Air Pollution Aspects of Emission Sources:

CEMENT MANUFACTURING

A Bibliography with Abstracts

U. S. ENVIRONMENTAL PROTECTION AGENCY

AIR POLLUTION ASPECTS OF EMISSION SOURCES: CEMENT MANUFACTURING— A BIBLIOGRAPHY WITH ABSTRACTS

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AIR POLLUTION ASPECTS OF EMISSION SOURCES: CEMENT MANUFACTURING— A BIBLIOGRAPHY WITH ABSTRACTS

INTRODUCTION

Cement manufacturing contributes significantly to the overall air pollution level in the United States. To aid efforts to improve air quality, the Air Pollution Technical Information Center (APTIC) of the Office of Technical Information and Publications, Office of Air Programs has compiled this bibliography relevant to the problem and its solution.

Approximately 130 abstracts have been selectively screened from the contents of APTIC's information storage and retrieval system to cover the 14 categories set forth in the table of contents. The compilation is intended to be representative of available literature, and no claim is made to all-inclusiveness.

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All documents abstracted herein are currently on file at the Air Pollution Technical Information Center, Office of Air Programs, Environmental Protection Agency, P. O. Box 12055, Research Triangle Park, North Carolina 27709. Readers outside the Environmental Protection Agency may seek duplicates of documents directly from libraries, publishers, or authors.

A. EMISSION SOURCES

040261

Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control. Jan. 1967. 21 pp.

SURVEY OF AIR POLLUTION SOURCES IN SIXTY-NINE STANDARD METROPOLITAN STATISTICAL AREAS WITH EMPHASIS ON SULFUR DIOXIDE EMISSIONS .

This survey presents estimates of a number of parameters that contribute to an area's air pollution problems. The Standard Metropolitan Statistical Area (SMSA) was selected as the unit of study. The parameters presented here are consumption of fuels, sales of gasoline, and production of steel, petroleum, and cement. The method used to estimate the various parameters is an abbreviated form of the Ozolins-Smith technique. Further investigation is planned with a view toward reliably predicting sulfur pollution problems from emission estimates based on community parameters.

09541

Sprung, S., and H. M. V. Seebach

FLUORINE BALANCE AND FLUORINE EMISSION FROM CEMENT KILNS. ((Flu- orhaushalt und Fluoremission von Zementofen.)) Text in German. Zement-Kalk-Gips (Wiesbaden), 21(1):18, Jan. 1968. 20 refs

In the burning of Portland cement clinker, fluorine is partly driven out of the raw materials and fuel. To determine whether gaseous fluorine is emitted along with the other kiln gases, complete fluorine determinations were performed for 11 cement kilns of varying design. No gaseous fluorides could be detected in the cleaned gas from these kilns; the significance of electrofilters in the removal of solid fluorides is discussed. In conclusion, cement kilns cannot emit gaseous fluorides because, in the presence of an excess of CaO, they produce CaF2. The negligible level of fluorides in the dust from the cleaned gas (0.009-1.420 mg. F/Nm to 3rd power) is thus not dependent upon the magnitude of the fluorine balance, but upon the efficiency of the electrostatic precipitators. The amount of fluorine combined in the clinker ranges from 88-98 percent of the total fluorine intake, and this percentage increases with a decrease in dust load of the emitted gas. Fluorine appears as CaF2 in clinker and kiln dust and, as such, is harmless since CaF2 is relatively insoluble in water.

10667

Feldstein, M. L., B. Potter, A. E. Alcocer, and H. Moore

THE COLLECTION AND ANALYSIS OF INORGANIC DUST DOWNWIND OF SOURCE EFFLUENTS. Preprint, Bay Area Air Pollution Control District, San Francisco, Calif. and California Dept. of Public Health, Berkeley, Air and Industrial Hygiene Lab., 7p., 1968. 6 refs. (Presented at the 61st Annual Meeting of the Air Pollution Control Association, St. Paul, Minn., June 23-27, 1968, Paper 68-11.)

Dust collected downwind from two types of industrial operations is analyzed. One is concerned with the emission of cement dust from a materials handling operation within a cement manufacturing plant; and the other deals with the emission of mica dust in an asphalt saturating operation. The method of sampling used to collect dust was the same in both cases. The basic collecting apparatus consisted of high volume samplers, operated by directional control unit. Each directional control unit activated a sampler when the wind blew from a predetermined direction. One sampling set was placed downwind of the source and a second placed upwind. Both were oriented in the same direction, being activated by the same wind sweeping across the source. Comparative samples were thus provided for evaluation of the source as a cause for nuisance complaints. After the sampling period was completed the filters were removed and the collected materials were chemically processed and analyzed by X-ray spectrometry, and by microscopic examination. Authentic samples of cement dust and mica dust from the industrial sources were also obtained and submitted for comparison and analysis. Results of the analysis show that mica dust was present in the asphalt case to the extent of 15-20% of the total inorganic dust collected. Cement dust was present in the cement manufacturing case to the extent of 10-15% of the total inorganic dust collected. Upwind samples contained little or none of the respective minerals. It is reasonable to conclude that the collected mineral in each was contributed by the suspected source.

15637

Muhlrad, M. Wolf

CEMENT PLANTS AND ATMOSPHERIC POLLUTION. PROBLEMS OF DUST REMOVAL. (Les cimenteries et la pollution atmospherique. Les problemes de depoussierage). Text in French. Equipement Mecan., 48(87):91-95, 1969.

Cement plants have the most formidable dust removal problems among industrial dust and smoke emission sources. The centrifugal, the wet, the electrostatic, and the screen filtering, methods of dust separation are described in detail; dust sources and the dust collecting equipment used in the individual successive stages of cement production are considered. Quarrying limestone in open air gives rise to moderate quantities of dust, which are sometimes sprayed with water. Pounding and crushing limestone calls for the use of multitubular centrifuges followed, if need be, by screen filters. Wet crushing produces no dust, while dry or semi-dry crusing requires high-capacity, fine-mesh, movable screen filters. Electrostatic filters are occasionally used instead. Homogenizing requires limited dust removal. Drying and crushing of coal pose difficult dust removal problems due to the danger of coal-dust explosions. Smoke from roasting kilns is the primary source of dust. Particle size distributions and concentrations of dusts from six kinds of roasting kilns are given in a Table. Most modern kilns are provided with electrostatic filters. Clinker cooling uses dust centrifuges. Clinker crushing sometimes uses electrostatic filters but, more commonly, bag filters with movable screens. Automatic cement bagging machines usually have movable screen filters made of nylon. At present, no satisfactory solution of the problem of dust removal in cement plants exists, so that the establishment of new cement plants should still be based on considerations of dispersal of dust emissions in the atmosphere.

16229

Friese, Guenther

THE ROHRBACH-LURGI PROCESS FOR THE GENERATION OF STEAM AND ELECTRICITY AND THE MANUFACTURE OF HYDRAULIC CEMENT FROM OIL SHALE. (Das Rohrbach-Lurgi-Verfahren zur Gewinnung von Dampf, Strom und hydraulischen Bindemitteln aus Oelschiefer). Erdoel Kohle (Hamburg), 14(9):702-703, Sept. 1961. Translated from German. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 6p., Sept. 18, 1969.

In the Rohrbach-Lurgi process, high strength hydraulic cements are produced by combustion of oil shale in fluidized-bed furnaces. The electricity required for the project is generated by the waste heat; unlike familiar low temperature processes, no oil or gas is obtained. The raw material is kept in suspension by an air stream that enters the furnace at the bottom. The turbulent movement in the suspended layer has a surface similar to a boiling fluid, making it extremely favorable for combustion and heat exchange. The good heat exchange makes it feasible to maintain a constant temperature at all points in the fluidized bed. The optimum temperature for the oil shale particles is soon reached. It is important to determine both optimum temperature and optimum residence time, since the binding property and hydraulic strength of the cement depends to a large extent on these factors. Other equipment required for the process include a waste heat boiler, gas cleaning plant, turbine, sifting, shredding, and grounding facilities, conveyance system, and measurement and control units. The use of modern control units permits fully automized operations, enabling even large plants to be run with only two or three workers.

19177

Tripler, Arch B. Jr. and G. Ray Smithson, Jr.

A REVIEW OF AIR POLLUTION PROBLEMS AND CONTROL IN THE CERAMIC INDUSTRIES. Preprint, American Ceramic Society, Columbus, Ohio, 25p., May 5, 1970. 19 refs. (Presented at the American Ceramic Society Annual Meeting, 72nd, Philadelphia, Pa., May 5, 1970.)

Air pollution in the ceramic industry stems from the large amounts of dust and fumes which form at various processing stages. Five segments of the industry (glass, cement, mineral wool, asbestos, and brick) are considered. Prior to the analysis of the problems of each of these, eight basic control methods are listed along with comment on the application and approximate cost of each. The control methods listed are cyclones, scrubbers, fabric filters, electrostatic precipitators, adsorption, burning, stacks, and process modification. In the manufacture of glass three chief sources of air contaminants are batch drying of finely divided raw material prior to melting, gas or oil fired melting furnaces, and glass forming. The first of these presents only a dust problem. The furnaces, on the other hand, emit particulates and a gas combination representing both fuel products and the melt composition. Glass forming machines generate heavy smoke from vaporization of hydrocarbon lubricants. Both process modification and electrostatic precipitation are recommended. In the cement industry, dust is the major problem; dust reclamation is an an economic necessity. In spite of highly efficient collection, some of the dust escapes. Dustfall rates of 35 tons per square mile were recorded in areas adjacent to efficiently controlled kilns. A secondary problem is the effluent from the kilns which contain gaseous pollutants from the fuel and from the heating of the components. In the mineral wood industry, stack emissions containing condensed fumes from the molten material, sulfur dioxide, and fluorides as well as blow chamber and curing oven emissions consisting of fumes, oil vapors, binding agent materials, and up to 90% wool fibers must be contended with. The asbestos industry is faced with the twin threats of asbestosis and lung cancer as a result of asbestos dust in which a fiber thickness of 0.01 micron is fairly common. The current threshold limit value of 5 million particles per cu ft of air for a daily 8-hr exposure, 40 hrs per week is thought by some to be too high. The importance of controlling dust in the manufacture of silica brick was pinpointed in a Pennsylvania Dept. of Health report in 1939 revealing that 51.9% of 1035 workers examined had silicosis. The threshold limit value of airborne dust as set by the American Conference of Governmental Industrial Hygienists is a function of the silica content. In a dust containing 5% free SiO2, the TLV is 25 mppcf, but in a dust containing 45% free SiO2, the TLV is only 5 mppcf. For amorphous silica, the TLV is 20 mppcf.

21221

Fels, M. and H. L. Crawford

FEASIBILITY STUDY OF CENTRALIZED AIR-POLLUTION ABATEMENT. (FINAL REPORT). Battelle Memorial Inst., Columbus, Ohio, Columbus Labs. NAPCA Contract PH-86-68-84, TAsk 12, 51p., Nov. 17, 1969. 35 refs. CFSTI: PB 190486

The technical and economic aspects of a centralized air-pollution control plant located a distance from seven industrial plants were investigated. The plants chosen were as follows: lime, 200 tons/day; cement, 4500 barrels/day; sulfuric acid, 400 ton/day; power, 25 Mw; fertilizer, 570 tons/day; gray iron, 1440 tons/day; and electric arc, 2600 tons/day. Gaseous and particulate-emission levels were taken from literature sources, and as far as possible, average values were used for each industry. The total amount of gases from the plants was 627,000 cfm at 320 F and after mixing. While the centralized control facility is less expensive to build and operate than individual control devices, transportation costs are so high as to make the centralized concept unattractive. The economics would favor centralized abatement only if each of the seven plants were located at about 1/2 mile from the central facility. This distance is considered to be unrealistically close from the standpoint of an individual plant's land requirements. In addition to transportation costs, the centralized plant would render emissions from lime, cement, and sulfuric acid plants valueless, and any equipment malfunction would release large quantities of pollutants over a relatively small area. Finally, vegetation growth over buried pipes would be inhibited, leading to potential esthetic problems. (Author summary modified)

21627

VDZ (Verein Deutscher Zementwerke), Emissionsausschuss

RESTRICTION OF EMISSION PORTLAND-CEMENT WORKS. (Auswurfbegrenzung Zementwerke). VDI (Ver. Deut. Ingr.) Richtlinien, no. 2094, Feb. 1967. 15 refs. Translated from German by D. Ben Yaakov, Israel Program for Scientific Translations, Jerusalem, 26p. CFSTI: TT 68-50469/12

The various sections of a cement plant yield dusts of widely differing composition, including raw-material dust, flue-gas dust from the kilns, clinker dust, coal dust, and cement dust; each of these requires a specific separation process. The production processes and equipment that emit dust in cement works as well as the technically most effective means of removal and the operating conditions that affect the dust content of the flue gases are described for kiln and drier systems, crushers, grinding and drying mills, clinker coolers, and other equipment. Factors affecting collecting efficiency for centrifugal collectors, fabric filters, and electrostatic precipitators are outlined; aggregate-layer filters can also be used. A limit of

150 mg/cu m STP for particulate emissions is established for undisturbed and continuous operation of a new plant after a starting period. The emission of noxious gases is inherently very low in cement works and can be effectively dispersed from stacks.

B. CONTROL METHODS

02024

W. Kohler

(METHODS FOR THE ABATEMENT OF AIR POLLUTION CAUSED BY CEMENT PLANTS.) Verfahren Zur Verminderung Der Durch Die Zementindustrien Verursachten Luftverunreinigungen. Proc. (Part I) Intern. Clean Air Cong., London, 1966. Paper Iv/12). pp. 114-6.

With the increasing cement consumption the production plants of the cement industries are on the whole fully employed. To some extent they were enlarged by new plants in order to satisfy the demand for cement. According to temperature, contents and components of dust, the quantities of air or gases escaping from the production plants are dedusted by various dust extraction plants, e.g. centrifugal dust-extractors, fabric filters, gravel-bed filters, electric dust extractors, so that a vast reduction of the dust emissions will be reached. To produce one ton of cement some 2.8 tons of raw materials, gypsum, clinker, and coal of rough or fine quality must be crushed to powder. During the various stages of production the fine crushed material always mixes with cold air or hot gases, and this necessitates a further separation. The removal of the fairly considerable dust contents of raw gases and the observance of the required limits of emissions not only are diccicult technical task butr also cause considerable financial costs by capital expenditure for new plants, their management and maintenance. (Author abstract)

02028

M. Tomaides

DUST COLLECTION IN THE CEMENT INDUSTRY. Proc. (Part I) Intern. Clean Air Cong., London, 1966. (Paper V/4). pp. 125-8.

