subsystem; hot gas subsystem; turboelectric subsystem; and design analysis. The TCT package program plan includes: a program summary; a work statement; organization; personnel allocations; program controls; data reporting; and data handling and submittals. The corporate facilities are described. (This document is retained in the SWIRS library.)
[24424]

73-5260

Continental Can's expansion at Hodge a tremendous success. *American Paper Industry*, 55(5):28-34, May 1973.

This article announces Continental Can's expansion at Hodge, Louisiana. Key installations are the 390-in. wide Valmet paper machine, the Kamyr digester capable of handling pin chips and sawdust, and the centralized power and recovery plants featuring C-E boilers. The topics which are covered in detail follow: wood supply; the woodroom complex; the pulp mill; stock preparation and flow; the wet end; the dryer section, calender, and reel; roll handling; the broke system; the white water system; process control; the recovery boiler; the power boiler; water pretreatment; and turpentine and tall oil.
[24425]

73-5261

ELLERBE, R. W. Why, where, and how U.S. mills recover tall oil soap. *Paper Trade Journal*, 157(26):40-43, June 25, 1973.
This article reports on methods and practices utilized at kraft pulp mills for the collection of tall oil soap. It also discusses why, where, and how mills recover soap. Pulp mills recover soap because it produces byproduct income and it offers important operational advantages. Most mills recover soap continuously in evaporator soap skimmers. They recover it intermittently with manifold values on foam towers and storage tanks, and with specially designed foam concentrators.
[24426]

73-5262

ENVIROGENICS CO. Appendix A--wastage and fouling. *In* Systems evaluation of refuse as a low sulfur fuel, a final report to the Environmental Protection Agency. v. 2. Appendices. Report No. F-1295. Washington, U. S. Environmental Protection Agency, Nov. 1971. p. A(1-29).
This appendix on wastage and fouling in connection with the utilization of refuse as a fuel is part of a study sponsored by the U.S. Environmental Protection Agency's National Air Pollution Control Administration. A literature survey is provided for the following: operating conditions; laboratory investigations; and corrosion by reducing atmospheres, chloride compounds, and sulfur compounds. Corrosion test results and an extensive bibliography are also included. The following data are provided: chemical analyses of refuse-fired furnace deposits; summary of operating conditions of steam-producing incinerator plants; typical ash analyses from different boilers; and comparative analyses of bulk and inside layers of ash samples. (This document is retained in the SWIRS library.)
[24428]

73-5263

ENVIROGENICS CO. Appendix B--state of the art survey. *In* Systems of refuse as a low sulfur fuel, a final report to the Environmental Protection Agency. v. 2. Appendices. Report No. F-1295. Washington, U.S. Environmental Protection Agency, Nov. 1971. p. B(1-163).
This state of the art survey which was conducted in connection with the utilization of refuse as a fuel is part of a study sponsored by the U.S. Environmental Protection Agency's National Air Pollution Control Administration. The following topics are covered in detail: the history and technology of steam generators; air pollution control (the nature of emissions and pollution control techniques); and a study of refuse-fired steam generators in selected German plants (description of the plants, data analysis, performance tests, emission control equipment, and dust collector tests). Extensive data are provided in the form of 21 tables and 73 figures. (This document is retained in the SWIRS library.)
[24429]

73-5264

ENVIROGENICS CO. Conclusions and recommendations. *In* Systems evaluation of refuse as a low sulfur fuel, a final report to the Environmental Protection Agency. v. 1. Report No. F-1295. Washington, U.S. Environmental Protection Agency, Nov. 1971. p. I(8-27).
The conclusions and recommendations based on a study sponsored by the U.S. Environmental Protection Agency's National Air Pollution Control Administration are presented in this paper. They are categorized under the following headings: refuse as a fuel (quantity-quality considerations, reduction in pollutant emissions, processing technology, and thermal utilization);

power plant designs (engineering criteria for candidate systems, economic model, and detailed design and cost studies); and recommended research and development (criteria and two plans are outlined). The following pertinent data are included: projected compositional changes in U.S. urban refuse, 1970 to 2000; summary of systems characteristics of 10 refuse-firing steam generator designs; and refuse disposal costs for retrofit systems. (This document is retained in the SWIRS library.)
[24430]

73-5265

ENVIROGENICS CO. Appendices D and E--bibliography and glossary. *In* Systems evaluation of refuse as a low sulfur fuel, a final report to the Environmental Protection Agency. v. II. Appendices. Report No. F-1295. Washington, U.S. Environmental Protection Agency, Nov. 1971.
This bibliography and glossary on the utilization of refuse as a fuel are part of a study sponsored by the U.S. Environmental Protection Agency's National Air Pollution Control Administration. The bibliography lists reasonably current (none earlier than 1962) and accessible information sources that deal with subjects falling within the basic scope of this study. Only those publications that clearly relate to refuse-fuel systems have been cited. This bibliography is divided into the following topical groupings: steam generation; corrosion; bottom residues; refuse characteristics; air pollution aspects; related thermal processes; and related waste handling processes. An author index is also included and the glossary contains over 60 technical terms. (This document is retained in the SWIRS library.)
[24427]

73-5266

ENVIROGENICS CO. Program objectives and approach. *In* Systems evaluation of refuse as a low sulfur fuel, a final report to the Environmental Protection Agency. v. 1. Report No. F-1295. Washington, U.S. Environmental Protection Agency, Nov. 1971. p. I(1-8).
The purpose of the program discussed in this paper, which was sponsored by the U.S. Environmental Protection Agency's Natioal Air Pollution Control Administration, was to determine the characteristics of systems for using refuse as a low sulfur fuel for power generation, to determine the overall potential of using such systems to decrease the total emissions from the incineration of refuse, and to assist in reducing sulfur pollution which results from fossil fuel combustion. These objectives were approached as follows: assessment of refuse as a fuel by studying published and solicited data and conducting chemical and physical property analyses; assessment of power plant designs (survey of wet- and dry-bottom steam generators fired with conventional and unconventional fuels and preliminary engineering designs of boilers); and development of recommendations and formulations of research and development plans. The information and data sources used and the organization of the report are also outlined. (This document is retained in the SWIRS library.)
[24431]

73-5267

ENVIROGENICS CO. Recommendations. *In* Systems evaluation of refuse as a low sulfur fuel, a final report to the Environmental Protection Agency. v. 1. Report No. F-1295. Washington, U.S. Environmental Protection Agency, Nov. 1971. p. IV(1-21).
Recommendations for the utilization of refuse as a fuel are presented which are based on a study sponsored by the U.S. Environmental Protection Agency's National Air Pollution Control Administration. Under Plan A a research facility is outlined with the following programs: combustion optimization studies; corrosion and fouling; systems analysis of alternative thermal conversion process for refuse; particulate control; small refuse-fired boilers; sub-scale component testing; and flow modeling. The following programs are recommended under Plan B: combustion optimization studies; evaluation of refuse pyrolysis and gasification processes in connection with steam generation; evaluation of refuse combustion in fluidized beds; an engineering manual for the conversion of boilers to combined firing; design of a demonstration unit; and the construction of a demonstration plant. (This document is retained in the SWIRS library.)
[24432]

73-5268

ENVIROGENICS CO. Refuse as a fuel--quantities available. *In* Systems evaluation of refuse as a low sulfur fuel, a final report to the Environmental Protection Agency. v. 2. Report No. F-1295. Washington, U.S. Environmental Protection Agency, Nov. 1971. p. II(1-21).

The quantity of refuse available in the United States is discussed in this study sponsored by the U.S. Environmental Protection Agency's National Air Pollution Control Administration. The following topics are discussed in detail: refuse collection rates for the United States and selected metropolitan areas; and refuse composition in terms of an analysis of current refuse, projected composition, seasonal variation, and heat value. The purpose of establishing these quantities of refuse is to consider their value as a fuel. The following data are also included: 1965 survey of collection rates; estimates of future urban refuse collections in the United States; large metropolitan areas having severe sulfur pollution problems; and composition of refuse. (This document is retained in the SWIRS library.)

[24433]

73-5269

ENVIROGENICS CO. Refuse as fuel--energy utilization. *In* Systems evaluation of refuse as a low sulfur fuel, a final report to the Environmental Protection Agency. v. 1. Report No. F-1295. Washington, U.S. Environmental Protection Agency, Nov. 1971. p. II(68-73).

The utilization of refuse as an energy source is discussed in this study sponsored by the U.S. Environmental Protection Agency's National Air Pollution Control Administration. The following topics are discussed in detail: turboelectric generation; Rankine cycle systems; gas turbine systems; industrial and district heating; and desalination and miscellaneous applications. The economic variables affecting a steam generating system are outlined as follows: regional electrical demand and anticipated growth rate; district heat demand; distribution of population density; temporal effects on output demand for both services; annual outdoor temperature statistics; fossil fuel costs; refuse hauling and processing costs; refuse heating value; and capital charges and labor. (This document is retained in the SWIRS library.)

[24434]

73-5270

ENVIROGENICS CO. Systems evaluation of refuse as a low sulfur fuel, a final report to the Environmental Protection Agency. v. 1. Report No. F-1295. Washington, U.S. Environmental Protection Agency, Nov. 1971. 290 p.

This report describes a systematic assessment of the fuel properties of refuse and of the mechanics and combustion technology associated with the utilization of refuse as a fuel in generating utility grade steam. By estimating the inventories and compositions of refuse that might occur, the extent of sulfur-abatement that might be realized in using refuse as a partial coal substitute was projected through the year 2000. The fuel's behavior in, and compatibility with, furnace structures were established. Cost and design specifications were adopted for certain components examined in the analysis. A cost model was developed to consider all the major elements involved in the erection and operation of the candidate refuse-burning systems. Two plants were chosen and subjected to detailed engineering analyses and two suggested 5-year plans are presented. (This document is retained is the SWIRS library.)

[24435]

73-5271

Gas from garbage. *Materials Reclamation Weekly*, 122(19):28-29, May 12, 1973.