The paper describes briefly the main sources of dust nuisance in Czechoslovak cement works and specifies the usual, as well as the recommended means of dust collection in this industry. Attention is mainly devoted to the description of Czechoslovak separating equipment, i.e. cyclone separators, wet type separators, electrostatic precipitators and cloth filters, all of which are used for dedusting cement factories. Readers are further acquainted with the newly introduced unit ventilating set and the mobile industrial dust exhauster. (Author abstract)

02031

R. L. Chamberlin and G. Moodie

WHAT PRICE INDUSTRIAL GAS CLEANING.? Proc. (Part I) INTERN. CLEAN AIR CONG., LONDON. 1966. (PAPER V/7). PP. 133-5.

This paper gibes a brief description of four standard industrial gas-cleaning tools, electrostatic precipitator, mechanical collector, high-energy scrubber and cloth filter. The application of these collectors to air pollution problems of the power, cement and steel industries is expalined. Finally, capital, utility, maintenance and amortization cost of specific gas-cleaning plants for these industries are given. These cost studies point out approximate cost of solving these specific problems and empahsize the need to go beyond capital costs in choosing gas cleaning equipment. (Author asbaract)

02229

P.W. Spaite, D.G. Stephen, A.H. Rose, Jr.

HIGH TEMPERATURE FABRIC FILTRATION OF INDUSTRIAL GASES. J. Air Pollution Control Assoc. 11, 243-7 & 58, May 1961. (Presented at the 53rd Annual Meeting, Air Pollution Control Association, Cincinnati, Ohio, May 22-26, 1960.)

The field of industrial filtration over 300 F is assessed in a general way. High temperature media other than fiber glass are not discussed. Thermal effects on equipment, media, chemical attack and power requirements are covered. Applications to gray iron cupolas, nonferrous fumes, perlite processing, carbon black production, cement kilns, and electric arc steel furnaces are reviewed. Potential applications and research are discussed.

02735

R. E. Doherty

CURRENT STATUS AND FUTURE PROSPECTS-CEMENT MILL AIR POLLUTION CONTROL. Proc. Natl. Conf. Air Pollution 3rd, Washington, D.C. 1966. pp. 242-9.

Author discusses the efficiencies of control equipment/methods in the cement industry, particularly in the Lehigh Valley of Pennsylvania. Dust separating equipment the fiberglass baghouse filter, electrostatic precipitation, and cyclones are presented as partial answers to the control of dusts. Author suggests that a 98% efficiency is not enough for a control device and suggests tandem dust separating units such as mechanical cyclones preceding the electrostatic precipitators.

02939

K. Oleksynowa

CHEMICAL CHARACTERISTICS OF WASTE CEMENT DUSTS AND THEIR VALUE FOR AGRICULTURE . (Charakterystyka chemiczna cementowych pytow odlotowych i ich wartosc dla rolnictwa.) Cement, Wapno, Gips 11/20, (3)62-4, 1955. CFSTI: 60-21233

Waste dust from cement works was analyzed. The material was obtained on electrofilters when purifying waste gas from clinker kilns in one of the larger Polish cement plants. This material, a waste product in cement burning, has long been an object of interest on account of its high potassium oxide content. The raw material introduced into cement kilns contains barely 0.2 to 1.2% K20. In the course of burning the cement, a large part of the finest fraction is carried off by air current, and the aluminum silicates contained in the crude clay substance undergo thermal decomposition. At high temperatures, the liberated K20 sublimates, combine with anions freed during thermal decomposition of the raw material. In this way, potassium chlorides, fluorides and silicates of various composition are formed. The dust analyzed in the present work contained fairly large quantities of carbonates, so that it was a typical blend of dust. From the analysis it was established: (1) Some 72% of the substance including total K is soluble in water and 2% citric acid, as is the major part of the Ca and half the SiO2; (2) K, Na and Ca pass into water solution in the form of sulfates, chlorides and carbonates; (3) Ca, Fe and K cations pass into citric acid solution together with silicate, carbonate and sulfate anions; and (4) that cement dust can be used as a fertilizer. It primarily contains compounds soluble in water and 2% citric acid, especially K and Ca.

03126

Kohler, A.

METHODS FOR REDUCING POLLUTION CAUSED BY SPECIFIC INDUSTRIES. (CHAPTER III. CEMENT WORKS). European Conf. on Air Pollution, Strasbourg, 1964. p. 283-311.

The main reason for emissions of cement works is that, in order to produce 1 ton of cement, it is necessary to reduce to dust some 2.8 tons of coarse material. Throughout this process, the finely ground product repeatedly comes into close contact with cold or hot gases, from which it must be separated by means of appropriate devices. The light-grey dust produced by cement works, being very visible, makes a direct impression on the public. However, it must be said that emissions of dust from cement works are not a dangerous source of pollution and are not harmful to health. Reports show that in the past ten years, the cement industry has successfully dealth with the problem of the extraction of dust from waste air and burnt gases. For some years now new plants have been equipped with the most up-to-date and efficient dust extractors. The present trend is for older plants already in use to achieve the same efficiency in dust extraction.

03754

G. L. Allen, F. H. Viets, and L. C. McCabe

CONTROL OF METALLURGICAL AND MINERAL DUSTS AND FUMES IN LOS ANGELES COUNTY, CALIF. Bureau of Mines, Washington, D.C. (Information Circular 7627.) Apr. 1952. 85 pp.

The nonferrous pyrometallurgical industry of Los Angeles has three unusual characteristics that contribute to its difficulties in developing suitable fume control: (1) It consists of a multiplicity of relatively small establishments subject to wide variations in products and operating schedules; (2) operations are largely of the secondary or reclaiming nature; and (3) much of the industry is concentrated near the center of a city. A difficulty inherent in most nonferrous foundries is the high volatility of zinc and the extremely small mean particle size of the resulting zinc oxide fume. The nonferrous industry has found only one type of equipment that could be depended upon to adequately remove particulate matter emitted by the larger furnaces in which the gases are characterized by heavy dust loadings at high temperatures. This is a specially equipped baghouse, and its first cost is rather high. For smaller furnaces, particularly of the crucible type, the conventional sock-type baghouse has proved satisfactory. The inert slag cover, which reduces emission at the source, has proved fairly effective and economical, particularly with the crucible-type furnace and pouring ladle, but is successful use depends on the skill of the operators. The gray-iron-foundry branch of the ferrous industries has not fared as well as the nonferrous branch, despite extensive investigation and development of equipment for control of cupola emissions. Appreciable progress has been made in adapting equipment suitable technically and cost-wise for cupola-exit gases, and development continues. Equipment capable of producing the required clearances is available but is not within the financial ability of many small foundries. The baghouse equipped with specially woven glass-fabric bags, as used commercially in the nonferrous industry, has technically been the most successful single device to date for controlling cupola emissions and has been proven in pilot operations. After extensive investigation, electrical precipitation has been adopted for cold-metal open-hearth work, and hydrodynamic scrubbers and baghouses have been adopted for electric-steel-furnace fumes. In addition to the fact that such equipment removes the necessary dust, capital and operating costs were important factors in their selection.

05441

M. Hankin, Jr.

IS DUST THE STONE INDUSTRY'S NEXT MAJOR PROBLEM? Rock Prod., 70(4):80-4, 110, Apr. 1967.

The special problems of the stone producers include: airborne dust from unpaved plant roads; dust from wind action on fine material stockpiles; and dust from crushing, screening, conveying, and stockpiling of crushed stone. The control of the dust emissions involves more of an investment htan technical problems. For dusty plant roads, calcium chloride, used motor oil, fuel oil, or dust oil will control the road dust at costs from 10 to 15 cents per square yard per year. Wetting agents and fine water sprays are stated to be the simplest, least expensive means of controlling dust at crushing and screening operations. The various dust collecting systems are reviewed with pictures of commercial collectors.

05472

CONTROL AT SANTEE CEMENT. Southern Eng. 50-1, Mar. 1968.

Dust control is a major concern in the design, construction and operation of a cement plant, especially at such critical processes as: kiln operation, clinker handling, milling, grinding, conveying, and storage. At a plant with a capacity of 5800 bbl/day, kiln dust is collected by a bank of 8 cyclones designed to handle 185,000 cfm of kiln dust at 500 degrees F. The collected dust is returned to the kiln by insufflation or withdrawn through a rotary valve for disposal. The kiln discharge is cooled in an air-quenching clinker cooler from 2500 degrees F to 150 degrees F with the dust collected in a Dracco CC collected and returned to a drag vonceyor. Dust collection for the finish mill is provided by an 18,000 crm Dracco three-compartment Mark II collector. The dust collectors at the silos handle 5800 cfm; the packer dust collectors each handle 9000 cfm, and the bulk truck collector handles 2500 cfm. The rail bulk loading is vented by a fan and returned to the storage silo. The importance of environmental engineering is evidenced by the use of dust control equipment at the critical processing points.

05511

E. W. Schroder

DUST COLLECTION PRACTICE IN THE CEMENT INDUSTRY. Proc. Clean 11p.

The eight main sources of dust in a cement plant are briefly described and the equipment available for its suppression, namely, wet collectors, centrifugal types, electrofilters, bag-type collectors and dust collectors integral with certain kilns. A dust collection cost analysis, based on recent Australian figures, is given for a 1000 horsepower cement mill and a kiln producing 200,000 tons per year. Running costs and capital charges for the mill installation would total 3,500 Pounds per year, while for the kiln the figures would be about 29,000 Pounds per year, or 2.9 shillings per ton of cement produced.

The latter figure could be greatly offset in certain favourable circumstances, but might also be much higher, particularly in the case of plant retained for part time operation. Clean air legislation, based on broad consideration of the whole industry, therefore could fall very unevenly on different works, with marked financial effects. (Author abstract)

07783

G. Funke and H. Fischer

(RESULTS OF DUST MEASUREMENTS ON CEMENT KILNS.) Ergebnisse von Staubmessungen an Zementofen. Zement-Kalk-Gips (Wiesbaden) 20, (4) 146-51, Apr. 1967. Ger.

In 1966, the Research Institute of the Cement Industry in Germany performed 270 measurements at dust collection installations in 37 cement plants. The results, pertaining for the most part to electrofilter installations, are summarized in 6 tables. The individual measurement conditions are reported. The measured values provide a survey of the present position of dust collection technique for cement kilns. The limiting values at present specified for the dust content of the cleaned gas are indeed usually conformed to if the dust collection plant is correctly designed, but at the present stage of technical development troubles still often occurr which impair the collection efficiency. Conditioning of kiln exit gases by water spraying, especially in the case of rotary kilns with suspension preheaters in direct operation, continues to present difficulties. The prevention of the infiltration of 'false' air and constantly applied proper maintenance contribute much to ensuring that the dust collectors maintain the required collection efficiency under continuous working conditions.

07492

Yamashita, K.

TEST PARTICLES (DUST) OF JIS. Text in Japanese. Kuki Seijo (Clean Air J. Japan Air Cleaning Assoc., Tokyo), 2(3):59-63, 1965. 2 refs.

The methods for determination of chemical composition, specific gravity, and particle size distribution of dust are covered. The sampling method is standardized by JIS M 8501 as a 'coning' and 'quartering' methods; this method is required for processing coarse dust. For determining chemical composition, the 'firebrick' method and 'cement physical analysis' methods are used. A pycnometer and stopper and a chemical balance having a sensitivity to 0.001 g are standardized for the specific gravity determination. With the exception of talc and portland cement, the particle size distribution of all of the test dusts is determined by standard sieve. The Andreasen pipet (50-mm diam., 200-mm distance between top of pipet and surface of liquid, capable of drawing in 100 cu. m. at one time) is used to determine particle size distribution of medium or fine silica, portland cement, and medium and fine loam. Procedures for measurement are outlined. Equivalent methods can be used for talc and fly ash.

07535

W. Leithe

CLEAN AIR MAINTENANCE - AN IMPORTANT TASK FOR CHEMISTRY AND ECONOMY. (Reinhaltung der Luft ein dringendes Anliegen fur Chemie und Wirtschaft.) Text in German. Allgem. Prakt. Chem. (Vienna), 18(8):239-241, Sept. 10-17, 1967. 4 refs.

This article is a summary of two lectures given at meetings of chemical societies. The problem of air pollution and some control methods are outlined. Typical examples of well-known air pollution problems are mentioned: London's smog chiefly caused by domestic heating, the smog of Los Angeles due to automobiles, the sun, and temperature inversions, and the industrial air pollution of the Ruhr Valley. Some characteristic data for all three examples are quoted. The techniques for the control of dust emissions are farthest advanced. This is verified by the fact that in Germany, emission of cement dusts decreased to one third while the production of cement tripled in the last 17 years. Far less satisfactory is the control of SO2 emissions. About twice as much sulfur is blown into the air than is used for the production of sulfuric acid. Some wet and dry processes for the elimination of SO2 from smoke are mentioned, but no method is known today which is both effective and economical. The chemical industry tackled its problems mostly by reducing the emission of air polluting substances by increasing the efficiencies of the relevant chemical processes. Examples are the production of sulfuric acid and nitric acid. Organic compounds can be recovered by either absorption on activated charcoal or oxidation by catalytic afterburners.

07562

O'Mara, Richard F. and Carl R. Flodin

FILTERS AND FILTER MEDIA FOR THE CEMENT INDUSTRY. J. Air Pollution Control Assoc., 9(2):96-97, 100-101, Aug. 1959. 6 refs. (Presented at the 51st Annual Meeting, Air Pollution Control Assoc., Philadelphia, Pa., May 25-29, 1958.)

The oldest and most common filter design are stockings or tubes - either circular or oval type individual bags. The most common fabric employed as a filter medium has been cotton. In recent years a number of synthetic fibers have become available such as Dacron, Dynel, Nylon, and Orlon. Rayon and Teflon are available as filter cloth. The most commonly used weaves are chain, twill, and satin. The approximate comparative costs of various filter media are given. The removal of the dust from the separator can be done by automatic shakers that give either vertical or lateral motion to the bags. Most types of filters are arranged so that the gas flow can be shut off and some gas allowed to flow back through the bag to assist in cleaning. Some filters are provided with dual dampers so that when a compartment is shut off for cleaning it is opened to atmosphere and the fan pulls atmospheric air or warm clean air through for reversing flow. In raw mills filters are used for ventilation of the mill circuit. In coal pulverizers cotton fabric filters have been used for the cleaning of coal pulverizer vent gases but these are subject to fire and explosion. Experiments have been under way with the application of glass cloth filters for this service. Glass cloth filters show considerable promise for the treatment of waste gases from both dry and wet process cement kilns. One of the most important considerations for filters in the cement industry is a program of preventive maintenance. Shaking type filters should be checked at regular intervals to be sure that all of the shakers are functioning properly. Patching materials are available for all types of bags. When a unit is taken out of service for maintenance, all of the bags in the unit should be removed and replaced with a new set of bags or with a set that has been carefully repaired.

07699

Pottinger, J. F.

THE COLLECTION OF DIFFICULT MATERIALS BY ELECTROSTATIC PRECIPITATION. Australian Chem. Process. Eng. (Sidney), 20(2):11-23, Feb. 1967. 11 refs.

Problems encountered in the metallurgical, cement and power generation industries which led to an extensive study of the electrical properties of dust particles and the effects of these properties on precipitator performance are reviewed. Electrical breakdown and resistivity measurement are discussed and a design of a bulk resistivity measuring apparatus is illustrated. Negative resistivity is cited as a problem. The remedial measures in the industries cited are described in technical terms.

07875

T. E. Kreichelt, D. A. Kemnitz, S. T. Cuffe

ATMOSPHERIC EMISSIONS FROM THE MANUFACTURE OF PORTLAND CEMENT. Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-17, 47p., 1967. 29 refs. GPO: 803-789-2

Information is presented on actual and potential atmospheric emissions resulting from the manufacture of cement. Raw materials, process equipment, and production processes are described, as well as the location of plants, and process trends. Emission and related operating data are presented, along with methods normally employed to limit or control emissions from the dry, semi-dry, and wet processes. The main source of emissions in the cement industry is the kiln operation. Dust generated in the dry-process kiln may vary from 1 to 25 percent expressed in terms of finished cement; from the wet process, 1 to 33 percent. Sulfur dioxide emissions from the kiln gases combine with the alkalies as condensed sulfates. In the wet process, an odor problem may arise from heating certain types of raw material such as marine shellls, marl, clay, or shale. Another important source of dust emissions in the cement industry is the dryer normally used in dry process plants. Dust can be adequately arrested in the cement industry by proper plant layout and proper selection of high-efficiency multicyclones, electrostatic precipitators, or fabric filters. Electrostatic precipitators or fiber-glass fabric filters that have been properly designed, installed, operated, and maintained will adequately collect the dust from the hot kiln gases. In many plant designs, multicyclones precede the precipitator or fabric filter. Precipitators or low-temperature fabric filters alone may be adequate on other unit operations such as handling, crushing, grinding, drying, and packaging. Dust emissions as low as 0.03 to 0.05 grains per standard cubic foot have been obtained in newly designed, well controlled plants.

07931

Ertl, D. W.

ELECTROSTATIC GAS CLEANING. S. African Mech. Engr. (Johannesburg), 16(8):159-168, March 1967.

Electrostatic precipitators are a highly developed and efficient means of cleaning industrial and waste gases, satisfying all modern hygienic and industrial requirements. Each precipitator has to fulfill two functions: (1) electrically charging the dust and capturing it by electrodes which are at earth potential; and (2) passing this precipitated dust, with minimum re-entrainment losses, into the hoppers underneath the precipitation field. Parameters influencing the total dust collecting efficiency are: the ratio of the collecting plate area to gas flow rate, which is a dimension of the precipitator size; the migration velocity or the velocity by which the dust is attracted to the collecting plate under electrical forces, which is dependent on field intensity; the dielectric constant of the dust; the dew-point of the gas/dust mixture, high dew-point being better suited for precipitation than a completely dry gas. Factors adversely affecting precipitation efficiency are space charges, which develop when there are large amounts of very fine dust in the gas, and dust resistivity, which makes precipitation difficult when the dust layers have an electrical resistance of greater than approx. 10 to the 11th power ohm/cm. Precipitators are important for thermal power stations where the dust fineness must also be taken into account in design. The use of precipitators for blast furnaces and steel works, cement works, and in the chemical industry, is noted. Dust collecting efficiencies of 99.5% are not exceptional and greater efficiency is advisable in continuous operation at numerous plants. For optimum dust collecting results, the specific dust properties have to be taken into account during the planning stage of the whole plant.

08372

Wiemer, Peter

DUST REMOVAL FROM THE WASTE GASES OF PREPARATION PLANTS FOR BITUMINOUS ROAD-BUILDING MATERIALS. Staub (English translation), 27(7):9-22, July 1967. 2 refs. CFSTI: TT 67-51408/7

Dust in waste gas from preparation plants for road building depends on many characteristic factors. This is valid for the dust at the drying drum outlet and also for clean gas dust at the chimney inlet. The crude gas dust is naturally influenced by the properties of raw material, while clean gas dust is also influenced by the dust removal method used. These problems are discussed on the basis of a wide range of numerical data.

08636

Gale, W. M.

TECHNICAL ASPECTS OF A MODERN CEMENT PLANT. Clean Air (J. Clean Air Soc. Australia New Zealand,) 1(2):7-13, Sept. 1967

Dust collection problems encountered in the cembent industry are discussed and the basic processes for the production of cement are reviewed. At some plants in the United States rapid analysis is being carried out using x-ray analysers and attempts are being made to have these analysers control (by computers) and the mixing of raw materials. This means that the analyser will require clean rooms with filtered air, and air conditioning. But in order to decrease the probability of analyser failure due to dirt and dust it will be almost essential to pay careful attention to the raw materials stacking and recovery system so that the air-borne dust in the region of the analyser is kept at a minimum. Observations of several different companies indicate that many control installations do not give the performance of which they are capable because of minor engineering defects. Examples of this are: (1) Insufficient study of the choice of filter cloth in relation to material to be collected so that the build up of filter cake is too rapid. (2) Poor sealing between clean air and dirty air compartments particularly around the edges of bags. (3) Insufficient strength so that bags collapse under suction. (4) Insufficient slope on the sides of collecting hoppers so that they do not empty properly. (5) Poor finish of welded joints inside hoppers. This can cause build up. (6) Insufficient instrumentation. Each installation has certain variables which are absolutely essential to efficient operation. These variables should be instrumented so that they can be kept at the correct values and so that management can see that they are being maintained.

09789

Simon, Herbert

SINGLE-STAGE ELECTRICAL PRECIPITATORS. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.), Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 135-156, 1967. GPO: 806-614-30

The history of electrostatic precipitation, its advantages and disadvantages, diverse applications, and mechanism are discussed. The mechanisms involved in electrical precipitation are treated in detail providing pertinent information on the following: construction; voltage for successful operation (rectifiers, effects of wave form, controlled sparking rate); uniform gas distribution; theoretical analysis of performance; theoretical efficiency; effects of resistivity; and effects of nonumiform gas velocity. Proportion, capacity, cleaning of electrical system, accessibility for maintenance, control of gas flow, control of erosion of dust from electrodes, and power supply are design factors that are critical elements in an electrostatic precipitator. The fundamental theory of the mechanisms involved in electrical precipitation is only partially understood at present. Designs are based either upon previous experience with similar processes or upon the results of pilot model precipitator studies. Data is tabulated on; dielectric constants for some common materials; pioneer precipitator installations (1907-1920); summary of U.S. precipitator installations in major fields of application; typical precipitator applications (flow rate, temperature, dust concentration, dust weight, efficiency, cost); suspended particulate matter in commercial gases in typical installations; average diameter of particles in various industrial operations; typical values of drift velocity encountered in practice for use with precipitators; and typical values for some design variables used in commercial electrostatic precipitator practices.

09806

Vincent, Edwin J. and John L. McGinnity

CONCRETE-BATCHING PLANTS. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.), Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub-999-AP-40, p. 334-339, 1967. GPO: 806-614-30

Concrete-batching plants store, convey, measure, and discharge the ingredients for making concrete to mixing or transportation equipment. One type is used to charge sand, aggregate, cement, and water to transit-mix trucks, which mix the batch enroute to the site where the concrete is to be poured; this operation is known as wet batching. Another type is used to charge the sand, aggregate, and cement to flat bed trucks, which transport the batch to paving machines where water is added and mixing takes place; this operation is known as dry batching. A third type employs the use of a central mix plant, from which wet concrete is delivered to the pouring site in open dump trucks. Dust control equipment and hooding and ventilation requirements for each plant are discussed. Filters may be used to control dust emissions in wet concrete batching plants. No hooding and ventilation requirements are necessary. Dry batching plants present more difficult control problems. A local exhaust system with an efficient dust collector is required to control a dry batching plant adequately. This is a difficult operation to hood without interfering with the truck's movement or the batch operator's view. A canopy type hood just large enough to cover one compartment at a time provides effective dust pickup and affords adequate visibility. A baghouse is the most suitable type of dust collector for this service. A hydraulically operated, swing-away cone-shaped hood is normally used with a 2 inch clearance between the hood and mixer in central mix batching plants. A baghouse is required to collect the dust emissions. From an air pollution standpoint, the central mix batching plant is preferable to dry batching. The dust is more easily captured and there is no generation of dust at the pouring site. The operation is also preferable to wet batching because designing control equipment for a stationary mixer is easier then it is for a transit mix truck-loading area.

09807

Vincent, Edwin J.

CEMENT-HANDLING EQUIPMENT. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.), Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS Pub-999-AP-40, p. 339-340, 1967. GPO: 806-614-30

The equipment involved in the operation of a bulk cement plant which receives, stores, transships or bags cement includes hoppers, bins, screw conveyors, elevators, and pneumatic conveying equipment. Its main purpose is usually to tranfer cement from one type of carrier to another, such as from railway cars to trucks or ships. In the handling of cement, a dust problem can occur if proper equipment or hooding is not used. Hooding and ventilation requirements of receiving hoppers, storage and receiving bins, elevators and screw conveyors, and hopper trucks and car loading are discussed. A baghouse has been found to be the most satisfactory dust collector for handling the ventilation points. All sources are normally ducted to a single baghouse.

09808

Vincent, Edwin J.

ROCK AND GRAVEL AGGREGATE PLANTS. In: Air Pollution Engineering Manual. (Air Pollution Control District, County of Los Angeles.) John A. Danielson (comp. and ed.), Public Health Service, Cincinnati, Ohio, National Center for Air Pollution Control, PHS-Pub- 999-AP-40, p. 340-342, 1967. GPO: 806-614-30

Rock and gravel aggregate plants supply sand and variously sized aggregates for the construction and paving industries. The processing of the gravel consists of screening out the usable size and crushing the oversize into various size ranges. A simplified flow diagram for a typical plant is shown. An inventory of sources of dust emissions in rock and gravel plants usually begins with the first crusher and continues with the conveyor transfer points to and including the succeeding crushers. Here the rock is more finely ground, and dust emissions become greater. As the process continues, dust emissions are again prevalent from sources at conveyor transfer points and at the final screens. The points that require hooding and ventilation are the crusher discharge points, all elevator and belt conveyor transfer points, and all screens. All these dust sources should be enclosed as nearly completely as possible and a minimum indraft velocity of 200 fpm should be maintained through all open areas. One method of suppressing the dust emissions consists of using water to keep the material moist at all stages of processing; the other, of using a local exhaust system and a dust collector at all sources. The preferred dust collector device is a baghouse. A combination of a dry centrifugal collector and a wet scrubber is sometimes used. A centrifugal collector alone would allow a considerable amount of very fine dust to be emitted to the atmosphere. A scrubber of good design is required, therefore, to prevent such emissions.

09914

Hankin, Montagu, Jr.

VARIOUS METHODS OF DUST COLLECTION AT STONE PLANTS. Preprint, Grove (M.J.) Lime Co., Lime Kiln, Md., ((35))p., 2966. 5 refs. (Presented at the 49th Annual Convention, National Association, Chicago, Ill., Feb. 6-10, 1966.)

The sources and types of dust generated in the stone processing industry are discussed. Diagrams and operating ranges are presented for the following dust control equipment:

electrostatic precipitators, bag filters, cyclones, packed towers, wet centrifugal collectors, venturi-type collectors, and wet dynamic precipitators. Methods are also considered for controlling dust from roads. from roads.

09950

Okuma, R., and H. Shimazu

AIR-POLLUTION PREVENTION IN CEMENT WORKS. Test in Japanese Netsu Kanri (Heat Engineering) (Tokyo), 19(4):18-26, April 1967.

Air pollution devices for Japanese kilns and dryers are reviewed. Electric dust collecting devices for cement kilns are said to be over 98.5% efficient. Six different types of rotary kiln (used mainly in Japan) and different types of dryers are illustrated. The main dust collecting devices are electrostatic collector (for kiln and dryer): multiclone (for cooler, ventilator, or dryer); starclone (for rapid dryer); cyclone (for coal dryer); wet system (for dryer); Venturi scrubber (for dryer); and bag filter (for crusher, conveyor, or wrapper). Some larger factories in Japan are restricted by law as to SO3 and SO2 content in the exhaust gas (22% of SO2 and SO3 per 1 gram of soot). The analysis of exhaust gas from a cement factory is given; particle size distribution of cement dust and a chemical analysis of collected dust are also given. Exhaust gas from cement factories generally does not exceed the legal limit for SO2 and SO3. Studies have shown that cement dust is not harmful to animals or plants, but efforts to minimize dust fall are continuing.

12347

Plass, Robert J. and Harold H. Haaland

ELECTROSTATIC PRECIPITATORS IN THE CEMENT INDUSTRY. Preprint, Pennsylvania State Univ., University Park, 29p., 1957. (Presented at the Electrostatic Precipitation Seminar, University Park, Pa., June 16-21, 1957.)

The applications and problems of electrostatic precipitators in cement plants are reviewed. Precipitators have a variety of uses in these plants, including collection of dust from coal handling systems, emissions from rock and shale drying, and cleaning effluen air from modern air-swept raw and finish grinding mills. By far th greatest problem, however, is the cleaning of dust from kiln gases. The specifics of the problem vary, depending on the kind of plant and kiln and the raw material source. Although the quantity of dust to be removed is a management decision which must depend on individual0 plant and community factors, as a general frame of reference there has been wide acceptance for a relatively clean stack at about 0.05-0.06 gr/CF for low alkali content effluents, and at about 0.025-0.03 gr/CF for higher alkali content effluents. Raw feed problems, exemplified by alkali volatilization, are discussed, as well as sulfur oxides from the presence of sulfur kiln feed and in fuel. Difficulties related to the major cement making systems in current use, including wet process, filter cake feed, dry process, wet nodulizing kiln, and Fuller-Humboldt preheat, are examined in some detail, and progress in precipitator design as it applies to 0the cement industry is described.

13946

American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio, Committee on Air Pollution

PROCESS FLOW SHEETS AND AIR POLLUTION CONTROLS. Cincinnati, American Conference of Governmental Industrial Hygienists, 1961, 40p. 33 refs.