This article describes a new process that can turn solid waste into gas which is being tried out at Orchard Park, near Buffalo, New York. The demonstration is being supported by the U.S. Environmental Protection Agency. The process is being developed by Torrax Systems Inc. The facility can deal with car body sections, trees, plastics, refrigerators, and 55-gal steel drums. The process is a combined combustion-pyrolytic system. The nonburnable residues are liquefied into a molten slag which may be made into building blocks and insulating fiber or may be used as

a base material in road construction. The gases from the gasifier can be burned to make steam for power generation. Capital costs will probably be low for this system.
[24436]

73-5272

GLYSSON, E. A., J. R. PACKARD, AND C. H. BARNES. Reclamation and recycling. I. General aspects and paper reclamation. *In* The problem of solid waste disposal. Ann Arbor, College of Engineering, the University of Michigan, 1972. p. 96-113.
This chapter discusses the advantages of reclaiming our resources instead of simply disposing of them. The importance of devising separation processes to facilitate reclamation is stressed. Special case studies of paper and metals are presented. Charts, graphs, diagrams, and illustrations are used to present the material. These include: percentage and amounts of various metals, and paper and textiles presently being recycled in the United States; pounds of packaging materials being consumed in the United States per capita; a flow chart for reclamation of residential and industrial waste; a flow chart for reclamation of paper and metals; paper stock classifications and prices; percentage of wood fiber products recycled in various countries; sources and quantities of fiber consumed by the U.S. paper industry; the effects of repulping on paper stock qualities; a comparison for different areas of the United States of rail freight rates for waste paper and pulpwood; and comparison for pulpwood and paper waste in ocean shipping rates from different port areas; and a diagram of the Black-Clawson process for fiber reclamation. (This document is retained in the SWIRS library.)
[24437]

73-5273

GLYSSON, E. A., J. R. PACKARD, AND C. H. BARNES. Reclamation and recycling. III. Economics. *In* The problem of solid waste disposal. Ann Arbor, College of Engineering, The University of Michigan, 1972. p. 125-134.
The economic factors and policies that affect reclamation are presented in this section. In particular the role of government in creating favorable economic situation for reclamation is presented. The normal profit considerations that previously determined the choice between virgin and reclaimed materials can no longer be considered strictly applicable, because these interactions of supply and demand fail to take into consideration the dwindling supply of resources. While there is great disagreement on what steps the government should take to positively make the utilization of secondary materials more profitable, it is generally agreed by those concerned with the preservation of resources that the government must cease to carry out those economic policies which discriminate against reclamation. Governments at various levels are finally beginning to require recycled materials in the products that they buy. However, laws like the Wool Products Labelling Act and various laws on the re-use of oil inhibit reclamation when their purposes could be as well served by other methods. Incentives, transportation rate regulation by the ICC, and Federal tax policies are also discussed in detail. Another hindrance to reclamation is that most of the secondary materials enterprises are on a fairly small scale and, therefore, are not able to utilize the economies of scale that are available to larger companies involved in primary materials extraction. (This document is retained in the SWIRS library.)
[24439]

73-5274

GLYSSON, E. A., J. R. PACKARD, AND C. H. BARNES. RECLAMATION RECLAMATION AND RECYCLING. II. IRON AND STEEL. *In* The problem of solid waste disposal. Ann Arbor, College of Engineering, The University of Michigan, 1972. p. 114-125.
This section discusses the recycling of ferrous metals. This is chiefly done through graphics. There is also a brief discussion of non-ferrous metals reclamation. Only two types of metals are presently being reclaimed at anything near their full possibilities0 stainless steel and precious metals. This is largely because these two materials are the only ones which are sufficiently valuable to be worth the cost of the processes to reclaim them. Zinc recovery processes are becoming more common and it may soon be

recovered in large quantities. The graphics illustrating the information are as follows: iron demand and supply by source presently and projected into the future; the end uses and quantities of iron in the United States; scrap iron classifications; the percentage of pig iron and scrap used in basic oxygen, open hearth, and electric furnaces in U.S. Steel production; a comparison of rail and freight rates for scrap and ore; iron and steel scrap consumption in the United States, 1925-1969; average prices of U.S. iron and steel scrap, 1955-1970; and the Huron Valley Steel Company's new process for reclamation of all types of metals0 now used only for scrap automobiles. (This document is retained in the SWIRS library.)
[24438]

73-5275

HANNA, R. C. Simplified, economical reclaiming of insulating oil. *Transmission and Distribution*, 25(4):66, 68, Apr. 1973.

A mobile filter system using an improved asbestos-cellulose cartridge type medium is less expensive than the blotter type paper when used to reclaim oil through filtration. The new mobile filtering system, developed in the early 1960's, utilized an asbestos-cellulose fiber cartridge. The system consisted of a filter, pump, and motor on a common portable base. Tests showed that the overall cost per gallon of oil filtered with the asbestos-cellulose sheets was less than with the blotter type paper. This lower operating cost is possible because the unit cartridge construction reduces the labor required to make a change of medium. Filtering some 5.8 million gallons of oil a year resulted in a cost saving of more than $30,000 a year.
[24440]

73-5276

HARADA, H. Kinsoku haikibutsu no shigenka. [Reutilization of metal wastes overseas.] *Kinzoku Zairyo*, 13(6):55-58, June 1973.

In Europe and the United States, the Pollutor Pays Principle is in more widespread use than in Japan and wastes are regarded as important resources. This fact is symbolized by the boom in the waste management industry, with about 10,000 enterprises in the United States. The bigger ones do annual business of 150 billion yen. Several trillion dollars worth of wastes are being reutilized, in the United States, and over a trillion in the United Kingdom. More than 120 million tons (in terms of money, about 2 trillion yen) of waste metals is being reutilized in the United States. It is comparatively easy to reutilize metal wastes from mechanical processing; they can be reprocessed into other products or to be turned into an alloy ingot. However, recovery and reutilization of waste metals from individual consumers in wide areas, mixed with other materials and dirt is very difficult. The fraction of metal wastes in general city wastes, such as metal cans varies between 3 percent and 8 percent. Even after manually sorting out large metal items like prams, bicycles and washers, and picking up empty cans by magnetic selector, the incinerator residue still contains much metal, which may again be sorted by magnetic selector. The recovered metal waste is pressed by compactor, to make blocks. Bulky wastes like televisions, radios, beds, and refrigerators are collected separately from general city wastes along with cars, and treated by hammer mills and shredders. Japan is too preoccupied by pollution problems and such problems as securing sufficient space for dumping wastes, treating to make them non-polluting is neglected and such worthwhile waste as metal waste is not fully utilized. (Text in Japanese)
[24441]

73-5277

HARADA, H. Purasuchikku haikibutsu no shori to sairiyo. [Disposal and reuse of plastic waste.] *Kagaku*, 28(2):144-152, Feb. 1973.

When the presorting and collection of city wastes is put into practical application, the use and grade of processed products to be reused are different according to the extent of the presorting collection, which corresponds to the thermal plastics. In the case of the thermo-setting plastics, they are ground to fine particles and then may be reused as fillers for remolding of the thermal plastics. Fundamentally, the extrusion molding of thermal plastics takes a leading part in the field, but another mold processing method can of course be applied to the thermal

plastics. Since plastics are the highly polymerized compounds of the low-molecular monomers, the idea to reuse plastic wastes by resolving the original monomers has been presented, but has not been put to practice because it was not economically feasible. However, now that plastic wastes are exhausted in great quantities, the depolymerization method is, of course, worthy of reexamination as one of the methods of reuse. As a premise for it, there is a great problem on whether or not the presorting collection of plastics from the city wastes is possible, but if plastic wastes can be collected easily and in great quantities, its profitability may be expected. According to existing information, for polystyrene, more than 60 percent of styrene monomer can be recovered by heat decomposition at about 400 C, whereas polyethylene is resolved into unsaturated compounds such as carbon-3 or carbon-4, or methane, not into ethylene. Thus, there is no other way but using it as a fuel. (Text in Japanese)
[24442]

73-5278

HEDENLAND, L. D. District goes into the reclamation business. *Water and Wastes Engineering*, 10(3):30-34, Mar. 1973.
The Las Virgenes Municipal Water District was organized in 1958 to bring imported water into the semi-arid region in western Los Angeles County, north of Malibu. Presently, the Tapia plant is primarily a reclamation facility that features primary sedimentation, aerobic sludge digestion, aeration, secondary sedimentation, and chlorine contact to achieve an effluent that is used to irrigate agricultural products in the area. Technical highlights include: an extremely versatile aeration system; temporary use of one final sedimentation tank as a chlorine contact chamber, careful control of nitrification; and the study of a simplified single stage oxygen contact system. The first phase of the reclaimed water system is a five mile six million gal per day pipeline terminating in a 34 acre ft storage reservoir located 350 ft in elevation above the plant. Use of this water is on irrigated agriculture, primarily alfalfa and permanent pasture. The proposed second phase of the reclaimed water system will be a dual water system throughout the District, making reclaimed water available for additional uses such as residential, golf courses, park and cemetary irrigation.
[24443]

73-5279

Hydrogenation of discarded tires yields reusable carbon black. *Rubber World*, 168(3):26, 28, June 1973.
In this article it is noted that hydrogenation could prove to be a means of converting discarded tires into saleable products at a cost competitive with methods of disposing of used tires other than by dumping them. Hydrogen will not react with the carbon in the tires; therefore, the carbon can be recovered nearly unchanged. Products of hydrogenation of ground discarded tires are fuel gas, naphtha, gas oil, and carbon black. The carbon black and oil produced in the pilot-plant-scale tests of the process appear to be satisfactory for reuse in commercial rubber compounds. The main factors affecting the profitability of the plant are the cost of the ground rubber feed and the value of the carbon black sold.
[24444]

73-5280

INAGAKI, K. Saisei riyo no jikkenka shiken. [Reutilization experiments on sludge containing heavy metals.] *Kinsoku Zairyo*, 13(6):25-30, June 1973.
Sludge containing heavy metals is generated from more than 50 kinds of processes such as waste oil treatment and woolen yarn washing. By adding clay, sand, or similar materials to such sludge, and heating it at temperatures above 1150 C, the sludge was successfuly turned into construction structural material, without dissolving of heavy metals which would cause pollution. The critical temperature is approximately 1200 C. Using a tunnel type kiln, the dust generated was found to be within the limit controlled by law, and quantities of heavy metals contained in the dust were extremely small. Very little metals became gaseous during processing, so that there was very little danger of air pollution. The mixture should contain at least 25 percent clay added to the sludge. The

price of clay is 1500 to 2000 yen a ton, so that there is no difference from the cost of presently marketed tile. However, the product using sludge is 5 to 20 percent stronger than those marketed, which are manufactured without sludge, since heavy metals in the sludge strengthen the final product. (Text in Japanese)
[24445]

73-5281

KELLER, E. Recycling Stichwort oder Schlagwort? [*Recycling - Catchword or keyword?*] *Umwelt*, 3(3):17-20, July 1973.

Efforts of recycling waste products in industries have been under way in all developed countries for many years, in some industries such as the steel or chemical industry, for decades. Much more complex than the recycling of wastes in industries is the recycling of domestic and communal wastes because they are a mixture of many varieties of waste products. Sorting techniques are thus gaining increasing importance. Many recycling processes are in developmental stage. For example there is a pilot plant in Franklin, Ohio, for a wet process developed by Black-Clawson for the developed recovery of fiber material. For recycling as for any environmental clean-up measures the cost acceptability is no longer decided by economists alone but in cooperation with ecologists. (Text in German)
[24446]

73-5282

KURODA, J. Puraschikku haikibutsu no yoyu saisei riyoki purachiraiza. [Platilizer, reclamation equipment for plastic wastes.] *Plastics Age*, 18(9):43-47, Sept. 1972.