A variety of industrial processes, described in the text and illustrated by flow charts, are categorized according to the odors or pollutants produced by each stage of plant operations. Appropriate primary and secondary air cleaning equipment, including dry centrifuges, wet scrubbers, and fabric and electrostatic filters, are matched to each operation and evaluated as satisfactory or not satisfactory. The suggested controls have applications for asphalt and cement plants, gray iron or malleable foundry operations, the milling of asbestos ores, alfalfa dehydrating plant operations, coffee processing, iron and steel making, and scavenger-type rendering processes. Suggested reference sources are included for each process.

14289

Hohmann, Hans and Horst Huckauf

INVESTIGATIONS OF THE SYSTEM CACO3-SO2-H2O(D) IN CONNECTION WITH PROBLEMS OF DUST AND SO2 EMISSION FROM CEMENT KILNS. (Untersuchungen zum System CaCO3-SO2-H2O(d) in Verbindung mit Problemen der Staub- und SO2-Emission von Zementbrennaefen). Text in German. Silikat Tech., 20(5):148-155, 1969. 23 refs.

The four alkali earth carbonates (CaCO3, travertine, limestone, and dolomite) were studied with respect to their adsorption of sulfur dioxide and water vapor using gas chromatography. It was found that CaCO3 dried at 180 C at first adsorbs considerable quantities of SO2 from a SO2 and CO2-containing gas. The SO2 adsorption isotherms found by the frontal gas chromatographic process of G. Schay all belonged to type I of Brunauer's classification. Water vapor adsorption of all four carbonates was determined at 20, 40, 60, and 80 C. The water vapor adsorption isotherms were found to belong to type II of Brunauer's classification. Studies by the gas chromatographic pulsed flow method showed that SO2 adsorption by the system CaCO3-SO2-H2O at temperatures ranging from 0 to 100 C occurs at relative water vapor partial pressures of almost 1.0. Chemical conversion of SO2 to calcium sulfite occurs at partial pressures down to zero. This leads to the conclusion that formation of the adsorbed water vapor into a three dimensional fluid at the absorbent surface is a more thorough process than all known theories concerning water vapor adsorption on solids have anticipated. A critical relative water vapor partial pressure for calcium sulfate formation was found at 0.50, above which higher chemical activity occurs. Calcium sulfite (at oxidation) or calcium sulfate solidifies calcium carbonate dust and changes its surface properties. Cloth filters and electrostatic precipitators are thus hampered in their function. Five known types of waste gas of desulfurization are discussed.

14425

Hodgkiss, J. E.

SOME ASPECTS OF AIR POLLUTION AND THE CEMENT INDUSTRY. S. African Mech. Eng. (Johannesburg), 18(10):265-267, May 1969. 4 refs.

The ways in which dust can be suppressed or collected at almost every stage of the cement-making process are illustrated. These methods are designed to meet the requirements of the South African Air Pollution Prevention Act of 1965. Major sources of dust to be controlled include the quarrying of raw materials, the crushing plant, mill ventilation, stack emission from the burning process, coal drying and grinding, bagging and dispatch, in-plant transport systems and storage of raw materials, and surface dust on roads and roofs. Particular attention is given to the cyclone system for mill ventilation, the electrostatic precipitator used to reduce stack emissions from the kiln, and the stack whose height and diameter were determined after theoretical calculations of dust deposition patterns. The installation of cyclones to remove coarse particles and of additional plates and electrodes on the precipitator commissioned in 1966, have reduced stack emissions to 86 mg/cu m at standard temperature and pressure.

15629

Eisner, Joachim H.

DUST EXTRACTION IN CEMENT WORKS. (Enstaubung von Zementwerken). Text in German. Wasser Luft Betrieb, 13(11):433-439, 1969.

Various dust separators used in cement factories, and their structural design and special uses are discussed. The operating principles and various components of electrostatic precipitators, cyclones, and packed towers are reviewed. Electrostatic precipitators, which have become the most efficient dust separators for the cement industry, may be horizontal or vertical to the flow of gas. The vertical type must have a larger filter surface. The ventilator here is usually installed in the exhaust gas duct, which leads to more rapid wear. This version is advantageous only if there is danger of explosion; otherwise, the horizontal type is preferable in all respects. Cyclones are now used in a cement factory only for preliminary dust separation. Their collection efficiency is improved by a larger specific weight of the dust, a larger speed, smaller cyclone diameters, larger dust grains, and by a lower dynamic viscosity of the carrier gas. They can be used for dust concentrations of less than 1000 g/cu m. Packed towers can be used only at temperatures below 350 C; collection efficiencies of 99.9% can be obtained, and the dust content can be reduced to 50 mg/cu m, but their costs run extremely high. In almost all instances in the cement industry, the high collection efficiency can be more economically obtained with electrostatic precipitators.

15728

Betta, Vittorio and Francesco Reale

A STUDY ON LIGHT TRANSMISSION OF LAYERS OF DUST PARTICLES AND ON CORRELATIONS TO BE USED IN DISCOLORATION METHODS FOR EFFICIENCY TESTING OF FILTER DEVICES. (Studio della trasparenza di depositi di polveri per le correlazioni nei metodi colorimetrici di misura dell'efficienza di filtrazione). Text in Italian. Termotecnica (Milan), 23(6):295-317, 1969. 3 refs. (Presented at the 23rd National ATI Congress, Bologna, Sept. 24-28, 1968.)

A study of the transparency of deposits of dust is presented, to be used for correlations with colorimetric methods for measuring the effectiveness of air filtration. Theoretical and practical descriptions are presented related to testing the effectiveness of air filters in removing dust particles of various sizes and materials from the air passing through them. The method depends on the measurement of opacity of trapped particles. Experiments are described using aerosols from cement (5-25 microns in diameter); talcum (3 microns); iron oxide (3 microns); and graphite (1 micron).

15759

Frauenfelder, A.

WHAT HAS BEEN DONE BY THE SWISS CEMENT INDUSTRY TO ELIMINATE THE DUST PROBLEM IN THEIR DIFFERENT WORKS. (Was hat die schweizerisc Zementindustrie fuer die Entstaubung ihrer Werke getan). Text in German. Zement-Kalk-Gips (Wiesbaden), 58(11):501-504, Nov. 1969. 3 refs.

There are only 18 cement works in Switzerland with relatively small capacities and only one kiln producing more than 1000 tons per day. Since 1950, this industry made great strides in air pollution control. The Swiss Association of Cement, Lime, and Gypsum Producers established their own rules for dust emissions in 1963 which were binding for members. Clean gases from new installations should not have more than 75-100 mg dust/cu m. Older plants have until 1973 to reduce their emissions to 100-150 mg dust/cu m. A federal law states that only plants which meet these requirements obtain approval from the Authorities of the Canton. In all cement works meeting the emission standards, adequate dust collection devices are in operation. The sources of dust in the cement works, adequate dust collection equipment, and costs were discussed. Equipment includes bag filters for dry dust and gases at low temperatures, electrical precipitators for the cleaning of waste gases from kilns, and raw material dryers. Installation difficulties from corrosion and methods for the correction of the problem were described. Multicyclones and gravel bed filters also have special applications in the dedusting of clinker coolers. It was concluded that many Swiss cement works are clean and by 1973, all cement works will meet emission standards. (Author summary modified)

15957

Mel'nik, M. N.

MEASURES FOR SANITATION OF ATMOSPHERIC AIR IN THE UKRAINE. (Meropriyatiya po ozdorovleniyu atmosfernogo vozdukha na Ukraine). Text in Russian. In: Sanitation Measures Against Air and Water Pollution in the Planning of Cities. (Ozdorovleniye vozdushnogo i vodnogo basseynov gorodov). Government Committee on Civil Building and Architecture (ed.), Lecture series no. 2, Kiev, Budivel'nik, 1968, p. 17-18.

Control measures instituted at cement plants in Dneprodzerzhinsk and Krivorozhsk have given significant reduction in quantities of dust emitted into the atmosphere. The ore enrichment combine at Krivorozhsk was provided with dust control equipment which resulted in a substantial recovery of iron. Effective gas purification measures at the Kramatorsk Metallurgy Plant and at the Zaporozhstal Martensite Furnace No. 2 are also reported. Failures at pollution control have occurred at some locations, especially in the Donbass, because the actual efficiency of control equipment has been significantly below the design values, or else already existing pollution sources were not adequately accounted for.

16446

Vypov, A. I. and G. N. Makarets

PROTECTION OF THE AIR AND WATER BASINS AT NOVOKUZNETSK. (Zashchita vozdushnogo i vodnogo basseynov v novokuznetske). Text in Russian. In: Sanitation Measures Against Air and Water Pollution in the Planning of Cities. (Ozdorovleniye vozdushnogo i vodnogo basseynov gorodov). Government Committee on Civil Building and Architecture (ed.), Lecture series no. 2, Kiev, Budivel 'nik, 1968, p.37-38.

An overall examination of the pollution problems of Novokuznetsk was made in 1965-1966 by the Deputy Commission on Natural Conservation and the Presidium of the Novokuznetsk Branch of the Association for Natural Conservation. Dust emission from the Kuznetsk cement plant was 260 tons per day in 1962; it was reduced to 50 tons per day by the end of 1966, and the installation of electrofilters at two roasting furnaces in 1968 reduced emission to 10 tons per day. Measures were also taken to reduce emission from the aluminum and iron-smelting plants. Efforts at pollution control in this city are regarded as successful and similar measures are recommended for other Soviet cities.

17402

Hashimoto, Kiyotaka

THE POINT OF PLANNING AND ITS EFFECT ON OPERATION RESULT OF AN ELECTRIC PRECIPITATOR IN VARIOUS INDUSTRY SMOKE ABATEMENT (V) -- AIR POLLUTION IN CERAMIC INDUSTRY. (Gyoshubetsu ni miru denkishujinsochi no setsubikeikaku to untenkoka (V) -- Yogyohin seisan ni tomonau haigasu no jogai). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 3(3):165-174, March 15, 1967. 28 refs.

Dust generated in the manufacturing of cement is high in electric resistivity and has an erosive property. A rotary dryer generates high amounts of dust whose apparent resistivity varies considerably with the treatment of the raw material. A rotary kiln generates dust the apparent resistivity of which is high. By considering such variabilities, an effective dust collecting system can be designed. Dust generated by a packer is a part of the final product and has to be precipitated and collected by a special dust collector. An electric precipitator is usually controlled by reading the voltage of the transformer and the amperage of the discharge-amperemeter. For the most effective operation of the precipitator, a precipitative voltmeter has to be used. The spark-count controlling method can be adopted for the dust of low resistivity. Plumes or smut result when precipitating efficiency is not satisfactorily high. In the carbonic industry, the production of electrodes for metal refining and other purposes and the production of carbon black have to be considered first with respect to air-pollution prevention. Dust generated in the manufacturing of electrodes is low in electric resistivity, has little cohesive power, and contains some higher boiling hydrocarbon; thus, a stabilizer is necessary. Dust generated in the manufacturing of carbon black can not be precipitated by an electric precipitator because of its special properties, but it can be precipitated by a special unit system of dust collectors. In other parts of the ceramic industry, it is easy to precipitate dust by an electric precipitator, but most of the factories are small in scale so special methods of treatment are necessary.

17750

Funke, G.

POLLUTION AND NUISANCE CONTROL ACTIVITIES. (Aus dem Arbeitsgebiet Emissionen). Text in German. Zement-Kalk-Gips (Wiesbaden), 57(5):209-219, May 1968. 9 refs. (Presented at the Technical Meeting of the Vereins Deutscheer Zementwerke, Karlsruhe, Germany, Sept. 27, 1967.)

Dust removal equipment in the cement industry has improved. Multicyclones can be efficiently used to collect dust from cooler exhaust air if blockage and excess wear are prevented. Mixing-bed filters with increased operational reliability are also used for dust collection from cooler exhaust air. New developments are fluidized bed filters and hot-gas dry filters with mineral wool as the filter medium. Longer filter fabric life was attained with new types of cleaning mechanisms. Electrostatic precipitators are not always in continuous operation due to unfavorable gas and dust conditions which produce a limit of 150 mg/N cu m. Precipitators are also affected by corrosion of the internal fittings and filter chambers. Electrostatic precipitators for rotary kilns with air suspension preheaters should be equipped with evaporative coolers in order to cool and moisten gases when direct kiln operation is employed. Regulations aimed at combating noise will necessitate measures to reduce noise, particularly in wet-process plants. The vibrations caused by blasting in quarries are continually measured in order to enable the requisite technical precautions for reducing the vibration velocities to be established. (Author summary modified)

18160

Herod, Buren C.

NCSA'S DUST CONTROL SEMINARS REFLECT INDUSTRY'S CONCERN WITH EFFECTIVE MEASURES. Pit and Quarry, 61(12):118-124, June 1969.

Several reports given at two seminars on dust control technology for producers in the stone industry are reviewed. Dry mechanical collectors, including the inertial, settling chamber, and centrifugal, were identified. Centrifugal collectors are most affected by particle size. They are most effective in collecting material in the 10 to 200-micron range. Wet scrubbers usually act as an after cleaner for mechanical collectors. Various inherent advantages of wet scrubbers were cited. Scrubbers have the ability to collect particles in the submicron range. A comprehensive review of fabric collector fundamentals covers the theory of fabric filtration, types of fabrics, factors in the selection of proper fabric, operation of this type of collector, and proper maintenance procedures. The principles of operation, along with a physical description of the basic components, plus a review of factors affecting performance of electrostatic precipitation were presented. The effective control of dust by wet suppression techniques also was reviewed.

19210

Matsuda, Norikazu

ABATEMENT OF AIR POLLUTION CAUSED BY FLUORIDE. (Fukkasuiso oyobi kakushu fukkabutsu niyoru taikiosen no taisaku). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 6(7):509-514, July 15, 1970.

Sources of fluoride pollutants include aluminum refining and phosphate fertilizer, brick, glass, glass-fiber, steel, and cement manufacturing. Fluorides emissions from an aluminum refinery and a phosphate fertilizer plant, both subject to large numbers of damage claims, are shown in a block diagram. Examples of fluoride pollution by the Showa Denko plants in Fukushima and Chiba and Sumitomo Chemicals in Ehime are presented. Regulations applicable to pollutant sources in Osaka and Fukushima Prefectures are noted. A common method of processing fluorine compounds is the use of caustic soda. Fluorine becomes sodium fluoride, which is subsequently converted to calcium fluoride by lime. In aluminum refineries, the recovery rate of fluorine by the method is over 99%. Exhaust gas, however, shows a recovery rate of only 60-70%, even in factories equipped with a recovery device. If the density at the source is lowered to several ppm, the use of chimnneys around 200-m high will reduce the ground concentration to .1 ppb. At present, the recovery of fluorides is accomplished by wet methods, which give rise to mists such as hydrofluoric acid. The efficient processing of the mist is a future problem. Since the demand for aluminum is predicted to be 2,000,000 tons in 1975, an increase in aluminum refineries is expected. In the process of construction, future refineries must be thoroughly evaluated for fluoride pollution.

19240

Deynat, Gerard

DEVICE FOR CONTINUOUS EXTRACTION OF ALKALIS FROM THE ESCAPE GASES OF A CEMENT KILN. (Societe des Forges et Ateliers du Creusot, Paris (France) U. S. Pat. 3,503,187. 4p., March 31, 1970. 9 refs. (Appl. Aug. 2, 1968, 1 claim).

A device for the continuous removal of alkalis from the waste gases of cement kilns is described. It consists of an outlet duct for the gases and a curtain formed by a number of metal chains. The two runs of the chains are wound on a return wheel immersed in a tank containing water for washing and cooling the chains. The two tanks have double walls to allow cooling by the circulation of washing and cooling liquid, the temperature of which is maintained at 50-60 C. This accelerates the dissolving of the alkalis entrained by the chains and reduces the effects of thermal shocks. The tanks have hoppers for recovering the dust collected by the chains; the chains pass over glide wheels in the upper part of the hopper, and dust is collected in the lower part. To complet the sealing tightness and to prevent fresh air from entering the ducting, the device can include two pressure detectors in the ducting and casing, respectively. A comparator of the pressures then controls a regulating chain which controls a shutter in the duct for fresh air, so that the duct pressure is always slightly higher than the casing pressure. The air introduced into the casing is evacuated by a fan which draws air through a filter which entrains fine dusts. Larger dust particles, released from the chains by nozzles and brushes, are collected in a recovery hopper situated in the lower part of the casing.

20014

Wasilewski, L., J. Z. Zaleski, A. Kaczorowski, and W. Badzynski

THE METHOD OF PRODUCTION OF SULFUR DIOXIDE AND PORTLAND CEMENT FROM GYPSUM. (Otrzymywanie dwutlenku siarki i cementu portlandzkiego z gipsu). Text in Polish. Przemysl Chem., vol. 18:633-647, 1934. 15 refs.

The decomposition of gypsum was studied on laboratory, semi-technical, and plant scales. Laboratory studies determined the effect of temperature and of additions of carbon, silcion dioxide, and iron and aluminum oxides on the rate of calcium sulfate decomposition. The effect of carbon and iron oxides was most prominent. The effectiveness of CaSO4 decomposition as dependent upon coke, clay, and iron ore addition in varying amounts was studied in a four-meter-long rotating furnace at different temperatures. The agreement with the lab results was good. At the same time, the concentration of SO2 in exhaust gases was determined for each separate experiment. At 1200 deg, it was about 3.5 %. The plant testing was carried out in a 40-meter-long furnace. When appropriate amounts of coke are added, the most favorable conditions of decomposition result, yielding SO2 in concentrations high enough for H2SO4 production; as a byproduct, Portland cement is obtained. The excessive addition of coke results in CaS formation in the firing remnant, thus lowering clinker quality. Insufficient amounts of coke yield clinker with a high content of CaSO4; thus, effectiveness of gypsum decomposition is lowered. The optimum amount of coke when the clinker is free of CaS depends on the temperature and firing conditions. The results of the study can serve as a basis for industrial design of H2SO4 and Portland cement production from gypsum.

20188

Squires, B. J.

FABRIC FILTER DUST COLLECTORS. THEIR USE IN THE VENTILATING, STEEL, NON-FERROUS METAL, CEMENT, POWER STATION AND CHEMICAL INDUSTRIES. Filtration Separation (Purley), 1967:228-239, May/June 1967. (Presented at the Meeting of the Filtration Society, Manchester, Jan. 17.)

Design aspects, industrial applications, and development of new fabrics for fabric filter dust collectors are reviewed. Fabric collectors are of three kinds: screen type filters, reverse jet or blow back filters at high filtering ratios, and tubular filters at normal filtering ratios; the latter are in most general usage, have undergone considerable recent development, and are described in detail. Theoretical criteria for fabric selections are noted. Some typical fabric filter installations are discussed. The use of a pre-coat filter aid in fabric filters to achieve very high cleaning efficiencies when filtering air and gas streams with low dust concentrations, such as the cleaning of atmospheric air for special ventilating systems, is one new application which has opened new fields for this equipment in the sewage, pharmaceutical, and steel industries. Particular attention is paid to the use of fabric filter dust collectors to clean high temperature gases and to applications in the cement, non-ferrous, smelting, and carbon black industries.

20674

Abelitis, Andris

APPARATUS FOR HEAT TREATING CEMENT RAW MATERIAL OR PRECIPITATED WASTE LIME CONTAINING COMBUSTIBLE CONSTITUENT. (Klockner-Humbold Deutz A. G., Cologne (West Germany) U. S. Pat. 3,491,991. 3p. Jan. 27, 1970. 1 ref. (Appl. Oct. 30, 1967, 4 claims).

Apparatus is described for heat treating cement raw material or precipitated waste lime material containing combustible constituents, wherein the waste gas pipe or duct is given a special construction to achieve complete combustion of the carbon material. By providing the waste gas duct or pipe with a downcomer portion descending to and connecting with the separator and having a larger cross section than a riser portion, the material is entrained and upwardly driven by the waste gases in the riser portion at a greater velocity than the velocity in the downcomer portion of the waste gas duct. An initmate intermixture and uniform distribution of the material over the entire cross section is produced. Since the flow of the gas in the descending portion of the waste gas duct or pipe is in a downward direction, there is no danger of the material tending to bake together even for relatively slow flow velocities, so that slow gas velocities and relatively lengthy periods during which the material is present within the waste gas duct are permitted. The cross section of the descending portion can be such that the gas velocity is only between approximately 1-5 meters per second. Thus, the combustible carbon constituents are certain to be consumed while the cement raw material is carried by the waste gas flow in suspension through the waste gas duct.

20756

Deussner, Herbert

METHOD AND DEVICE FOR REMOVING DUST FROM EXHAUST GASES. (Klockner-Humboldt-Deutz A. G., Cologne (West Germany)) U. S. Pat. 3,485,012. 4p., Dec. 23, 1969. 5 refs. (Appl. March 11, 1968, 7 claims).

A method for removing dust from the exhaust gases of a cement manufacturing installation is based on increasing the dewpoint of the gases. After leaving a raw-powder-preheater, the gases are conducted to the lower portion of a vertically extending moistening compartment. Water in an excess amount is sprayed into the upwardly moving gas stream and the excess water is loaded with dust collects in a sump at the bottom of the compartment. A pump withdraws the muddy water from the sump and discharges it first to nozzles tangentially extending into the sump to circulate its contents and then to the upper portion of the compartment to wet the inner wall. Another pump conveys a portion of the muddy water from the sump to the raw-powder-preheater at a point before the one where the raw powder is introduced. (Author abstract modified)

21187

Kato, Yujiro

PLANS AND OPERATIONAL EXAMPLES ON FILTER TYPE DUST COLLECTOR SYSTEM AT VARIOUS INUSTRIES (IV). THE ROLE OF BAG FILTERS IN THE CERAMIC INDUSTRY (I). (Gyoshubetsu ni muru rokashiki shujinsochi no keikaku to untenjisshirey (IV) - yogyo ni okeru baggu-firuta (sono I). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 4(6):385-389, June 15, 1968.

A baghouse is the most suitable type of dust collector for the cement industry. The raw-material mixer, the kiln exhaust, the clinker cooler, the clinker storage, the finishing mill, the packer, the tanker, and the cement-receiving station are the possible emission points in a cement plant. The operational conditions of bag filters installed at these points are reviewed. Dust from a dry-type kilm results from the finely powdered material. In the American plant described, the bag filters are located at the top of the silo to control dust created in conveying and mixing processes. Since multi-cyclones have low collection efficiencies, baghouses are being increasingly used to control the large volumes of dust emitted by the clinker cooler. The cement product which comes from the finishing mill is swept through the separator, cyclone, and the baghouse; in this process, the baghouse plays the most important role. With reference to the baghouse for the packer, the hood method is considered. Also noted is the ability of the baghouse to deal with an airstream the inlet concentration of which is several kgm per cu m, despite predicitons to the contrary.

21292

Arras, K.

EVAPORATIVE COOLERS FOR ELECTROSTATIC PRECIPITATORS IN THE CEMENT INDUSTRY. (Verdampfungskuehler fuer Elektrofilter der Zermentidustrie). Text in German. Zement-Kalk-Gips (Wiesbaden), 59(3):106-112, March 1970. 5 refs. (Presented at a meeting of the Committee on Emissions of the German Cement Industry, Duesseldorf, Feb. 6, 1970.)

In the cement industry, waste gases must be conditioned (i.e., reducing the temperature of the waste gas and simultaneously increasing the moisture content) to reduce dust resistance. This measure is necessary to assure high collection efficiency of the electrostatic precipitator. Roughly 0.5 g water/cu m gas are needed to reduce the gas temperature by 1 C. For calculation of the volume of the evaporative cooler, the time required for evaporation of the injected droplets must be known. The equation by Gumz indicates that the evaporation time is proportional to the square of the maximum droplet diameter. Calculation of the volume as a function of the input and output conditions is more precise. There are four types of coolers: uniflow and counterflow coolers, with bottom to top or top to bottom flow. The cooler most commonly used in the cement industry is the uniflow type where the gas inlet and the water injection device is installed in the top. Of the various types of nozzles, the so called 'return pipe nozzle' has proved to be most advantageous because the droplet size does not increase when the throughput decreases. The water enters tangentially into a cylindrical chamber and cannot leave through the nozzle, since the diameter of the return pipe is larger than the nozzle opening. If the pipe cross section id changed by a simple shutter, so that the inner diameter of the water rotating in the chamber becomes smaller than the nozzle outlet, the water leaves through the outlet and is atomized. The quantity of water injected with such a nozzle can be controlled by changing the water quantity in the return pipe. The advantages and dissadvantages of conventional type nozzles and the possibilities of controlling the sprayed amount of water are likewise discussed. Examples of the arrangement of evaporative coolers behind heat-exchanger kilns with combined drying and grinding mills are presented.

22351

Trauffer, Walter E.

MAINE'S NEW DUST-FREE CRUSHED STONE PLANT. Pit Quarry, 63(2):96- 100, Aug. 1970.

Most aggregates producers have, or eventually will have, problems with encroaching residential or industrial areas, tightening and changing specifications, and increasing their output. One crushed stone plant was able to solve these other problems by completely rebuilding the plant to produce more -- and finer -- sizes of stone, and taking drastic steps to reduce noise and blasting vibration, to control all plant and incidental dust, to shield operations from public view, and to prevent water pollution. The important environmental features and practices include complete wet and dry dust collecting systems; the dustproofing of all haul roads (with reclaimed oil); noise shielding with acoustical treatment at the primary crusher; and the use of old conveyer belting at impact points. The combination of wet and dry dust collecting system has completely eliminated any problem with neighbors or employees. A wet system with a spray nozzle is used at the primary crusher when necessary. The dry system, which effectively controls and collects dust in the rest of the plant, comprises 456 cotton sateen tubes, with a total bag area of 6338 square feet, an intermittent shaker system, three slide discharge valves and hoppers, a size 30 AAF exhauster, and a 75-hp motor. The duct system maintains the required suction at the eight collecting points. These are at the three cone crushers, the scalping screens, the twin sizing screens, and the shuttle and transfer conveyers. The 6000-12,000 lbs of dust collected each day are currently hauled to a pond on the plant site, but markets for it are being developed.

22500

Conrad, Guenter

PROBLEMS IN THE CONSTRUCTION OF HIGH SMOKESTACKS IN THE GERMAN DEMOCRATIC REPUBLIC. (Probleme beim Bau hoher Schornsteine in der DDR). Text in German. Energietechnik, 17(12):550-551, Dec. 1967.

Problems connected with the designing and construction of high industrial smokestacks as they emerged during the planning of the construction of a 300 m high steel-concrete smokestack for the Boehlen II power plant in East Berlin are discussed. This height was necessary if the ground sulfur dioxide concentration was not to increase above its present levels with the projected draught capacity of 7.5 million cu m flue gas per hour. Decisive for the steadiness of so high a structure was the correct determination of the wind stress factor which was calculated from data about wind currents, velocity, and frequency supplied by the Meteorological Service and from wind tunnel experiments. A concrete lining reinforced by locally available materials is foreseen for the flue gas duct proper to be built inside the static smokestack column. The empty space between the flue and the column is designed to reduce the heat stress on the structure and will permit easy inspection of the lining. While present technology permits a daily erection of 2.5 m of the structure with the protective lining being constructed with the help of a separate scaffolding, specially constructed sliding shells foreseen for this construction are expected to increase the daily construction of both the column and the lining to 4 to 6 m.

22523

Lyn, Andrew Van der

PRESCRIPTION FOR CEMENT PLANT DUST CONTROL. Rock Prod., vol. 73:73, 76-78, 80, 86, 87, Aug. 1970.

Prevention, or effective control, of the fine particulate matter generated in the portland cement industry involves enclosure of the dust, conveying lines, and collection at the terminal end of the lines. An adequate air flow velocity to assure capture of these particles is generally considered to be 200 fpm, and total air volume for any particular dust generating operation is readily arrived at merely by multiplying the 200 fpm velocity by the actual open face area in sq ft to obtain the total volume in cfm. Normally, round ducts are used for minimum static control when conveying the captured dust. Large radius segmented elbows, rather than abrupt 90 deg elbows, should be used, as well as branch pipes which enter at no more than 45 deg with the preferred entry angle being 30 deg or less. Dust conveying lines should be as straight as possible, with the minimum number of changes in direction, and a minimum transport velocity of 3500 fpm should be maintained in the branches and main header. A reference table for dust collector selection is presented tabularly. Electrostatic precipitators are high-voltage, high-efficiency units, with efficiency as high as 99.99% if the precipitator is properly designed and sized. Woven, graphited, silicone glass bags in the form of tubes or stockings enjoy wide use on high temperature dust control applications up to 550 F. Felted fabrics have a multiplicity of much finer pores than woven fabrics, but, they must be combined with a means of thorough and very frequent cleaning. An operation utilizing a series of traveling rings is explained.

22997

Lyn, Andrew van der

PRESCRIPTION FOR CEMENT PLANT DUST CONTROL, PART 2. Rock Prod., 73(9):118-120, 136-138, Sept. 1970. Part 1. Ibid, Aug. 1970.