The 'Platilizer' is an efficient and inexpensive plastic recycling machine which can be adapted to an existing extruder. The machine has several special attachments and the manner of operation and molding can be changed to direct extrusion molding or flow molding. The equipment requires only one operator, and recycled pellets can be produced at the full capacity of the machine at all times. The machine comprises a crusher, a blower conveyor, a storage tank with bridge, a screwfeeder with the speed change gear, a compactor, an extruder, and a pelletizer. The special attachments are the screw changer, supplementary storage tank and feeder, and the flow mold. The crusher cuts the material into rather large particles for screens 50 by 60 mm. The crusher is installed in the ground for noise abatement; foreign materials are eliminated on the conveyor. The crushed plastics are transported by a blower or a screw conveyor into the storage tank, where they are stored for 10 to 12 minutes and fed into the compactor periodically. The screwfeeder supplies a given amount of material into the compactor. The speed change gear adjusts the difference of apparent weight and balances the extrusion quantity and material charge. The compactor is a conical screw and the theoretical pressure ratio is larger than 10; in operation, the effective pressure ratio is smaller than that, regulated by the supply quantity. The compactor barrel has a watercooled jacket extruder without melting. The extruder is the Bent type. The pelletizer is water-cooled. (Text in Japanese)
[24447]

73-5283

KUROKI, K., T. HONDA, T. TAKESUE, AND T. IKEMURA. Purasuchiku haikibutsu no yokoriyo ni kansuru kenkyu. Poriechiren no thermal sand cracking. [Study on utilization of plastics wastes. Thermal sand cracking of polyethylene.] *In* Proceedings; 28th Spring meeting of the Japan Chemical Society, Tokyo, Japan, Apr. 1-5, 1973. 1916 p.

Thermal sand cracking was carried out under normal pressure and at relatively low temperature, and it was found out that decomposition and liquefaction is possible at a temperature as low as about 310 C. The liquid component of the decomposition product has some selectivity and it may be useful in the disposal of plastics wastes. A 100 cu cm stainless steel autoclave was used as experimental equipment with a stainless steel pipe connected to it. Sea sand was mainly used as packing agent, varying in size from 5 to 80 mesh. Ordinary sand was also used after treating it with acid or alkali. Mixture of polyethylene with the sand was packed in the reactor, and the sand was in the pipe. Heat was applied from the outside to complete thermal cracking at the prescribed temperature. The

reaction product was then expelled from the top of the pipe and cooled, and underwent analysis mainly by means of gas chromatography. For qualititative analysis, dimethyl formamide plus dioctyl phthalate for gas component, and SE-30 3m, for liquid component were used. Olefins were quantitatively analyzed as a whole using silica gel column, and chain molecules by synthetic zeolite molecular sieve 5 A respectively. Liquefaction rate of liquid components in decomposition product was 70 to 80 percent by weight to the packed sample, and its major component, olefins, came up to 65 percent by weight. Paraffins and mixture of isomers were also identified. Formation of carbon and gas was very low. Regarding the effect of sea sand on product, the smaller the size, the less the high boiling distillate. Acid treated sand produced lower boiling substances, which indicates the increase in contact space at the reaction zone prevents heat localization and give effective cracking. In cracking of plastics wastes at low temperature, peeling off reaction from chain ends presumably predominates. (Text in Japanese) (This document is retained in the SWIRS library.)
[24448]

73-5284

MIYAKE, M. Kemikaru shuzu kosaidan kuzu to no shigenka no kenkyu. [Study of utilization of scraps accumulated after making chemical shoes.] *Kogai Boshi Sangyo*, 3(3):77-85, March 1973.

Of 1200 tons artificial leather used for making chemical shoes in and around Kobe City, 15 percent become scraps, which, treated with sulfuric acid, plastic is recovered. However, since this method presents problems, a new approach of utilization0 making soles out of scraps and other vinyl sheet scraps, etc. has been developed. The scraps are cut by irregular cutter and crushed repeatedly by mixers, with fibers and all, and rolled by a newly developed 'fish-tail die'. There is no secondary pollution involved, since the effluent is the industrial water used for cooling of machinery and does not contain oil, etc. Care must be taken, however, in abating odor from polyvinyl chloride and noise and vibration in crushing process. If the beneficiaries are to bear the cost of depreciation and interest on the loan they owe banks, and the cost of wastes disposal borne by enterprises and local governments is to be defrayed, with some financial assistance from the national and local government, this plan is quite feasible. The rolled out material looks brownish, so that it must be coated with new polyvinyl chloride to make soles, or used as inner sole, etc. The presently used rubber adhesive with adequate primer is quite satisfactory. (Text in Japanese)
[24449]

73-5285

More fluting, testliner from waste paper as Jass Fulda mill reaches full output. *Pulp and Paper International*, 15(5):76-78, May 1973.

A new German paper mill, Jass Fulda, started up in late 1971 and is now producing 200 tons per day of fluting and testliner grades based almost entirely on waste paper. This compact, efficient mill features an Er-We-Pa cylinder machine and is designed for future expansion. The topics discussed include: expansion potential; the recycling concept in operation; two shock lines0 a third planned; machine already exceeds design output; machine is run on sales orders; full auxiliary facilities; and good demand for testliner and fluting. Illustrations are also provided.
[24450]

73-5286

NATIONAL CENTER FOR RESOURCE RECOVERY, INC. Capital and operating costs. *In* Materials recovery system. Washington, Dec. 1972. p. 9(1-53).

This paper discusses the economic factors involved in the establishment and maintenance of a municipal materials recovery system. The following topics are presented: calculation of general contracting and field supervision; calculation of contingency estimate; operating costs; and sample calculations and design work. A summary of the estimated capital costs is given, then detailed estimates are presented and discussed. Some sample engineering calculations and drawings are also included. (This document is retained in the SWIRS library.)
[24542]

73-5287

NATIONAL CENTER FOR RESOURCE RECOVERY, INC. Environmental considerations. *In* Materials recovery system. Washington, Dec. 1972. p. 7(1-8).

This paper discusses environmental protection in connection with the disposal and reclamation of municipal refuse. U.S. Environmental Protection Agency regulations, local requirements for control of air and water effluent quality, and the occupational health and safety guidelines provided by the U.S. Department of Labor must all be considered when establishing a waste management system which is to be compatible with a clean environment. The environmental considerations discussed include: prevention of local pollution of air, water, and landscape; maintaining quiet operations; avoiding overloads of municipal sewage processing facilities; providing safe and reasonably pleasant working conditions for employees; and fire prevention. Organic refuse, process water, and dust are also discussed in detail. (This document is retained in the SWIRS library.)

[24543]

73-5288

NATIONAL CENTER FOR RESOURCE RECOVERY, INC. Equipment. *In* Materials recovery system. Washington, Dec. 1972. p. 4(1-92).

This paper presents in detail the unit processes utilized in a municipal refuse resource recovery system. Major current applications, foreseeable advantages, and drawbacks of selected equipment are presented. Manufacturers are indicated for the sake of information and clarity, not for endorsement. The critical unit processes outlined herein are: the air classifier; the rising current classifier; the heavy media system; and the electrostatic separator. The basic processes described follow: a Trommel as a shredding substitute; dry screening and other dry processes as a substitution for the rising current classifier and the wet screen; and the electronic ore sorter as a possible substitute for the heavy media system. (This document is retained in the SWIRS library.)

[24544]

73-5289

NATIONAL CENTER FOR RESOURCE RECOVERY, INC. Introduction. *In* Materials recovery system. Washington, Dec. 1972. p. 1(1-13).

This engineering feasibility study conducted by the National Center for Resource Recovery discusses the system flow of a resource recovery facility. Each unit process is described and preferred pieces of equipment identified by manufacturer. The topics which are discussed in detail follow: economic separation of potentially valuable components in refuse; refuse shredding; the economic viability of resource recovery as an adjunct to a landfill system; four general approaches that could be used for separating metals and minerals from organics0 advantages and disadvantages of each process; and the three modules which compose a recovery facility0 the basic building, additional buildings and the equipment, and color sorters of glass. The analysis presented is based on the experience of the professional staff in materials handling and mineral processing, a review of the literature, visits to sites using applicable processes, and discussions with equipment manufacturers and other experts. (This document is retained in the SWIRS library.)

[24545]

73-5290

NATIONAL CENTER FOR RESOURCE RECOVERY, INC. Manpower requirements. *In* Materials recovery system. Washington, Dec. 1972. p. 8(1-12).

This paper discusses the manpower requirements of a municipal waste management and recovery system. The direct manpower needed is presented in a table and detailed job descriptions are provided for the following: superintendent; shift foreman; quality control; clerk; front end loader operator; shredder and air classifier operator; maintenance; and hand pickers. To determine how many pickers are required, it is necessary to estimate their production of recovered material as shown in the equations provided. The following two measures are provided for finding the amount of newspaper that is available to be bundled: computing the weight of paper delivered within the municipality by

weighing samples of each newspaper and multiplying by the circulation rate of each within the municipality; or using a percentage base to project the amount of total newsprint available. Equations are also included for determining how much aluminum could be picked by specified numbers of pickers. The results are shown in tabular form. (This document is retained in the SWIRS library.)
[24546]

73-5291

NATIONAL CENTER FOR RESOURCE RECOVERY, INC. Materials recovery system. Washington, Dec. 1972. 381 p.
This document examines the engineering and economic aspects of a facility designed to separate municipal refuse into six major components. The general intent is to adapt standard equipment commonly found in the minerals processing industries to the application of segregating marketable products from household waste. The topics which are covered in detail follow: the systems concept; unit operations; equipment; output characteristics; site requirements and plant layout; environmental considerations; manpower requirements; capital and operating costs; and process economics. An extensive bibliography, data, and illustrations are also included along with appendices on the laboratory testing program, equipment manufacturers, water balance, plant personnel, and plant costs and returns. (This document is retained in the SWIRS library.)
[24547]

73-5292

NATIONAL CENTER FOR RESOURCE RECOVERY, INC. Output characteristics. *In* Materials recovery system. Washington, Dec. 1972. p. 5(1-35).
The output characteristics of municipal refuse are discussed under the following headings: dry organics; paper specifications; ferrous scrap; mixed other nonferrous metals; glass; aluminum scrap; and inorganic fines. The products to be reclaimed are summarized in tables along with the standards which must be met in order to retain markets for these goods. Dry organics are discussed in terms of landfilling and the practicality and economic viability of burning shredded refuse in existing incinerators, new incinerators, or utility-grade boilers. The following tabular material is provided: specifications for folded news; specifications for old corrugated boxes, and mixed news and old corrugated containers; specifications for can bundles, ferrous scrap, and nonferrous metals; specifications for recovered glass; chemical composition limits of aluminum scrap for wrought products; and the chemical composition limits of aluminum scrap for secondary metal. Fine organic particles, passing through a 100-mesh screen, will be separated and collected. This material could be a substitute for sand and fine gravel. (This document is retained in the SWIRS library.)
[24548]

73-5293

NATIONAL CENTER FOR RESOURCE RECOVERY, INC. Systems concept. *In* Materials recovery system. Washington, Dec. 1972. p. 2(1-26).
This paper describes the basic systems concept for a prototype recovery system for a municipality. The characteristics of the raw materi-al0 mixed municipal refuse0 which the system processes are also discussed. The proposed system is an add on to an existing solid waste management system, to be complemented by future additions of processes to take advantage of the economic potential of the residue of this sytem. The topics which are discussed in detail follow: a comparison of various system approaches; equipment capabilities, advantages, and disadvantages; energy recovery; composting; various recovery systems; reasons for selecting a materials recovery system; reasons for selecting a dry system; and design inputs. Data and an extensive bibliography are also provided. (This document is retained in the SWIRS library.)
[24551]

73-5294

NATIONAL CENTER FOR RESOURCE RECOVERY, INC. Unit operations. *In* Materials recovery system. Washington, Dec. 1972. p. 3(1-34).