The cement industry has done little to control and collect dust generated by the primary crusher or by the mechanical material handling equipment that conveys the product of the primary crusher to further processing and storage. These operations are suitable for ventilation with cloth dust collectors of either the woven fabric shaker type, incorporating cotton sateen or Dacron cloth; or a reverse pulse jet venturi equipped with Dacron or wool felt. With inlet baffles incorporated, these collectors are also suitable for the areas of raw material grinding and blending, the filling of raw material proportioning bins, and material withdrawal by proportional feeders. The kiln is the major producer of particulate matter in air float dust, and mechanical separators are normally required ahead of either precipitators or glass bag collectors to reduce the dust load from the kiln. Where waste heat boiler are employed on kiln exit gases, reverse pulse jet venturi scrubbers should be considered. Precipitators and woven glass bag collectors have been well applied to reduce dust loading from a clinker cooler, but the use of cyclones or other pre-separators should be considered. The applications of shaker collectors and the reverse pulse jet venturi in the handling of clinker and gypsum from cooler to storage and from storage to proportioning and to the grinding mill are noted. Also indicated is the relationship betwee grain loadings and temperature and dust control requirements.

23127

Schwanecke, Rudolf

HOW HIGH ARE THE COSTS OF AIR POLLUTION CONTROL? (Wie teuer ist die Luftreinhaltung?) Text in German. Wasser Luft Betrieb, 14(7):286-289, July 1970. 2 refs.

Examples of the cost of air pollution are cited. A plant producing bituminous highway surfacing material emits 100 g/N cu m dust. To produce a ton of surfacing material approximately 500 N cu m/t hot combustion gases are generated. A medium-sized plant with an hourly output of 50 t/h and a waste quality of 25,000 N cu m/h emits 2500 kg dust per h. The investment in a good dust-arrester installation of 99.9% efficiency consisting of a battery of cyclones as preliminary separators and a high-efficiency dust arrester comes to about 82,000 DM for the whole plant. The dust is reclaimed almost completely in a dry state. It can be returned into the production cycle and replace ground limestone as a filler. On this basis, the pollution control installation will pay for itself in 1 1/2 years. Similar calculations are presented for examples involving the cost of control installations in a chemical plant manufacturing toxic compounds, in the manufacturing of cement and in the petrochemical industry (olefins or acetylene production). In all cases the value of the reclaimed materials or the saving in the cost of high stacks for example which would be necessary if no pollution control equipment existed more than make up for the initial investment in pollution equipment.

23364

Weber, Ekkehard

ANNUAL REPORT ON THE STATE OF AIR POLLUTION CONTROL (SERIES 5). (Jahresuebersicht Reinhaltung der Luft (5. Folge). Text in German. Giesserei (Duesseldorf), 56(12):372-377, June 5, 1969. 88 refs.

A survey is given of literature covering a vast scope of air pollution problems, including legislation, governmental regulations, measurement of the content of sulfur dioxide, carbon monoxide dust fall, etc. in various parts of Germany, France, Italy, and other countries. The emissions of dust and gases from various industries are discussed, including the types of equipment used for their control, such as dry and wet processes, electrostatic filters, and bag filters. Measuring techniques are also reviewed.

23616

Vance, Rupert C.

DO-IT-YOURSELF DUST SUPPRESSION SYSTEM SAVES MONEY. Plant Eng., 24(15):84-85, July 1970.

High levels of dust generation have long been associated with the stone processing industry, but a Massachusetts stone company designed and built their own dust suppression system for approximately $1500. Since their well and main pump were too far from the plant to provide sufficient pressure and volume, they mounted a used 20,000 gal glass-lined tank on a concrete block foundation alongside one of their crusher control houses. Use of the tank provides the additional benefit of isolating the system to ensure cleanliness, while the addition of a wetting agent to the reservoir water helps to settle the dust and keep the inside of the system and nozzles clean. All suction, bypass, and pressure piping was specified polyvinylchloride with the pressure line being adapted to standard 150 psi black plastic water pipe to feed the spray nozzles. Manifolds made from galvanized iron pipe were placed at the discharge chutes of all crushers except the primary crusher where a 20 gpm fog nozzle was installed. An inline, self-cleaning, 100 mesh filter was installed on the pressure line, and a 150 psi adjustable pressure regulator controls the bypass line. A schematic diagram of the system is included.

23725

White, Harry J. and Walter A. Baxter, Jr.

A SUPERIOR COLLECTING PLATE FOR ELECTROSTATIC PRECIPITATORS. Preprint, American Society of Mechanical Engineers, New York, 7p., 1959. 2 refs. (Presented at the American Society of Mechanical Engineers, Annual Meeting, Atlantic City, N. J., Nov. 29-Dec. 4, 1959, Paper 59-A-279.)

The basic importance of collecting-electrode design to over-all precipitator performance is analyzed, and a scientific program leading to the development of greatly improved collecting plates broadly applicable to a wide range of practical applications is described. A newly-designed solid collecting plate with triangular baffles was evaluated for fundamental and practical performance criteria, including electrical characteristics, aerodynamic properties, precipitation rate, rapping requirements, weight, and cost. The solid plate was superior in every measured characteristic to an expanded-metal plate tested under the same conditions. The new plate has been successfully applied to fly ash cement, powered catalyst, gypsum and alumina dust, paper-mill, oxygen converter, and open-hearth fume, and other recovery problems (Author abstract modified)

24200

TWENTY BAGHOUSES ON CLINKER COOLERS FOR PERMANENTE CEMENT PLANT. Pit Quarry, 63(1):133, 144, July 1970.

The new $1.1 million dust collection system for the six clinker coolers at a cement and gypsum plant manufacturing facility in California consists of 20 individual and identical glass-cloth baghouses. Each unit, equipped with its own induced draft air fan, is capable of drawing 15,000 cfm of dust-laden air for a combined system capacity of 300,000 cfm. A manifold connects each collector unit to a large central duct, which is linked, in turn, by another manifold to the six cooler exhaust systems. Nevertheless, the average exhaust temperature through this manifold ranges from 300 to 500 F, necessitating the use of glass cloth instead of the normal cotton or synthetic fiber bags. A timer, located on the control panel, actuates the cleaning cycle of each unit in sequence. The system has built-in flexibility that permits individual dampers to provide separate draft-air control for each of the coolers. Since the burner building was built into the side of a hill with no available space around it, there was no choice but to place the new dust collection system on top of the building.

24568

Put, Y. and J. Stassen

PREVENTION OF ATMOSPHERIC POLLUTION IN THE CEMENT INDUSTRY AND LIME OVENS. (Prevention de la pollution atmospherique dans les cimenteries et les fours a chaux). Text in French. Ann Mines Belg., vol. 12:1337-1347, 1969. 2 refs. (Presented at the Congres International de Securite et d'Hygiene du Travail, June 30 - July 4, 1969.)

The sources of atmospheric pollution from the manufacturing processes of cements and lime are investigated. Two categories of dust control installations can be distinguished; those which purify the gases from the ovens, and the separators which remove the dust from the manufacturing installations. A rational approach to both types of problems requires a knowledge of such fundamental data as the nature of the gases, the nature of the dust to be removed, the topographical situation of the plant, and the meteorological conditions of the region. The solutions generally adoped in Belgium for each source of pollution are described, and new tendencies are pointed out. The legal and administrative problems associated with the prevention of atmospheric pollution are discussed, and the system of permits and working conditions imposed presently are described. The total cost of dust removal is calculated from the point of view of investment, maintenance, and power consumption.

24881

Kazarinoff, Andrew

INDUSTRIAL AIR POLLUTION--ITS CONTROL AND COST. Design News, 23(14):18-24, July 5, 1968.

Power generating plants, steel mills, and cement kilns are included in the groups that will be forced by government restrictions to control pollutants. The industrial air pollution control equipment available now, the cost of pollution control to industry, and some air pollution problems for which there are yet no practical solutions are discussed. No real innovations have been made in control equipment for a long time; the major devices are still electrostatic precipitators, bag filters, cyclones, and scrubbers. Research and development is needed on equipment that can control both particulate and gaseous pollutants; equipment that can perform at higher efficiencies without size and cost penalties; equipment whose efficiency curve is relatively flat over broader ranges of particle size; and lower-cost equipment.

25078

Koehler, Wilhelm and Gerhard Funke

DUST CONTROL IN THE CEMENT INDUSTRY OF THE GERMAN FEDERAL REPUBLIC. Preprint, International Union of Air Pollution Prevention Associations, 21p., 1970. 7 refs. (Presented at the International Clean Air Congress, 2nd, Washington, D. C., Dec. 6-11, 1970, Paper EN-22B.)

The cement industry of the Federal Republic of Germany (FRG) endeavors to cut down dust emissions. Therefore, the Verein Deutscher Zementwerke (Association of German Cement Manufacturers) has emphasized in its statute the reduction of the emissions as a main objective of the Association, and has set up a special Dust Commission for self-control in its member works. Though the cement output in the FRG has approximately tripled since 1950, the dust emission in the same period has been reduced from 3 to 5% of the production to less than 0.15%. The latest state of engineering in the field of dust control in cement plants is delineated in the VDI-Richtlinie (Directive) 2094 entitled 'Staubauswurfbegrenzung Zementwerke' (Dust Emission Control-Cemen Plants). In this publication a maximum dust emission of 150 mg/N cu m has been prescribed for all cement plant installations. These dust control measures imply considerable expense for the cement industry; about 12% of the total investments are necessarily allotted to dust removal equipment. The dust collectors, such as electrostatic precipitators, granular bed filters, and filters made of fibrous material, used in the various cement plant installations, are continuously being improved, with the intention of getting a more trouble-free operation in the future. Recently the authorities demanded that the stacks of the cement plants be fitted with measurement instruments for continuous dust monitoring. (Author abstract modified)

25453

POLLUTION: EVERYBODY'S CONCERN. Pit. Quarry, 63(6):74-78, Dec. 1970.

The necessity to convert the present waste economy into a recycle economy means that industry, communities, and individuals must mature to the acceptance of responsibility that we live in a limited world that must be protected. Not all the technology required to accomplish this is available due to the waste philosophy that developed over the years. In shifting their living patterns from a waste to a recycle economy, individuals can start immediately to conserve what they use and to use products more effectively. Industrialists can start thinking of waste as a source of material that can at times be profitable because of recycle into their own processes or into material with potential for sale. The costs of recycle have always proved to be lower than the cost of abatement. An instance of recycle thinking is illustrated by modern, efficient cement manufacturing where extensive recycle of dust lowers the actual leftover or waste from the process to less than 3%, which is removed.

25609

Litynski, T., H. Jurkowska, and E. Gorlach

PRELIMINARY EVALUATION OF CEMENT DUST FROM ELECTROFILTERS AS A POTASSIUM FERTILIZER. (Wstepne doswiadczenia nad wartoscia pylu cementowego z elektrofiltrow jako nawozu potasowego). Cement, Wapno, Gips, 11(3):57-62, March 1955. 9 refs. (Translated from Polish by M. Radziwill, Centralny Inst. Informacji Naukowo-Technicznej i Ekonomicznej, Warsaw (Poland), 14p., 1961. NTIS: OTS 60-21237

The use of the dust precipitated by electrofilters in the productio of cement was investigated as a source of potassium for agricultura fertilizers. The dust has a high calcium but low potassium level; however, the potassium is highly soluble in water and dilute acids. Experiments were performed on pot cultures of sunflowers and Italia rye-grass with three fertilizer combinations: no potassium dressing, potassium in the form of chloride, and potassium in the form of electrofilter dust. Preliminary results indicate that the cement dust is an adequate source of potassium for these two plants although further pot and field tests are required. The dust not only showed no noxious effect on the plants from the high aluminum content, but some of its constituents (calcium, silica, trace elements) appear to have a beneficial effect on plant development and yield, and it can be considered a calcium as well as a potassiu fertilizer. Leaching and crystallization may be necessary to increase potassium concentration. It is concluded that all cement plants should be equipped with adequate dust-collecting equipment, since it appears that the large cement industry in Poland could supply much of her potassium needs and thus reduce imports of potassium salts.

25643

Sykes, W. and F. Broomhead

PROBLEMS OF ELECTRICAL PRECIPITATION REVIEWED. Gas World, 134(3494):98-104, Aug. 4, 1951. 5 refs.

Aspects of the design, construction, and operation of the electrical precipitator are discussed. The great advantage of this device is its ability to remove with high efficiency dust of particle size much smaller than that removable by mechanical or cyclone separators. Back pressure, and power needs to produce the corona discharge, a very small; however initial costs are much higher. Problems considered at length include removal efficiency and its relation to time contact of the gases in the field, design of the precipitation chamber, insulator breakdown, gas distribution across the precipitator, removal of deposits from electrodes, and electrical equipment requirements. Five essential design factors are given: correct time contact, good gas distribution throughout the fields, design and arrangement of the electrodes, maintenance of clean electrodes, and maintenance of correct voltage. Examples of the following typical application are described and the principal design features are indicated in each case to point up the great variety of constructions required by specific and differing operating conditions: detarring of producer gas from coal and coke, chamber and contact process sulfuric acid manufacture, aluminum and cement production, boiler flyash precipitation, gypsum dust removal, sodium sulfate recovery in the Kraft pulp industry, cleaning of blast furnace gas, air conditioning, and spray painting.

26239

Dietrich, Leo

DUST AS RAW MATERIAL AS A SOURCE OF LOSS AND OF GAIN. (Staub als Rohstoff, Verlust- und Gewinnquelle). Text in German. Chem. Ing. Tech. Z., 25(8/9):433-437, Aug./Sept. 1953. 2 refs.

Dust recovery processes in operation in West Germany in 1952 in the production of anthracite and bituminous coal, in iron and copper smelting, in the production of zinc from zinc blende, in the production of aluminum in calcining furnaces, in the cement industry, in pulverizers used in the chemical and food industries (dried milk, detergents) and in power plants are reviewed. Of a total production of 289.7 million tons of materials, 34.2 million tons (11.88%) were emitted in powder form. Of this quantity, 32.2 million tons (94%) were recovered; 1.98 million tons or 6% of all dust emitted was lost, representing a loss of considerable magnitude. In some industries, dust recovery technology has reached it limits, in others it has not. Thus, fly ash emitted from power plants amounted to 7.8 million tons, of which 82.5% was removed; 1.43 million tons were emitted into the atmosphere, 80% in the Ruhr area.

C. MEASUREMENT METHODS

06126

K. Potzl and R. Reiter

THE RESPIRATORY TRACT MODEL AS A RETENTION SIMULATOR IN PRACTICAL USE. Das Atemtraktmodell als Retentionssimulator im Praktischen Einsatz.) Zentr. Aerosol-Forsch. (Stuttgart) 13, (5-6) 372-81, May, 1967. Ger.

A four-stage filter simulating the human respiratory tract was used in eight industrial locations, for example a cement kiln and a fluorite mine. The distribution of Fe2O3, SiO2, Al2O3, and CaO particles over the filter stages was measured, as well as their radioactivity and electrical charge. The usefulness of the model, described elsewhere (Acta Albertina, Regensburg 26, 67 (1966)) to determine the retention of aerosols in the respiratory tract according to both particle size and material properties was demonstrated.