This paper discusses unit operations for a municipal resource recovery system. There is a detailed discussion of homogenizing mixed refuse, and separating the mixed material into its basic components, particularly the recoverable products the system is designed to extract from the waste. The following processes and equipment are described in detail: trucks; picking conveyer; paper baler; shredder; air classifier; compactor; magnetic separator; air knife; rising current classifier; slurry recovery; magnetic drum separator; dryer; four-deck shaker screen; roll crusher; ferrous incinerator; and an electronic ore sorter. A detailed, four-page schematic is included of a materials recovery system. The material balance is described in terms of output and recovery rates which are shown in tabular form. (This document is retained in the SWIRS library.)
[24552]

73-5295

O'BRIEN AND GERE ENGINEERS, INC. Salvage and re-use. *In* Jefferson County comprehensive solid waste planning study, CSWP-15. Albany, New York, New York State Department of Environmental Conservation, June 1972. p. 64-70.
This paper investigates the feasibility of recycling in Jefferson County, New York, as part of the Jefferson County Comprehensive Solid Waste Planning Study. The quantities of materials available for recycle were surveyed and the markets for these materials were evaluated. It was found that for most components of refuse the cost of collection and shipment exceeded the market value. This excess cost would have to be paid by the County's taxpayers in order to make salvage and refuse a workable concept. The conservation of resources, the quantities available, the markets, and future developments in the area of recycling are discussed in detail. It is concluded that since there are no proved processes for the separation of mixed refuse into saleable component products, in-home separation and separate collection of components are the recommended procedures for the present. (This document is retained in the SWIRS library.)
[24553]

73-5296

Paper reclamation survey: recovery rate of waste paper needs to be increased. *Materials Reclamation Weekly*, 17-18, May 12, 1973.
Great Britain's joint waste paper advisory council has concluded that the recovery rate of waste paper now has to be substantially increased because the traditional source of raw material, timber, is not keeping pace with the demand. Preliminary figures for waste paper consumption issued for the first 3 months of 1973 are presented. Great Britain's newsprint industry has been returning very low profits in recent years. This industry is not confident about its economic future because of Scandinavian competition and pollution controls which are adding to future cost problems.
[24554]

73-5297

Pavements: environmental composite pavement report. *Highways and Road Construction*, 41(1,761):27, May 1973.
This article discusses an experimental composite pavement which has been used on a 1,500-ft section of heavily travelled New Jersey highway. It has served as designed with minimal maintenance since its construction in 1963. The pavement consists of a five-component system involving a 6-in. crushed stone subbase, an 8-in. plain concrete base, a 3-in. layer of densely graded crushed stone, a 5-in. layer of dry-bound macadam, and a 3.5-in. surface of bituminous concrete. The composite pavement cost was about 15 percent higher than New Jersey's standard design of reinforced concrete pavement, but this is expected to be offset by the estimated 23 percent longer service life.
[24555]

73-5298

PROBERT, S. D., I. E. SMITH, AND R. J. HANSFORD. Casting waste ash should hot up the pace of building. *Engineer*, 236(6105):45-46, Mar. 15, 1973.
A casting process produces a continuous ribbon of ceramic which adheres to foundations and to itself. By laying a series of such ribbons, a wall can be formed. The solidified ceramic possesses

better physical characteristics for some applications than conventional brick. The raw material for the process is pulverized fuel ash0 a waste product from coal fired electricity generating stations. The process uses it at high temperatures0 1273 K to 1473 K. It sinters within this temperature range and with the addition of flux, becomes molten. It is this molten ceramic which, laid as a series of ribbons, is used to form a wall. No fixed formwork or shuttering should be necessary because the ceramic requires from 3 to 10 seconds to set. The ribbon emerges from an inverted cone of a mobile furnace. Thinner ceramic walls could replace standard thickness walls. Further research is necessary to improve the foamed ceramic to give even better physical properties and to develop a lightweight and easily maneuverable furnace with attached shuttering for shaping the continuous ceramic ribbon.
[24556]

73-5299

Rasensport auf Altreifen-Packlage. Sport on slabs of old tires.0 *VDI-Nachrichten*, 27(24), June, 1973. 01 The West German Federal Department of the Interior helped to finance the development of a process for the recycling of old tires. In the Federal Republic of Germany alone the annual accumulation of old tires amounts to between 200,000 and 300,000 tons. The method is based on comminution of old tires and shaping them into slabs. Steel and fiber belts in the tires do not interfere with the process. The tire chips are bound together by a new resin with an isocyanate base sold under the names Desmodur and Desmophen. The slabs are particularly suitable as infrastructure for sports grounds and for paths. They permit the installation of a heating system to keep the surface snow- and ice-free. (Text in German)
[24557]

73-5300

Recovering lead from scrap batteries. *Materials Reclamation Weekly*, 122(19):28-29, May 12, 1973.
This article announces that a lead recovery plant for processing scrap batteries has been developed by Hemco and Co., an English engineering firm. The plant handles up to 210 batteries an hour, giving a capacity of 20 tons in 6 hours and only one operator is needed. The complete recovery of lead and separation of the bakelite casing is achieved in three stages which are outlined in this article. The system basically breaks the batteries and separates them into three separate containers--battery terminals and bridges, battery plates and dross, and battery cases and fragments of bakelite.
[24558]

73-5301

Recycle more? It's up to Washington, study shows. *Chem 26 Paper Processing*, 9(5):55-57, May 1973.
Midwest Research Institute has concluded in a report on its year-long study of recycling trends from 1970 through 1985 that the rate at which waste paper is recycled in the United States could increase from the 20.6 percent of 1970 to 26 percent by 1985 given Federal Government incentives to help overcome recycling barriers. The report, entitled 'Paper Recycling0 the Art of the Possible, 1970-1985,' was released during the 96th annual American Paper Institute meeting in New York City. It is suggested that the most effective Government recycling incentive would be a tax credit per ton of paper recycled. In addition to statistical highlights of 1972, the report includes charts and tables on consumption, production by major grades of paper, capital expenditures, fuel and energy requirements, exports, sources of fiber, and capacity increases by major categories.
[24560]

73-5302

Recycled rubble saves contractors money. *Roads and Streets*, 116(4):80, 83, Apr. 1973.
This article discusses the substantial savings incurred by onsite recycling of concrete and asphalt. Other benefits include the saving of scarce landfill areas and the great reduction in truck traffic which help control air pollution. Problems include the scarcity and selection of quality concrete or asphalt and the relatively high maintenance costs. Savings on material handling vary but they always depend on site loca-

tion. The flow plan for continuous operation of the twoestage crushing system is provided and the equipment used is described.
[24559]

73-5303

Refuse reclamation pilot plant comes on stream. *Materials Reclamation Weekly*, 122(10):29, Mar. 10, 1973.
The Garrett Research and Development Co. of La Verne, California, is pilot testing a proprietary flash pyrolysis a process for municipal solid wastes designed to recover profitably ferrous metals, glass, and heating fuels. The system offers what is claimed to be an almost entirely pollution-free means of converting these wastes to useful products. Based upon present data, it is estimated that a full scale 2,000 tons a day processing plant to accommodate the needs of a community of 500,000 people would cost about $12 million. Fuel for the plant would be generated from its own gaseous pyrolysis products. The operating costs, it is estimated, would be about $5 a ton, including amortisation over 25 years at 6 percent interest. Approximately four acres would be required for a plant site, but this cost is not included in the capital estimate. The process offers the potential of replacing expensive and relatively inefficient disposal operations with a revenue producing process which minimizes pollution of the surrounding land, air, and water. Incoming solid wastes are shredded, dried, and passed through an air classifier which separates out most of the metals, glass, and other inorganic materials. The remaining refuse is shredded a second time and then pyrolized0 a process in which it is broken down into smaller molecules through the application of heat in the absence of oxygen. Laboratory reactor runs resulted in the production of good quality oil at the rate of about one barrel per ton of refuse received.
[24561]

73-5304

SADLER, T. B. A crushing success: aggregate from concrete. *Public Works*, :72-73, Apr. 1973.
The city of Minneapolis has successfully produced 75,000 tons of aggregate in 90 days by crushing waste sidewalk and paving materials for reuse. The cost of a ton of aggregate made by crushing demolition concrete and delivered to the job site is not substantially less than a ton of comparable material delivered from a gravel pit. Yet there is the convenience of having a disposal site 10 minutes away from the paving site. Crusher expenses are more than offset by demolition haul costs, wear and tear on trucks, and overall construction cost advantages. The work of crushing concrete proceeded at a rate of some 200 tons per hr.
[24563]

73-5305

Scrap tires can yield marketable products. *Environmental Science and Technology*, 7(3):188-190, Mar. 1973.
Approximately 11 billion lb of rubber products are produced annually in the U.S. Tires constitute the largest segment of these goods. Waste rubber is 70 percent tires. More than 200 million old tires are discarded each year. One reclamation answer is to use reclaimed rubber in asphalt for road surfacing. If 1 to 2 percent reclaimed rubber in roadbeds became common practice, 60 percent of the nation's waste tires would then be utilized each year. Reclaimed rubber is produced by treating vulcanized waste rubber with chemical agents, heat, and intensive mechanical working to produce a uniform consistency. Goodyear is installing a furnace to use old tires as fuel to generate steam for new tire production. About 3,000 tires will be used daily to reduce the disposal problem. Although tires have 50 percent more Btu value than coal, the expensive incinerator operation will not save money for Goodyear. Firestone has developed a destructive distillation process for reclaiming hydrocarbons and carbon black from tires. When oxygen is added to rubber, it becomes useful as a soil conditioner. Other possible uses are: to clean up oil spills, as high protein foodstuffs, as water purification material, as crash barriers, and for artificial reef programs.
[24564]

73-5306

SINGLETON, E. L., AND T. A. SULLIVAN. Electronic scrap reclamation. *Journal of Metals*, 25(6):31-34, June 1973.

This article describes how aluminum of 99.9 percent purity plus copper, lead, tin, silver, and gold can be recovered from obsolete electronic equipment. Aluminum ingots derived from sweated electronic scrap were processed by electrolytic methods to recover aluminum and to concentrate base and precious metals in an enriched anode. The ingots obtained contained most of the aluminum and part of the precious metals and copper in the original scrap. The copper, lead, tin, silver, gold, and other precious metals were concentrated threefold in an anode product which was then suitable for treatment by commercial methods to recover the copper and precious metals. Extensive data are provided.
[24562]

73-5307

Some equipment used in fibre recovery and effluent treatment operations. *Paper*, 179(6):294, 296, 299-300, Mar. 21, 1973.

This article describes some equipment designed specifically for fiber recovery and effluent and sludge treatments. The destruction of sludge by fluid bed incineration is outlined. The fluidized bed incinerator has the following advantages: reduction in volume and weight of sludge; suitability for centralizing waste sludge disposal in densely populated areas; and complete burning out of flue gasses and then freedom from any organic reactive matter. The floatwash system is designed to overcome the combined problems of the pollution of rivers from paper and pulp mill effluent, to assist in the reuse of white water within the mill's system and recover good fiber. The Brassert Strainer is a pressure type strainer for mechanical cleaning of water and other types of fluids. The Beloit-Jones Polydisk Filter consists of a series of discs mounted on a hollow centershaft. Each disc consists of individual sectors covered with filter media.
[24565]

73-5308

SUGIE, G. Ashio haidei no kenchiku tojiki to shite no riyo. [Reuse of Ashio mine waste (slime) as ceramic building blocks.] *Seramikkusu*, 7(12):943-945, 1972.

The mine waste (slime) from the Ashio copper mine contains much ferrous oxide and is not ideal as far as ceramic material goes; but interesting tiles and building ceramic blocks with superior mechanical property can be produced very inexpensively. The sizes of Ashio slime particles are even and large, but the shapes are irregular. The particle bond is not good, the surfactant is limited, and plasticity is poor. However, the bondage between particles and water is also poor and the slime can be relatively easily dried. The shrinkage caused by drying is 3 to 4 percent and is low, but that caused by baking is very large0 9.2 percent. However, a small difference in baking temperature causes a large difference in shrinkage and both sintering and mechanical properties are superior. Mixing of 30 percent clay makes extrusion very easy, increases drying shrinkage to 5.2 percent, and reduces the baking shrinkage to 7.5 percent. Presently, approximately 500 tons of attractive red clinker tiles and black clinker tiles (with manganese mixture) are produced very inexpensively every month. (Text in Japanese)
[24566]

73-5309

SULLIVAN, P. M., M. H. STANCZYK, AND M. J. SPENDLOVE. Resource recovery from raw urban refuse. Report No. 7760. Washington, U.S. Department of the Interior, Bureau of Mines, [1973]. 28 p.

The U.S. Bureau of Mines has installed and is operating a 5-ton-per-hr pilot plant for continuous mechanical separation of values contained in raw urban refuse. The process includes shredding, air classification, screening, gravity concentration, and electrostatic separation. Compactor trucks deliver raw refuse collected along typical routes in metropolitan Washington, D.C., to the pilot plant. The loads are separated into light iron, massive metals, glass, waste combustibles, paper, and plastics. The data obtained to date have indicated favorable economics for

commercial-size plants. (This document is retained in the SWIRS library.)
[24567]

73-5310

SUZUKI, M. Purasutikku no netsu bunkai ni yoru abura no kaishu. [Recovery of oil by thermal decomposition of waste plastic.] *Seisan0 Kenkyu*, 25(2):85-88, Feb. 1973.

From the standpoint of a closed system for the disposal of plastic wastes, the importance of the recovery method of light oil by thermal decomposition is pointed out. A fundamental experiment was carried out for the development of the recovery process of oils by dry distillation and thermal decomposition of polyolefins, where a possibility for a process to independently control the reaction rate and the composition of produced oils was reviewed. In this study, thermal decomposition was carried out using the outside dry distillation process, in which a cooling section was provided on the upper part of the dry distilling still and the temperature was regulated independently of the reaction section, with the intent of obtaining efficiently light oil by a method to reflux the heavy components of distillate. The device consists of a stainless steel cylinder with a 2 liter decomposition section and a 1 liter upper distillate section, together with a 90 mm diameter reaction section. As a result, using the dry distillation process provided with a cooling section on the upper part of the still, the light oil seems to be recovered with a good efficiency. But more technical problems such as enhancing the heat exchange efficiency of the cooling section, improving the heating method, and related various problems require further research. From the standpoint of the plastic cycle, the method of treating polyvinyl chloride and the reexamination of laws and specific policies would become important issues. (Text in Japanese)
[24568]

73-5311

TAKIHARA, T. Haipurasuchikku no maikurohayoyu to tankasuiso yu kaisyu. [The microwave fusion of plastic wastes and recovery of hydrocarbon oil.] *Kankyo Sozo*, 3(1):18-26, Jan. 1973.

In 1971, Sanyo Electric Co. constructed a test plant for disposal of plastic industrial wastes having a capacity of 1 ton per day to obtain various experimental data; in 1972, a practical plant having a capacity of 3 tons per day was constructed at the Gifu factory. In the process used, plastic wastes are first ground to grain sizes near the bean size and automatically sent to a fusing furnace through a pneumatic conveyer. The plastic wastes thus sent are fused by heating them to 250 to 270 C by the use of a microwave heating system and sent through a storage tank to a horizontal, cylindrical reactor about 3 m long where the molten plastic is heat decomposed at 500 C. The hydrocarbon gas produced by thermal decomposition is introduced into a cooling tank and the cooled oil is stored in a tank. The gas of carbon numbers of less than four is sent to a combustion cylinder through a filter. In the case of the microwave fusion, the efficiency of fusion is greatly changed by load material, its amount, and even by the shape and structure of furnace, so that impedance matching must be considered. In this company, by adding an amount of powdered carbon into plastic wastes, the effective fusion of plastic wastes was successfully attained. For vinyl chloride, which is in question more than 95 percent of the hydrogen chloride were removed in the test plant. (Text in Japanese)
[24569]

73-5312

Urban rural reports. *Compost Science*, 14(3):3, May-June 1973.

Four articles on reclamation are presented. In the article on tax reform for recycled materials it is pointed out that inequitable freight rates for raw versus recycled materials should be changed. The House Ways and Means Committee is holding hearings on a bill, H.R. 1508, which would alleviate the economic disadvantages to which recycled materials are now subjected. Garbage is discussed as a source of animal feed as well as plant food. Two researchers have found a way to turn 10 tons of garbage into 3 tons of 20-percent protein meal at a cost to farmers of $40 a ton. Peking generates more than 2,700 tons of garbage daily which are removed from the city every night by sanitation workers.

The inhabitants dump their garbage in designated places for collection. From there it is taken in garbage-disposal trucks to pits in the communes on the outskirts and turned into fertilizer. It was announced that trilingual abstracts covering European efforts on solid waste disposal and use are available from the International Solid Wastes and Public Cleansing Assn., Zurich, Switzerland. The abstracts are published in French, German, and English, and the treatment is scholarly.
[24570]

73-5313

Walmsley's Research Center develops waste paper processing methods. *Paper Trade Journal*, 157(23):32-34, June 4, 1973.
Walmsley's Research Center has recently expanded its research facility in England in order to study the problems involved in waste paper processing. Its pilot plant has produced new equipment and processes for fiberizing, removal of light contaminants, deflaking, screening, and pressing. The topics which are discussed follow: the Belcor unit; pressmaster and shredmaster; experimental board machine; deflaking; high consistency screening; dewatering and pressing; asphalt disperson; and high consistency processing. Economic considerations are of prime importance in the treatment of secondary fibers and careful selection of equipment can result in reduced costs. Illustrations of the equipment and systems are provided.
[24571]

RESEARCH

73-5314

OHTA, N. Kogai to Kagaku Gijutsu. [Chemical technology for pollution control.] *Yuki Gosei Kagaku*, (353): 17-23, Dec. 15, 1972
Methods of recycling waste material are being studied by the Ministry of International Trade and Industry. Some of the methods being examined are selective reuse of iron, aluminum, copper, lead, zinc, and glass from the refuse. The refuse is roughly crushed in a mill and classified into fibers, plastics, iron and metal, nonmetal, transparent glass, and colored glass by air, magnets, screening, weight, or optically. Steam is recovered in the combustion process. The 'Pulper' which is under development in the United States is a device in which waste and water are mixed and shredded by a propeller cutter. Some other methods in the process of development are the conversion of organic refuse into fuel gas, oil, and coal, or synthesizing petroleum by adding carbon monoxide and steam. Photolysis of plastics is also being studied in recent years; photosensitivity reagent or oxidation degradation basis is added to the polymer. The most desirable product will be a biodegradable plastic which can be reduced to carbon dioxide and water. (Text in Japanese)
[24572]

73-5315

YAMADA, K. Purasuchikku haikibutsu netsubunkai shori no kenkyu no doko. [Tendency of studies on the thermal cracking treatment of plastic wastes.] *Kankyo Sozo*, 3(1):11-17, Jan. 1973.
Since vinyl chloride which contains chlorine, unlike other olefinic series plastics, gives off hydrogen chloride at 250 to 300 C prior to the decomposition of the main chain, considerations must be taken not to cause air pollution. Stromberg and others subjected several kinds of vinyl chloride to heat cracking process under vacuum and determined the hydrogen chloride, benzene, and so forth, produced at a decomposition temperature of about 300 C by means of mass spectrometry. They then analyzed hydrocarbons which are decomposition products at 400 C. The mechanism of the decomposition reaction was investigated with a heat balance, which led to the result that the rate of reaction was on the order of 3:2, and the rate of reaction was about 30 calories. P. Dumn and others state that a metal oxide such as zinc oxide or iron oxide promotes the thermal cracking of a chlorinated high polymer such as vinyl chloride. Polystyrene like polymethyl methacrylate, can be easily decomposed by heat cracking to a monomer. F. A. Lehmann and others conducted detailed analyses for the decomposition gases of styrene and other high polymers. The production of waste polyacrylonitrile is smaller than in other plastics, but when the plastic is burned a harmful gas is emitted; that is, cyanic acid gas is emitted at

temperatures exceeding 180 C. (Text in Japanese)
[24573]