06752

H. Joel

(SOME PRACTICAL ASPECTS OF DUSTFALL MEASUREMENTS.) Aus der Praxis der Staubniederschlagsmessungen. Zement-Kalk-Gips (Weisbaden) 20, (4) 157-61, Apr. 1967. Ger.

The German cement industry's research association (Forschungsinstitut der Zementindustrie) carries out dust precipitation measurements in accordance with the directives contained in VDI-Richtlinie 2119 and 'The Technical Instructions for Clean Air Maintenance' (TAL). These measurements are being steadily extended. The experience gained over the years shows that even apparently quite insignificant influences, especially those due to environmental conditions, are liable to cause considerable variations in the results of the measurements. Besides the difficulties associated with setting up the measuring instruments, the dust pollution values are particularly affected by meteorological conditions such as rainfall, wind direction and wind velocity, and also by the season. The dust deposit parameters calculated according to TAL are discussed with reference to the evaluated results of the dust precipitation measurements. The comparative measurements performed with various types of equipment indicate the difficulties associated with the calculation of conversion factors for different measuring instruments. (Author summary modified)

07411

Yamashita, K.

TEST PARTICLE (DUST) OF JIS (I). Text in Japanese. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 2(2):56-60, 1964. 9 refs.

In 1958 Japanese industry standard JIS Z 8901 regulated six kinds of dust for the first time and it was modified in 1963 by the addition of two more types of dust. The eight dusts consist of coarse, medium and fine silicas, talc, fly ash, portland cement, and Kanto medium and fine loams. The dusts are used for the testing the endurance of machines, in performance tests of chemical apparatus, for testing dust collectors, etc. Four standards, namely SAE ('41), SAE ('53), MIL-F-7194 ('51), and JIS Z 8901 ('58) and their contents are described. Generally, the static state of the particles can be determined by particle size distribution, specific gravity, chemical composition, and shape. The latter three properties are regulated and tabulated for each of the eight dusts. Their specific gravities range from 2.0 to 3.2 and the particle size from 5.0 to 210 microns.

07916

Ligda, M. G. H.

DETECTION OF CEMENT DUST CLOUDS WITH A PULSED RUBY LIDAR. Stanford Research Inst., Menlo Park, Calif., Contract AT-(04-3)-115, Proj. SRI-5880, UCRL-13204, 18p., March 4, 1966.

A summary report of results of observations made with a pulsed ruby lidar, of clouds of cement dust dispensed by helicopter at Test Site 300 of the Livermore Radiation Laboratory on 5 February 1966 is presented. Under marginal weather conditions of low cloud cover, light wind, and variable visibility, strong and persistent echoes from the cement dust clouds were observed many minutes after they could no longer be observed visually at ranges varying from 435 to 2910 meters. The lidar operated satisfactorily under somewhat adverse weather conditions, the cement clouds were detected well after they had dispersed below visibility (even as viewed against a white cloud background), and the conditions of the experiment approximated to some degree those which might be encountered at the Nevada Field Site. Minor difficulties were experienced with the remote firing trigger of the lidar and the pulse energy monitoring circuit (the latter after completion of the LRL tests), but these were not serious and did not require interruption or termination of the experiment. Based on the signal-to-noise ratios observed at the close ranges, if the reflectivity of the cement dust clouds approximates that of the dust cloud produced by a nuclear explosion, it should be possible to detect the latter at ranges well over 10 miles with this same equipment. The primary limitation of this lidar is obviously its low firing rate (about 2 per minute, maximum), which makes it difficult or impossible to obtain an adequate number of observations of a large, fast changing cloud to determine its size or volume with precision. However, it would be possible to construct a much more efficient lidar, so this should not be regarded as a fundamental difficulty to the proposition that lidar may be a useful instrument for nuclear dust mensuration.

08130

Vigdorchik, E. A.

DETERMINATION OF AIR DUSTINESS ACCORDIHG TO OWEN'S METHOD. In: Survey of U.S.S.R. Literature on Air Pollution and Related Occupational Diseases. Translated from Russian by B. S. Levine. National Bureau of Standards, Washington, D. C., Inst. for Applied Tech., Vol. 3, p. 1-12, May 1960. 13 refs. CFSTI: TT 60-21475

The Owens method was tested in order to determine its possible use in routine sanitary inspection for the determination of air dustiness in manufacturing plants. On the basis of tests to which Owens apparatus was subjected in the dust chamber and under manufacturing plant conditions, it can be stated that the method and apparatus present a considerable advance in the problem of dust study. Particularly valuable characteristics of the instrument are: a. Particles suspended in the air measuring 0.3u and above in diameter can be reliably counted; b. Diferential particle counts can be made simultaneously; c. The dusts studied microscopically remain unchanged because of the special method used in making the preparations; d. Differences in duplicate readings do not exceed the limits of experimental error; e. Sample collecting is not time consuming; f. As a consequence to the rapidity of sampling, the dynamics of the dust-laden air can be studied reliably; g. The apparatus is of small size and is easily portable.

08607

Dresia, Heinrich, Peter Fischotter, and Gerd Felden

CONTINUOUS MEASUREMENT OF DUST CONTENT IN AIR AND WASTE GASES, USING BETA RAYS. ((Kontinuierliches Messendes Staubgehaltes in Luft und Abgasen mit Betastrahlen.)) Text in German.VDI (Ver. Deut. Ingr.)Z. (Duesseldorf), 106(24):1191-1195, Aug. 1964. 8 refs.

The quasi-continuous measurement by means of beta rays of dust sampled by a fibrous paper tape filter and by a cyclone is described. Since the absorption of beta rays does not depend on the composition of the dust or on particle size, this measurement method lends itself to all kinds of dust. The apparatus for the filter sampling method is illustrated, and the successful measurement results of various dusts such as soot, fly ash, cement, gypsum, quartz, scouring powder, and wheat flour are described. A schematic diagram of the cyclone sampler and graphs of the measurement results are provided. Better results can be obtained by this method, if the dust content is heavy and the particle size not very fine. The construction of the apparatus permits measurements close to the emission source and registration of the results elsewhere. The scattered beta-ray measurements indicate the composition of dust, if the dust can be regarded as a two component mixture with substantially different specific atomic numbers. The ash content of coal can be determined by this method.

13821

Potzl, Karl

RESPIRATORY SYSTEM MODEL ANALYZES AIR POLLUTANTS. (Atemtraktmodell analysiert Luftverunreinigungen). Text in German. Umschau, 68(24):757-8, Nov. 1968. 2 refs.

Suspended particles are generally heterogeneous mixtures of chemically and physically differing compounds. In addition, they vary greatly in size. Any study of the effects of such particles on humans must start with the respiratory tract, since this is practically the only way for particles to enter human beings. To facilitate determining the concentration and all physical and chemical properties of the various components, a model was developed which also permits determination of the extent of particle retention in the various parts of the respiratory tract. The model comprises four filters connected in series with staggered retention properties which draw in a measured amount of the particle-laden air. The four filters rest on wire nettings isolated by Teflon disks which measure and record the electric charge of the retained particles. The four filters are designed to retain particles from 0.02 to 6 micrometers in the trachea, bronchi, alveoli, and at exhalation. The results of measurements showed retention of SiO_2 particles from a metallurgical plant mainly in the trachea and bronchi, while only a minimum amount is retained in the alveoli. In contrast, SiO_2 from a mixture of suspended particles in a cement factory was mainly retained in the alveoli.

18130

Alcocer, A. E., L. B. Potter, M. Feldstein, and H. Moore

THE COLLECTION AND ANALYSIS OF INORGANIC DUST DOWNWIND OF SOURCE EFFLUENTS. J. Air Pollution Control Assoc., 19(4):236-238, April 1969. 6 refs.

Two directionally oriented high-volume samplers are used to pinpoint the collection of specific inorganic dusts from an industrial emission. One of the samplers is placed upwind of the source, and the other downwind. Both samplers are activated by winds blowing from the direction of the source of the downwind sampler. Both are de-activated when the wind shifts from the 30 degree sampling arc. Thus, the upwind sampler 'sees' background dust, and the downwind sampler 'sees' material originating from the source. Microsorban filters are used to collect the dust materials. The filter is then dissolved in benzene and the residue washed with benzene to remove the filter material and organic substances collected. The residue consists of dry, inorganic dust, which is then subjected to X-ray diffraction and optical microscopy for analysis. This technique was successfully used to collect and analyze cement dust and mica dust from two separate industrial sources. The technique has promise for the analysis of a wide variety of inorganic materials which can be identified by x-ray diffraction, optical microscopy, or other techniques. (Author's Abstract)

18236

Blezard, R. G., and R. W. Pring

ELECTRONIC TECHNIQUES FOR PARTICLE SIZE ANALYSIS. Minerals Process., 10(6):16-21, June 1969. 3 refs.

The Coulter counter, combined with sieve analysis, has proved to be reliable in determining the particle size distribution of cement raw mixes and cement clinker grinding, providing a high degree of reproducibility between duplicate determination. The electronic approach has revealed significant differences in the particle size distribution in cements and prepared raw materials, particularly where different types of mills are used. Satisfactory results are obtained if the correct choice of electrolyte composition, particle concentration, and instrument settings is made. A 2% solution of lithium chloride in methanol was the best electrolyte. Preparation of the sample for Coulter counter analysis consisted of weighing 10 mg of wet slurry on a microscope slide and adding one drop of Nonidet P 42 solution to assist in mixing the sample. Size analysis was determined using a 200 and a 50 micron tube.

D. AIR QUALITY MEASUREMENTS

07406

Terabe, M.

PUBLIC NUISANCE BY AIR POLLUTION. Text in Japanese Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 2(4):1-6, 1965. 6 refs.

The changes in air pollution problems and pollution by soot, dust, and SO2 are discussed. While soot and dust fall presented the greater problem in the past, SO2 is the present menace. In Yokkaichi city, 90% of the fuel used is petroleum and 400 tons of SO2 gas are emitted each day. A maximum peak of SO2 concentration was recorded at more than 1 ppm in the city. Another problem is automobile exhaust gas. In the past 10 years the number of cars has increased seven-fold. The chemical composition of the air in Tokyo and in Los Angeles are tabulated. The concentrations of CO and SO2 are higher in Tokyo. Measurements of dust and soot fall were made in Kawasaki, Tokyo, and Yokohama. The maximum value was 61.2 tons/sq. km. month in Kawasaki and 56.0 tons/sq. km. month in Tokyo. The biggest generators of dust and soot are the power plants, iron, steel, and cement industries. Dust particles 10 microns in size are radiated to 50 km from a chimney 80 m high by a wind velocity of 3.6 m/sec. The amount of sulfur in heavy oil used in industry is tabulated. Yokkaichi asthma has become an issue since 1962. About 10% of the citizens over 50 has asthmatic disease in 1963 in Isazu in Yokkaichi city. Asthmatic disease increases when SO2 reaches a concentration above 0.3 ppm. Yokohama-Tokyo asthma is also mentioned. SO2 concentration in Kawasaki is higher than in Tokyo. In 1964, the average range was 0.010 to 0.094 ppm in Tokyo and 0.041 to 0.115 ppm in Kawasaki.

21088

Dubrovina, Z. V., S. P. Nikolaev, and N. M. Tomson

EFFECT OF DISCHARGES OF A CEMENT PLANT ON THE POPULATION'S HEALTH. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, vol. 8:110-115, 1963. (B. S. Levine, ed.) CFSTI: 63-11570

Air samples were collected within the range of a cement plant's stack plumes for gravimetric, count, and dispersion determinations. The intensity of atmospheric air pollution with cement dust in the vicinity of the cement plant exceed the dust intensity found in the inhabited region; it was 3-4 times as great as the limit of allowable dust concentration in atmospheric air. Atmospheric air pollution with the cement plant discharges was detected 2000 m from the plant. The results showed that between 41 and 45% of the inhaled cement dust was deposited in the respiratory organs, the amount increasing with the increase in dust intensity. Dust dispersion studies showed that 95% of the cement dust in the air consisted of particles 5 micron in diameter. Particles of this size easily penetrate into the respiratory organs of man. Medical examinations of workers in the cement plant showed an increased frequency in the following morbid conditions: bronchitis, gastritis, gastric and duodenal ulcers, and diseases of the skin and hypodermis. The appearance of a vascular reaction began with the inhalation of 0.5-1.0 mg/cu m of cement dust concentrations. It was concluded that elimination or abatement of cement plant discharges into the atmosphere on inhabited localities can be attained by moving city plants into regions outside the city limits. It can also be controlled by adopting sanitary-hygienic protective means such as complete hermetization of all cement producing processes, installing effective dust catching equipment at all points of dust generation and insuring their proper operation, replacing coal burning with gas burning operations, and increasing the number and extent of park spaces containing trees, shrubs, and other plant life.

E. ATMOSPHERIC INTERACTION

10368

Berlyand, M. E.

METEOROLOGICAL PROBLEMS OF CLEAN AIR PROTECTION. ((Meterologicheskie problemy obespecheniia chistoty atmosfery.)) Text in Russian. Meteorol. i Gidrol. (Moscow), 1967(11):50- 62, 1967. 11 refs.

Causes and control of air pollution in Russia are discussed, as well as research in air pollution. Cement dust emitted in 1964 alone amounted to 1.5 million tons. Large heat and electric power plants are presently installing ash collectors which are 95% effective, but even the small percentage emitted causes significant pollution because of the sheer volume of burned fuel. Desulfurization equipment is lacking. The effect of pollution depends on volume of emission, but more importantly on distribution of the pollutant and meteorology. Ground level temperature and wind velocity measurements are no longer sufficient since so many emission sources are high above ground (200-300 m.). Meteorological studies at the Main Geophysical Observatory are dealing with the first several hundred meters of air and include the development of mathematical equations for atmospheric diffusion from tall emission sources as well as formulas for initial escape velocity of pollutants and for pollution concentration. When an air layer with a weakened turbulence is directly superimposed over the emission source, the concentration of the pollutant more than doubles, while if such a layer is 100-200 m. above the source, the concentration is much less. Results of practical research conducted near the three heat and electric power plants with the tallest stacks in Russia during the period 1961 through 1965, using ground-level and air-borne equipment, agreed with theoretical data and led to the compilation of 'Provisional methods of determining the dispersal in the air of emissions from stacks of electric power plants' which is being applied in planning new power plants. Regular pollution determinations were started in 50 larger cities beginning in 1966, mostly using automatic recording equipment. Results of research in several large industrial cities of the Ukraine, Urals and Siberia have shown that air pollution is greater in cities with unfavorable meteorological conditions; in most cases, pollution is more severe in summer than in winter.