SANITARY LANDFILL

73-5316

BEVAN, R. E. Controlled tipping of solid urban refuse and suitable industrial waste. *In* Waste disposal; Proceedings; 4th International Congress of the International Research Group on Refuse Disposal (IRGRD), Basel, Switzerland, June 2-5, 1969. Basel, Schweizerische Zeitschrift fuer Hydrologie. p. 364-382.
This section of the proceedings includes both the opening remarks and the conclusions presented at a working session of the congress on controlled tipping of refuse and industrial waste. (Controlled tipping is the British term for sanitary landfill.) Within the article, a definition is given of what the Ministry of Housing and Local Government considers to be the minimum requirements for a controlled tip. Space required for such tips, with or without pretreatment of the waste, is discussed, as well as findings from tips receiving refuse, commercial wastes, bulky wastes, fly ash from power stations, dust, street sweepings, and other types of wastes. Estimated densities of these types of refuse are given, both at the time of tipping and a few months later, when they would have presumably increased in moisture content. Considerations of the effect of tips on air and water quality. are discussed, and measures to avoid such damage are briefly outlined. Operating costs are also covered, and the effect of pretreatment by pulverization on costs is discussed. A short section is devoted to tipping of industrial sludge mixed with solid waste. (This document is retained in the SWIRS library.)
[24574]

73-5317

BODMAN, S. W. III, J. A. FEARNEY, J. J. HARRINGTON, D. H. MARKS, W. NIESSEN, L. J. PARTRIDGE, A. SAROFIM, AND D. G. WILSON. Landfill. *In* The treatment and management of urban solid waste. Westport, Connecticut, Technomic Publishing Co., Inc., 1972. p. 85-98.
This paper reviews some methods which would reduce transportation and handling costs and produce landfills which are tolerable to the local communities during filling, and which would be highly beneficial. The sanitary landfill methods discussed are: basic sanitary landfill; baling and landfill; landfill with pulverized refuse; and multiple use of land. The experimental methods considered were: continuous burial; pulverization in the land; and rapid stabilization by aeration. Some of the problems encountered are: water pollution; gas production; fires; and settling. (This document is retained in the SWIRS library.)
[24575]

73-5318

GLYSSON, E. A., J. R. PACKARD, AND C. H. BARNES. Sanitary landfills. *In* The problem of solid waste disposal. Ann Arbor, College of Engineering, The University of Michigan, 1972. p. 34-53.
This is a basic introduction to sanitary landfill practices. Landfill is defined, and its advantages and disadvantages are discussed; the latter are seen as chiefly economic. Site selection and landfill design must be carefully carried out in order to prevent pollution, secure social acceptance, achieve efficient operation, and utilize the completed fill. Basic operations of sanitary landfills are described and illustrated with diagrams, graphs, charts, and pictures. There are four types of landfill methods in terms of sites: 1) area, 2) slope or ramp, 3) trench, and 4) canyon, pit, or quarry. Landfill must be compacted; this is done daily in individual cells. The density of refuse in various landfill stages is presented. Cell construction, fill construction, and daily and permanent cover are illustrated. Heavy equipment for spreading and compacting solid waste and cover material includes the crawler dozers, crawler loaders, rubber-tired dozers, rubber-tired loaders, compactors, scrapers, and draglines. Each of these is evaluated for the different tasks that must be performed. Other graphics portray the following: cost per ton of sanitary landfill operations, based on different populations served; leachate and infiltration movement; leachate composition standards; groundwater quality near a landfill; gaseous end

products of decomposition of municipal refuse; nitrogen, methane, and carbon dioxide production from a landfill over different periods of time; cumulative volume of gas from a landfill; methods of controlling gas movement--including clay barriers and crushed stone with pipe vents; and comparative capital and operating costs of sanitary landfill, incineration, and composting. (This document is retained in the SWIRS library.)
[24576]

73-5319

SCHRAMMECK, E. Gewasserbeeintraechtigung druch Deponien und Abfallagerstaetten0 Empfehlungen zue laufenden Ueberwachung. [Water pollution through dumps and landfills. Recommendations for continuous monitoring.] *Wasser Abwasser GWF Gas- und Wasserfach0*, 114(5):214-217, May 1973.
According to the results of an inquiry by the center for waste disposal of the Federal Health Department in West Geramny, only 16 percent of the existing dumps are sealed off from groundwater, and only 11 percent are being monitored for possible changes in the ground and surface water composition. The results of analyses of leachate and groundwater from various dump sites as found in the existing literature are presented in a table along with analyses. According to the author, the water samples taken in the vicinity of dump sites with mostly domestic refuse had a biochemical oxygen demand of 15,000 to 46,000 mg per liter. Chloride was measured in concentrations between 1,700 and 2,250 mg per liter, and ammonium between 600 and 3,000 mg per liter. Traces of nitrate were found and less than 0.005 mg per liter of nitrite. The sulfate concentration measured was between 200 and 400 mg per liter, that of phenol between 180 and 230. For sampling of surface water, one sample before and after dumping suffices. For monitoring groundwater, pipes must be driven into the ground to the water level. The pipes shall end at least 30 cm above the ground and must be sealed. One observation pipe is necessary for every 100 m of dump site length, and further pipes at 100, 250, and 500 m distances are required. It is recommended to pump off at least 100 liters of water prior to sampling to gain a representative sample. In the first 3 to 5 years of groundwater monitoring, samples should be taken every 3 months. Later semiannual and annual samples might be enough. (Text in German)
[24577]

73-5320

TOSCH, M. Grundwasserschutz bei geordneter Deponie von Siedlungsabfaellen. [Ground water protection through controlled tipping of trash.] *Wasserwirtschaft--Wassertechnik*, 23(5):158-161, May 1973.
After a review of groundwater pollution by uncontrolled tipping and the self-purification capacity of groundwater, the prevention of groundwater pollution through controlled tipping of trash is discussed. Since measures for the protection of groundwater are expensive, sites should be selected for controlled tipping which do not have any useable groundwater or which have a natural water-impermeable layer. The layer must have a water permeability coefficient of 0.00001 cm per sec. Usually clay, clayey silt, and marl layers have the required impermeability. The water impermeability can be improved by compacting such layers. If no site is available with natural impermeable layers, the tipping site must be sealed either with natural earth material or with synthetic material. An aerobic, chemical-biological decomposition process which creates a large water demand higher than the supply by rainfall can be an efficient means to eliminate the leachate problem. Entirely sealed tipping sites must have a water drainage system. The costs for the drainage system may well absorb 50 percent of the total investment costs. Controlled tipping with aerobic decomposition requires rather light compacting of the 2 m thick trash layer and coverage with a rather coarse and permeable top layer. The relatively loose layer promotes the decomposition of the organic matter. Rainwater penetrating into the layer is evaporated because of the high temperature. For the decomposition process in the 2 m thick trash layer, 4 to 6 months must be allowed. At the end of this period the layer is tightly compacted and now serves as the base for a new trash layer. (Text in German)
[24578]

73-5321

UESHITA, K., T. KUWAYAMA, AND S. SAIDA. [Sanitary landfill disposal.] *Doboku Gakkai-shi*, 58(2):39-44, Feb. 1973.

Investigations and tests were conducted on landfill areas where various waste materials were buried. Samplings of rubble and gravel, various sludges, and various cinders and ashes were tested for chemical composting, specific weight, water content, and physical characteristics for their suitability as landfill material. The areas investigated mostly showed the signs of insufficient pretreatment of waste material. It was evidenct that waste was dumped and covered with earth without enough crushing, compaction, and other necessary pretreatment, and land settling and sinking had started. In one area where four large apartment houses had stood for the last 7 years, there was no sign of building damages, but the land had settled in spots as much as 20 cm. In another residential and school area which was developed 2 years ago, buildings show damages, and the land has settled 10 to 15 cm in spots. The covering earth is only 50 cm thick, and sometimes methane gas leaks from the waste layer, and newly planted trees do not live long.

[24579]

SLUDGE

73-5322

ANDERSSON, A., AND K. O. NILSSON. Enrichment of trace elements from sewage sludge fertilizer in soils and plants. *Ambio*, 1(5):176-179, May 1973.

This article discusses soil as a medium for the disposal of sewage sludge. Soils are more easily aerated than water and can receive large amounts of organic matter per unit volume that can be decomposed without harmful effects from the anaerobic and reducing conditions that occur in water. However, sewage sludge also contains hazardous components of domestic and industrial origin which are toxic even in low concentrations. When municipal waste products are to be used for agricultural purposes, the application rates recommended should be based on the content of potentially harmful components. Analytic data are provided for trace elements.

[24580]

73-5323

BJOERKMAN, A. Thermal treatment of sewage sludge. *In* Waste Disposal; Proceedings; 4th International Congress of the International Research Group on Refuse Disposal (IRGRD), Basel, Switzerland, June 2-5, 1969. Basel, Schweizerische Zeitschrift fuer Hydrologie. p. 670-686.

This article described the functions of heat treatment of sewage sludge--destruction of pathogens, facilitation of dehydration, and preparation for incineration or utilization. It describes two processes, the Porteous and von Roll, and gives flow charts and cost figures for both. Heat can be used for removal of intercellular water (thickening), removal of adhesion and capillary water (dehydration) and removal of adsorption or inner water (drying). The amount of power needed for each type of treatment is presented. Devices for drying sludge are described: multiple hearth dryer; drying drum; flash dryer; and belt drying. Two Swedish plants involved in drying sludge prior to incineration are used to demonstrate approximate costs. Incineration of sludge, with and without previous dehydration, is covered, including various processes and pieces of equipment and their approximate costs. A graph presents the calorific value of sewage sludge in relation to its water content. Cost figures for a Zimmermann process installation in Kansas City are included. There is also a short discussion of the technology and costs of refuse-sludge incineration. (This document is retained in the SWIRS library.)

[24581]

73-5324

BOEHNKE, B. Pretreatment of sewage sludge. *In* Waste Disposal; Proceedings; 4th International Congress of the International Research Group on Refuse Disposal (IRGRD), Basel, Switzerland, June 2-5, 1969. Basel, Schweizerische Zeitschrift fuer Hydrologie. p. 608-631.

Figures show that the amount of raw sewage sludge in the Federal Republic of Germany is equal to the amount of domestic refuse, or approximately 20 million cu m per year. However, the disposal of this amount of sludge should

present no great problem if two conditions are met. It must be rendered biologically stable and it must be reduced to the smallest practical moisture content, and hence, volume. Then it can be composted, incinerated, or landfilled without difficulty. Flow charts are given showing various systems by which both these objectives can be achieved. Tables show the characteristics of sewage sludge in relation to water contents and disposal volumes in relation to degrees of dehydration. For example, a sludge with a 4 percent dry matter content will have only 50 percent of its original volume after thickening. When the volume is reduced to 10 percent of the original, it will require only 10 percent of the disposal space. However, past this point, there is no economy in reducing the water content further, that is, beyond 60 percent. The results of the working committee's activities are presented under the following headings: criteria for the degree of anaerobic and aerobic sludge stabilization required; operational experience in and cost of anaerobic and aerobic sludge stabilization; operational experience in and cost of thickening; operational experience in and cost of centrifugation while considering preconditioning; operational experience in and cost of sludge processing in drying beds and lagoons; operation experience in and cost of vacuum filtration while considering preconditioning; operational experience in and cost of pressure filtration; and operational experience in and cost of sludge dehydration through conveyor screen compresses. Extensive data and graphs are provided for each of these topics. (This document is retained in the SWIRS library.)
[24582]

73-5325

BROUZES, P. H. Considerations in the multistage activated sludge treatment of industrial wastewater. *Water Research*, 7:783-791, May 1973.

This article discusses the possibilities of biological treatment for industrial wastes. The experiments which were carried out show that the rate of metabolism of activated sludge can be influenced by pH value, concentration of nutrients, presence of trace elements, and concentration of toxic substances. The treatment of sewage and industrial wastes in the same plant is generally to be preferred but optimum removal of pollutants is seldom achieved if the two liquors are simply mixed together. Substances which are biodegradable but toxic to activated sludge and nonbiodegradable toxic waste waters require different forms of treatment. This might be achieved by subdivision of these plants into various more specialized stages.
[24583]

73-5326

FOSTER, W. S. Potato starch--its extra water-softening benefits. *American City*, 88(5):83-84, May 1973.

This article describes how a plant in Ocala, Florida, conditions water-softening sludge with potato starch, obtains a sludge that is easy and economical to handle, and finds a way to use the sludge in the stabilization and improvement of roadways. The softening plant is able to receive and treat 6 million gal of water per day. Lime is the principal softening agent. The water is filtered and chlorinated before being pumped to a 2-million gal prestressed concrete storage tank, and ultimately delivered to the city's distribution system.
[24584]

73-5327

LABERIS, S. Compressed air sub-surface aeration. *Pollution Engineering*, 5(4):35-37, Apr. 1973.

This article discusses aeration of sewage and industrial wastes using compressed air. Extensive research has been done to improve upon the basic process of introducing air at some depth within a tank, and allowing the natural rise of the air bubbles and entrained water to provide oxygen transfer. Several ways of introducing air have been developed. Characteristics of the most common methods are summarized in a table. A new approach to the problem improves upon the compressed air method of aeration by using a maintenance-free, nonporous diffuser, increasing the path length and air-water mixing, and reducing air bubble size after the introduction of air in order to increase oxygen transfer. The system is described in detail after which it is con-

cluded that the degree of mixing is more than sufficient for waste treatment application.
[24585]

73-5328

LECLERC, H., AND P. BROUZES. Sanitary aspects of sludge treatment. *Water Research*, 7(3):355-360, Mar. 1973.
This study compares the efficiency of various sludge treatments0 dehydration, stabilization, and disinfection. The total removal of pathogenic microorganisms from sludge is not compatible with technological and economic necessities. This article sets forth the reasons which would lead to the codifying of the bacteriological control over various treatment processes. It seems essential that information be obtained in salmonella, total enterobacteria, and on the total count of bacteria. The techniques used are described. Graphs provide the following information: influence of the duration of stabilization on the elimination of bacteria and the decrease of mass; influence of temperature on the elimination of bacteria and on the sludge density; influence of treatment time on the elimination of bacteria and on the sludge density; and the influence of ultrasonic treatment time on the elimination of bacteria and on the sludge density.
[24586]

73-5329

RINCKE, G. AND R. BORN. Der Einfluss einer votbehandlung auf die Rueckloesung organischer Stoffe bei der thermischen Schlammkonditionierung. [Influence of pretreatment on the release of organic substances in thermal sludge conditioning.] *Staedtehygiene*, 24(1):8-12, 1973.
The rapid technological development in the treatment of sewage sludge led a specialized group of the University of Darmstadt to survey the present situation. Studies have been conducted as to the reduction of the rate of released substances in the thermal conditioning process through pre-separation, digestion, or both. It was found that the specific additional load, based on a sludge quantity of 100 cu m per day for thermally conditioned fresh sludge was 20 g BOD per day, for thermally conditioned fresh sludge with previous separation it was 12 g BOD per day, for thermally conditioned digested sludge it was 10 g BOD per day, and for thermally conditioned digested sludge with previous separation it was 6 g BOD per day. Consequently a reduction of 70 percent through both separation and digestion may be achieved. However, the economical point of view depends on the local situation, available digestion tanks, sludge quality, and the final disposal of dewatered sludge. Investigation results showed that in the case of a digestion process followed by thermal conditioning treatment, the interpolation of a separating step is recommended. (Text in German)
[24587]

73-5330

SPEECE, R. E., R. S. ENGELBRECHT, AND D. R. AUKAMP. Cell replication and biomass in the activated sludge process. *Water Research*, 7(3):361-374, Mar. 1973.
This article is concerned with the increase in biomass and the replication of microorganisms in the activated sludge process. Because of the difficulties in enumerating cell numbers in a flocculent suspension, deoxyribonucleic acid (DNA) was chosen as an indicator of cell numbers in the activated sludge process. An increase in DNA was assumed to be indication of cell replication. Storage was a function of the loading rate to which the organisms were acclimated. Higher loading rates maintained the sludges in a more active state having shorter time lags before replication occurred. Increased frequency of feeding also resulted in less time before replication occurred. In the contact stabilization process, cell replication would be expected in the stabilization tank with only substrate storage taking place in the contact tank, due to the low loading rates used. Extensive data and graphs are included.
[24588]

73-5331

WALKER, C. W. Collection and disposal of ship's sewage. U. S. Patent 3,721,207 owned by the U.S. Secretary of the Navy. Issued Mar. 20, 1973.
This invention pertains to the collection and disposal of ship's sewage. It has been customary

for ships to simply flow their waste overboard, but concern over water pollution has necessitated the development of systems for collecting and storing shipboard wastes, in particular sewage. This invention provides a system for collecting ship's wastes by running the discharges by gravity through a floating pipe and discharging the discharges into a submerged sewage pumping plant or holding station from whence it is pumped into the nearest domestic collection manhole of the onshore sanitary sewer lines. The invention comprises a series of fiberglass pipes cast in styrofoam floats and connected by rubber connectors. The rubber connectors are in turn connected by flexible rubber hoses to ship outlets. The series of pipes is pitched towards the submerged pumping station so that the ship discharge will flow by gravity to the pumping station.
[24589]

73-5332

ZINTL, G. Auslaugeverhalten metallhaltiger Faellschlaemme. [Lixivation behaviour of metal-containing precipitation sludges.] *Erzmetall*, 26(2):60-65, 1973.
The quantity of wastes in the nonferrous metal industry is growing. The high metal purity required makes separation and refining processes necessary. Leaner ores have to be mined to maintain raw material supply, and this in turn increases the quantity of waste. Arsenic and lead are contained in most nonferrous metal ores as well as in metal ores. The pollution of ground water with these noxious elements can be prevented by turning them into compounds having a low residual solubility, thus preventing them from reaching the groundwater by leaching through dumps. In experiments conducted in laboratory apparatus this is achieved by precipitation from aqueous solution with lime in the presence of surplus iron ions. The residual solubility of precipitation sludge produced in the process was 1 mg per liter or lower. Of great economic interest is such processing for copper cementates containing 35 percent copper, up to 10 percent arsenic, and a small percentage of lead such as those obtained in lye purification in zinc electrolysis. In the process developed for this purpose, copper is transformed with high yield into the solution, while arsenic and lead are precipitated by lime into sludge. An experimental dump is being prepared to verify the laboratory results and to determine the permeability of a precipitation sludge dump. (Text in German)
[24590]

STREET CLEANING

73-5333

ADAMS, F. S. Highway salt: social and environmental concerns. *Highway Research Record*, (425):3-13, 1973.
This article argues against expanding the use of highway salt as the, presumably, most effective, safe, and cheap method of snow removal. The topics which are covered in detail follow: physical, chemical, and biological makeup of salt; the fate of salt in the environment; direct runoff of dissolved salt; splash and percolate; pickup and discard; the relationship between salt, safety, and economics; and recommendations. It is concluded that under many meteorological and environmental conditions chloride salts are effective agents for melting ice and snow, but to calculate the true costs and real benefits of an expanding salt-based technology requires that a great deal of vital research be conducted. In the meantime, increasing the use of salt for snow removal is questionable.
[24591]

73-5334

BAIN, J. R. Vacuum sweeping curbs street cleaning costs. *American City*, 88(5):100, 170, May 1973.
This article discusses the introduction of vacuum street sweeping to the city of Ottawa. A 3-year study of street sweeping costs shows that operational hours for sweeping the same number of curb miles dropped as much as 21 percent using vacuum sweeping. Maintenance and repair costs plunged 50 percent and on an overall average the vacuum sweeper was 25 percent more efficient than mechanical sweeping. Aside from saving money and reducing sweeping time, the vacuum sweeper cuts down on air pollution by controlling dust efficiently.
[24592]

73-5335

VISSER, S. A. The microflora of a snow depository in the city of Quebec. *Environmental Letters*, 4(4):267-272, 1973.
This article describes a study which establishes that the snow cleared from the roads of Quebec and dumped at various depositories in and around the city contains a microflora consisting mainly of short chain and single cell groupings. It is well adapted to the rigid conditions of its environment. The sampling sites, methods, results, and a discussion of the study are presented. The following tables are provided: growth temperatures of microorganisms isolated from snow; and microorganisms present in different types of snow.
[24593]

TRANSPORT

73-5336

CHOUDHURY, A. Solids pipelines--a reality. *General Engineer*, 84(5):122-124, May 1973.
This article discusses pipelines techniques. The major problems to be ironed out in this area are the successful transportation of liquefied petroleum gas and liquefied natural gas through this medium, and means of combating the effect of permafrost (Arctic ground conditions) on pipelines. The topics which are discussed in detail include: existing pipelines for gases and solids; existing and projected pipelines for solids; hydraulics; pumps; receiving terminal; economic factors (physiography, end use/product, quantity, and distance); other vehicles; and Marcona flow (a patented system of pipelines transportation).
[24594]

73-5337

Copper slurry pipeline. *Compressed Air Magazine*, 78(5):10-12, May 1973.
This article discusses the Bougainville Mine in New Guinea which holds the distinction of being the site of several outstanding accomplishments in the field of ore processing. It houses the largest known copper concentrator, which feeds one of the only two copper slurry pipelines in the world. This installation also uses vertical, positive-displacement pumps instead of the usual horizontal type for this kind of mineral service. The slurry is pushed through a 16-mile pipeline that snakes up and down mountainous terrain and ends at a new seaport facility, some 2,000 ft below the elevation of the mine. Annual production is expected to exceed 150,000 tons of copper concentrate and 500,000 ounces of gold, which exists in small quantities in the ore body.
[24595]

73-5338

Haulers say, 'Charge it' at Seattle transfer station. *Solid Wastes Management/Refuse Removal Journal*, 16(1):8, Jan. 1973.
Computers are being used in Seattle, Washington, to speed up refuse-disposal operations at two municipal transfer stations. Each IBM system controls traffic lights guiding collection vehicles onto truck scales, calculates the net weight of each load, and bills contractors through a credit card system. At peak periods, 3,700 vehicles and 1,500 tons of refuse are handled at both stations. Six years ago Seattle pioneered the automated transfer station concept of waste disposal. The new system should enable the city to keep abreast of the increased number of credit transactions with the area's rubbish contractors. Each transaction of the weighing operation now takes less than 10 seconds. As drivers enter the facilities, they insert their credit cards into readers which record the empty-truck weight and other identifying characteristics. Transaction details are flashed on a display board by the computer and a green light is flashed when the transaction is completed. The system should be helpful in keeping account of annual disposal costs and in analyzing future operatioal trends.
[24596]

73-5339

Hauling compacted wastes. Compactor Handbook, p. 33-34, [1973].
A substantial amount of commercial refuse is being compacted into 2-, 4-, and 6-yd containers and then hauled in front- or rear-loading trucks. The lack of systematic methods for pricing these jobs often leads to undercharging. The reason

for this is very often that a substantial amount of low-revenue producing compacted refuse is mixed with uncompacted trash. Household wastes containing quantities of liquid can be compacted with greater density than commercial refuse loaded with paper, corrugated, and similar trash. A schedule for hauling charges is presented. It is concluded that the only way to arrive at a proper price rating would be to divide the number of possible daily trips into the required revenue.
[24597]

73-5340

Helicopter lifts garbage from park. *Wildlife Review*, 6(7):7, Spring 1973.
In Kokanee Glacier Park a helicopter is now used to haul rubbish from inside the park to the road's end. The refuse is gathered in bags and piled at the landing sites. Using cargo nets, the flying machine then picks up the bags and transports them in 800-lb lots to waiting trucks. Some campers bury their tin cans, paper, foil, and packaging, but the danger here is that the subsoil in high areas is so shallow that it is impossible to properly dispose of waste materials. Bears and other animals usually dig up camp rubbish almost as soon as the hiker has departed. Park workers find that people hiking in the back country leave tons of garbage behind them. This is the real problem.
[24598]

73-5341

Hydrogen atoms called key to pumping liquid coal. *Machine Design*, 45(12):10, May 17, 1973.
Researchers at West Virginia University are studying the possibility of pumping coal out of the ground as a slurry in order to recover coal which is now too thin to deep mine and too deep to strip mine. The biggest obstacle to pumping coal is finding an economical way of converting it into a liquid or slurry while it is still underground. Other problems are: choosing the coal, because every seam is different and reacts differently to liquefaction; and choosing the solvent. The solvent would have to be recycled for economic reasons. Laboratory tests have shown that swelling occurs when sub-bituminous coal is liquefied and it is accompanied by a transfer of hydrogen atoms from the solvent to the coal. The reaction weakens the structure of the coal and causes it to form fragments. The slurry containing the fragments, however, can be pumped much like a liquid.
[24599]

73-5342

Kanto Area Urban Waste Transportation System Investigation Committee, Ministry of Construction. [Examination.] *In* [Report on the investigation of an urban waste transportation system.] 1st ed. Tokyo, Japan, Ministry of Construction, Kanto Region Construction Bureau, July 1972. p. 79-329.
Chapter II of the report on a comprehensive study of urban waste transportation system discusses the direction, object, and method of examination, the structure of a waste treatment system (the purpose of a waste treatment system, components of the system, the hardware comprising the system), designing of a system, and case studies. As case studies, the 23 districts of Metropolitan Tokyo and Chiba New Town were selected and model systems were designed. The system flow chart shows: the purpose of case studies; the selection of areas; grasping of local characteristics; formation of procedural steps; examinations of each step; evaluation of each step; organization of the results; and proposal (chapter III). The six steps of redeveloping a waste treatment system in Tokyo involve the first 5 years for the first two steps, 1975 to 1983 for steps 3 and 4, and 1983 to 2002 for steps 5 and 6. In the first steps, the total incineration of all combustibles will not be attained; only by the 3rd and 4th steps will the total combustibles be burned; by the 5th and 6th steps, all the reusable waste will be recycled. From the standpoint of transportation, an additional circular expressway will be constructed by 1975; by 1983, there will be pollutionless cars; and between 1983 and 2002, a new traffic system and network will be completed; a deeper subway system and the use of underground passages will alleviate the waste transportation problems. (Text in Japanese) (This document is retained in the SWIRS library.)
[24600]

73-5343

Kanto Area Urban Waste Transportation System Investigation Committee, Ministry of Construction. [Introduction.] *In* [Report on the investigation of an urban waste transportation system.] 1st ed. Tokyo, Japan, Ministry of Construction, Kanto Region Construction Bureau, July 1972. p. 1-75.

The introduction to this report on a comprehensive study of an urban waste transportation system discusses the definition of waste material, classification, historical transition of waste treatment, civilization and waste, waste in the urban environment, the problem of waste on the national scale, local characteristics of waste, waste in the Tokyo metropolitan area, the policy and the role of the government in waste treatment, the role of local governments, the state and the role of private sanitation industries, the state of industries producing waste, the direction of waste treatment in the future, and the direction of reuse and recycling of waste material in the future. (Text in Japanese) (This document is retained in the SWIRS library.)
[24601]

73-5344

Kanto Area Urban Waste Transportation System Investigation Committee, Ministry of Construction. [Investigation methodology.] *In* [Report on the investigation of an urban waste transportation system.] 1st ed. Tokyo, Japan, Ministry of Construction, Kanto Region Construction Bureau, July 1972. p. 353-413.

Chapter IV of the report on a comprehensive study of urban waste transportation analyses existing studies of similar nature, general methods for waste treatment problems, and the future methods for waste problem investigations in Tokyo. In planning an investigation of the state of waste production, the clarification of the purpose, collection of sampling, examination of investigative methods, preliminary examination, application and investigation, and analyses and evaluation of results must be followed. Among various investigative methods, the waste material production projection method material flow investigation, the mesh method, and the questionnaire method of citizen attitudes are analyzed. (Text in Japanese) (This document is retained in the SWIRS library.)
[24602]

73-5345

Kanto Area Urban Waste Transportation System Investigation Committee, Ministry of Construction. [Proposal.] *In* [Report on the investigation of an urban waste transportation system.] 1st ed. Tokyo, Japan, Ministry of Construction, Kanto Region Construction Bureau, July 1972. p. 333-349.

Chapter III of the report on a comprehensive study of urban waste transportation discusses the proposal made by the committee as a result of their examination of the present situation and case studies. The basic proposal is urban redevelopment, in which specific suggestions are made for securing public land for waste collection and storage, redesigning of buildings for easy collection and sanitary waste storage, relaying points and their effective use, construction and redevelopment of connecting roads, automation of transportation, the use of railroad transportation, securing of treatment terminals, and the use of treatment terminal (landfill) as playgrounds, botanical gardens, zoos, farms, golf links, swimming pools, skating rinks, and public cemeteries. In addition, methods of reducing the amount of waste by reducing the total production or changing the quality of throwaway material and development of recycling methods are briefly mentioned. (Text in Japanese) (This document is retained in the SWIRS library.)
[24603]

73-5346

Kanto Area Urban Waste Transportation System Investigation Committee, Ministry of Construction. [Report on the investigation of an urban waste transportation system.] 1st ed. Tokyo, Japan, Ministry of Construction, Kanto Region Construction Bureau, July 1972. 80 p.

In this abridged version of the report on the investigation of an urban waste transportation system, the following topics are dicsussed: what is waste?; waste in human life; problems of waste; sociological attitude toward waste disposal problems; the future of waste; the

structure of a waste treatment system; designing of a waste disposal system; case studies; a proposal for the reformation of the nation and its regions; urban redevelopment as a preparation for the realization of a waste treatment system; an evaluation of existing investigation methods; and the future trend for the investigation of conditions in Tokyo. Toward the systematization of waste disposal and urban redevelopment, the following proposals are made: securing of public land for waste treatment and disposal; improvements on city buildings and structures; efficient collection methods and designing of structures with space for collection vehicles; the use of relaying points; redevelopment of connecting roads; automation of transportation; the use of railroads; and the use of disposal areas (landfill or burial) for functional and attractive community activities. (Text in Japanese) (This document is retained in the SWIRS library.)
[24604]

73-5347

SCHULTZ, G. A. Guidelines for selecting solid waste handling conveyors. *Pollution Engineering*, 5(4):45-46, Apr. 1, 1973.
The units summarized in this article are those most commonly used for the handling of solid waste materials. Guidelines for the selection of this equipment include: the type and volume of solid waste; the amount of accumulation required; the plant arrangement and size; and the final method of disposal selected (compaction, incineration, and/or product recovery). A system can be broken down into collection and process; and the collection segment can be subdivided into containerized and conveyorized methods. The topics discussed include: why and when to use conveyors; how to identify wastes; and an analysis of the conveying job. The following conveying equipment is described: belt; hinged metal belt; vibrating; drag chain; screw; and pneumatic conveyors.
[24605]

73-5348

VOCADLO, J. J., AND M. S. SAGOO. Slurry flow in pipes and pumps. *Journal of Engineering for Industry*, 95(B 1):65-71, Feb. 1973.
In this article a new approach to slurry flow both in laminar and turbulent regimes is outlined. It emphasizes an approach for turbulent slurry flow without deposits which does not rely on subdivisions of slurries into arbitrary groups and which is based on identifiable mechanisms of energy loss. The following aspects of slurry systems and pumps are discussed: technology of hydraulic transport; laminar flow of slurries; turbulent flow of slurries; the pressure gradient for the flow of the carrier liquid; the total pressure gradient; critical velocity; the wide range of particle size distribution; and slurry pipeline systems (gravity feed systems, solid handling pump systems, and clear liquid pump systems).
[24606]

73-5349

WILSON, G. The design aspects of centrifugal pumps for abrasive slurries. *The Canadian Mining and Metallurgical (CIM) Bulletin*, 66(733):91-102, May 1973.
This paper is concerned with the design and construction of centrifugal pumps for handling abrasive solids. It also outlined the wear phenomena due to slurry being pumped and the materials used to combat abrasive wear. The hydraulic design of the impeller and casing and their relationship to wear and the hydraulic radial and axial unbalance are also discussed. The prediction of abrasive wear in pumps cannot be precise because many factors are involved, but the researchers are working on this problem. Diagrams, equations, and data are included.
[24607]

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R, C. Waste disposal system. U.S.
3,705,851. Issued Dec. 12, 1972.
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