F. BASIC SCIENCE AND TECHNOLOGY

07949

S. Sprung

THE CHEMICAL AND MINERALOGICAL COMPOSITION OF CEMENT KILN DUST. (Die chemische und mineralogische Zusammensetzung von Zementofenstaub.) Text in German with English Abstract. Tonind. Ztg. Keram. Rundschau (Goslar), 90(10):441-449, 1966. 7 refs.

Previous investigations into the effect of dust emitted from cement kilns on vegetation have shown that the chemical and mineralogical properties of that dust are poorly delineated. The results of chemical and mineralogical investigations and measurement of the pH-value of 18 various kiln dust samples show that the alkaline reaction of dust with a PH-value higher than 10 depends primarily on the content of clinker phases. The segregation of dust in electrostatic precipitators leads to an enrichment of clinker phases in the preseparating chamber. Consequently the emitted dust in cleaned kiln waste gas, which corresponds at the best with the composition of the dust in the reseparating chamber of the precipitator, contains no or only small quantities of clinker phases and therefore reacts only slightly alkaline at pH-values lower than 10. The results of the chemical and radiographic analyses are tabulated showing the source of the dust, the chemical composition of the 18 dusts analysed, and the pH of a dust-water suspension.

14506

Hull, William Q., Frank Schon, and Hans Zirngibl

SULFURIC ACID FROM ANHYDRITE. Mod. Chem. Processes, vol. 5: 123-133, 1958. 12 refs. (Also: Ind. Eng. Chem., Aug. 1957.)

The chemistry of sulfate decomposition and differences in cement clinker production are discussed. The effect of decomposition speed, dependence on temperature and additives, particle size, and granular size with gypsum residues from the sulfate decomposition were investigated. In the industrial anhydrite sulfuric acid process, coke is used as a reducing agent and enough aluminum-containing materials are added so that portland cement is produced per ton of acid. Dissociation of the calcium sulfate consists of three stages; CaSO4 plus 2 C yields CaS plus 2CO2; CaS plus 3CaSO4 yields 4CaO plus 4SO2 (the overall reduction process is 2CaSO4 plus C yields 2CaO plus CO2 plus 2SO2); and 3CaS plus CaSO4 yields 3CaO plus 2S2. The CaS and CaSO4 have, at each temperature, a definite decomposition pressure. Additives of clay or similar materials raise the decomposition pressure and the temperature in order to maintain the same decomposition rate. Too much CaS and CaSO4 also lowers the decomposition rate. As far as sulfur dioxide is concerned, this is the end of the process. The rest involves making the cement clinker. A further rise in temperature up to 1400 C completes the reaction between the components and lime, formed during decomposition, to produce a good clinker. Besides an exact adjustment of the proportions of the reduction coke to the anhydrite, the proportions of the added materials to the CaO and to each other must be carefully adjusted within determined limits so that a good clinker results. Even more important, kiln operation must be carried out under steady conditions. Heat consumption for clinker in the anhydrite sulfuric acid process as compared with that of normal portland cement clinker must also be considered. A typical plant and its contact process are described. Production is inexpensive, and cement is sold at market value. There was no difficulty in marketing surplus acid.

19751

Bendinelli, Ralph A.

TESTS OF SANDED GROUTS. EFFECTS OF FLY ASH IN GROUTING COARSE SANDS AND FINE GRAVELS. Army Engineer Waterways Experiment Station, Vicksburg, Miss., TM-6-419, Rept. 5, 16p., April 1963. 2 refs.

Investigations were made to determine whether a fly ash with a carbon content in excess of specification limits would measurably affect the quality of grout in which it is used, and whether a grout mixture of water, cement, and fly ash would more effectively penetrate by pump-injection the voids formed by granular materials than normal neat cement grout (without fly ash), when the fly ash has an amount of material retained on the No. 325 sieve in excess of that permitted by current specifications. Proportioning studies indicated that an addition of 25% fly ash to a portland cement grout produced the optimum fly ash grout mixture. Injectivity test results indicated that (a) the use of the fly ash with a carbon content 8.13% in excess of specifications did not appear to affect the quality of the grout, and (b) the fly ash mixture and the mixture containing no fly ash exhibited essentially the same penetration characteristics. (Author summary modified)

24564

Shepard, N. L.

THE UTILIZATION OF RED MUD WASTE FROM THE ALUMINUM INDUSTRY. Preprint, American Inst. of Mining, Metallurgical, and Petroleum Engineers (AIME), New York, 13p., 1958. 2 refs. (Presented at the Mid-America Minerals Conference, St. Louis, Mo., Oct. 23, 1958.

Bauxite refining in the aluminum industry gives from one to three tons of 'red mud' for each ton of aluminum produced. From 0 to 20% of the red mud may be classified out as sand. At least 60% of the mud has a particle size less than one micron. The fine red mud from high-silica Arkansas bauxite is used in a sinter process to recover soda and alumina, and yields a substantially equal tonnage of 'sinter mud', which approaches the composition of the raw mix for Portland cement and might serve as a raw material for that industry. Red muds from bauxites other than those of Arkansas are not processed through the sinter step. Titanium minerals occur in Arkansas mud in two generations: discrete grains of manganiferous ilmenite, and dispersed leucoxene. The titanium content of the muds from Suriname and Caribbean bauxites is all in the dispersed form. Red mud from Arkansas bauxite contains from 0.1 to 0.2% columbium pentoxide which is too finely dispersed to permit mechanical concentration. Many proposals have been investigated but no large scale use for red mud (other than in the sinter process) or sinter mud has been developed to date. Because of the small particle size, it is probable that any recovery of values from red mud will be based on chemical decomposition or on smelting. (Author abstract modified)

G. EFFECTS-HUMAN HEALTH

06896

S. A. Davydov

CERTAIN PHYSIOLOGICAL CHANGES IN CHILDREN EXPOSED TO ATMOSPHERE WHICH HAS BEEN POLLUTED BY CEMENT WORKS. (O nekotorykh fiziologicheskikh sdvigakh u detei v usloviyakh zagryaznenmogo tsementnymi zavodami atmosfernogo vozdukha.) Hyg. Sanit. (Gigiena i b8sanit.) 30 (10), 7-12 (Oct. 1965) Russ. (Tr.)

The effects of cement dust on children were investigated. Physiological reactions in children age 10 to 12 who lived at distances 0.5 and 2 km from cement work sites for at least five years and also children living at control points are examined. The mean dust concentrations in the air are 1.48 mg/cu m at a distance of 0.5 km from the work site, 0.49 mg/cu m at a distance of 2 km and 0.3 mg/cu m at the control point. Practically healthy children residing in a dusty atmosphere for a prolonged period exhibited a reduced excitability of the olfactory analyzer and of the vegetative nervous system. They also exhibited an enhanced migration of leukocytes to the surface of the nasal and conjunctival mucosae and increased desquamation of epithelial cells. The changes in the physiological parameters were obviously due to the effect of the cement dust on the exteroceptors.

07571

Retnev, V. M.

OCCUPATIONAL HYGIENE AT AN AUTOMATED ASPHALT-CONCRETE FACTORY. (Gigiena truda na avtomatizirovannom predpriyatii po proizvodstvu asfal'tobetona.) Text in Russian. Gigiena i Sanit., 30(8), July 1965. 2 refs. Engl. transl. by JPRS, Hyg. Sanit., 30(7):133-136, July 1967. CFSTI: TT66-51033/3

A study of the working conditions at the factory revealed dust concentrations at the control panel of 9 plus or minus 2 mg/cu.m. The working conditions were more favorable from a hygienic standpoint than those in old factories, as indicated, for instance, by the concentrations of dust and carbon monoxide in the air. At the same time, one cannot ignore the presence of dust containing free silicon dioxide, the concentration of which was somewhat in excess of the maximum permissible concentration (4 mg/cu.m. allowed by Sanitary Standards SS 245-63). The measures required for other sections of the factory include thermal insulation of heated surfaces (to keep the external temperature down to 35 C); installation of air showers at the worksite, at the boilers for heating the petroleum bitumen, and at the drying drums; hermetic sealing of dust-producing equipment; and application of suction to ball mills, screens, mixers, and batchers. The noisy general equipment (ball mills) should be housed in a separate hall. The noise must be reduced in all sections of the factory, this being the management's most difficult task at present. Workers who come into contact with the dust must undergo mandatory periodic medical examinations. Some of the measures for improving the working conditions suggested to the management have already been implemented.

09004

Symon, Karel, Vladislav Kapalin, Olga Absolonova, and Ludmila Moudra

STUDY OF THE INFLUENCE OF AIR POLLUTION ON THE HEALTH OF CHILDREN IN BEROUN AND KRALUV DVUR. ((Studium vlivu znecisteni ovzdusi v Beroune a Kralove Dvore na zdravotni stav deti.)) Text in Czech. Cesk. Hyg. (Prague), 5(2/3):88-99, 1960.

Children (aged 2-13) were examined for 2 yrs. in two Czechoslovak cities (Beroun and Kraluv Dvur) where air pollution from smoke of cement factories and ore processing plants is high (exceeding 1000 tons/sq. km./year). Growth, erythrocyte count, hemoglobin level, alkaline phosphatase count, albumin/globulin ratio, protein levels, and blood color were measured and compared with normal levels. The air pollution definitely affects the children's health, seen in the higher incidence of diseases, as well as in the deviation of the studied parameters from normal values. These parameters are suggested for use in health studies of areas with air pollution. The results of this study are used as a convincing argument for the implementation of air pollution control measures.

16246

Reiter, R.

ELIMINATION OF ELECTRIC CHARGES IN THREE SECTIONS OF THE HUMAN RESPIRATORY TRACT WHEN INHALING VARIOUS INDUSTRIAL AEROSOLS. (Studie ueber die Abscheidung elektrischer Ladungen in drei Abschnitten des menschlichen Atemtraktes bei Einatmung unterschiedlicher Industrieaerosole). Text in German. Zentr. Aerosol-Forsch. V (Stuttgart), 13(7):3-19, Nov. 1967. 43 refs.

The electric charge of inhaled aerosol particles may influence the precipitation process in the respiratory tract and may have a biological effect. It is known that negative charges, if precipitated in sufficient amounts, accelerate the ciliary movement; positive charges hamper the movement and cause muscle cramps in the trachea. The distribution of electric aerosol charges in the respiratory tract was determined with a respiratory tract model. The model simulates retention of thee particles contained in a polydisperse aerosol in three sections of the respiratory tract: the trachea, the bronchi, and the alveoli; it also indicates the amount of dust exhaled again. The measurements were taken in the smoke plumes of various industrial plants (cement factory, kaolin plant, sintering plant, converter). It was found that the charges found in the various stages and the ratios to each other differed greatly and depended on the type of aerosol source. A grouping according to charge polarity was observed in the respiratory tract, even in the case when the aerosol cloud appeared to be neutral. The electrical surface charge in the respiratory tract was in some cases far above the threshold of biological effects as known from the literature.

16558

Barhad, B., M. Tai, C. Simionescu, and V. Mirea

RESPIRATORY FUNCTIONAL CAPACITY UNDER THE INFLUENCE OF DUSTS, AT REST AND AT WORK. (Capacite fonctionelle respiratoire sous l'influence des poussieres, au repos et a l'effort). Text in French. Arch. Maladies Profess. Med. Trav. Securile Sociale (Paris), 30(9):493-503, Sept. 1969. 28 refs.

The effects of inhalation of dust-bearing air was studied with 0 to 10, 10 to 25, 25 to 50, 50 to 100, more than 100, and 300 to 500 mg/cu m of cement dust with 70% of particles of less than 1 micron mean diameter, on the ventilatory capacity of 25 men, 20 to 25 years of age free of any pulmonary afflictions and never exposed to any dusts before this study, and on that of 41 miners, 30 to 45 years of age who had been working for various lengths of time before this study on the bottom of a zinc and a lead mine. Silicosis was presented in 39 of the latter in various stages of advancement, while all others were found to be free of pulmonary pathological modifications. Tests were made of the ventilatory capacity, which consisted of determining spirographic parameters, using a Godart spirograph, with and without bronchial dilatation by aleudrine; percentages of absorbed 02 and eliminated CO2; and oxyhemoglobin saturation during an exertion test. During the latter, the subject breathed dust-bearing air for 20 minutes through a respiratory mask connected by a flexible tube with an air dusting chamber the dust content of which was controlled by a tyndallometer, the five-minute exertion test being started 5 min after the start of the dust exposure. The results of this series of tests show that the dust had a direct effect on the respiratory functions of all subjects. Among the spirographic parameters, the 'vital capacity' constitutes a sensitive indicator of the effect of dust. As long as the dust content of the inhaled air is less than 50 mg/cu m, almost one-half of the subjects react by a lowering of their vital capacity. At dust contents above 50 mg/cu m, the proportion of those with lowered vital capacity is higher, and with subjects never exposed to dust before this study, a high dust content of air (300 to 500 mg/cu m) leads to a lowering of the vital capacity of 80% of them.

22990

Yano, Ryoichi, Ichiro Hata, and Toshiro Nakajima

FREQUENCIES OF COMPLAINTS OF RESPIRATORY DISEASES IN AIR POLLUTED AREA. (Taiki osen chiku ni okeru kokyukishojo chosa. I. Tsukumi-shi no baai). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 4(1):49, 1969. (Proceedings of the Japa Society of Air Pollution Annual Meeting, 10th, 1969.)

Tsukumi is a town devoted to the production of limestone and cement and the people complain much about the white dusts that rise from the factories. Oita Prefecture Medical Assoc. and Tsukumi Medical Assoc. conducted a city-wide questionnaire survey of kindergarten, grammar school and junior high school pupils concerning the respiratory afflictions caused by dust particles. The samples were drawn from industrial and residential areas. Examination of the individual with regard to the history of pneumonia and bronchitis showed that people in the industrial area are more prone to respiratory illness and the morbidity is higher, the lower the age. Other investigations including radiography and breathing test indicated that compared to the results obtained from other non-polluted areas, there are slightly more respiratory ailments among pupils in Tsukumi, but not at a statistically significant level.

23148

Nose, Yoshikatsu and Nobuko Tokojima

ON THE YEARLY ANALOGY OF AIR POLLUTION BETWEEN UBE-ONODA REGION AND TOKUYAMA-NANYO REGION. (Ube-Onoda chiku to Tokuyama-Nanyo chiku taiki osen no tsuinen no ruijika ni tsuite). Text in Japanese. Yamaguchi Idai Sangyu Igaku Kenkyusho Nenpo (Ann. Report Res. Inst. Ind. Med., Yamaguchi Med. School), no. 16:217-220, 1969. 5 refs.

Mining-industrial cities Ube and Onoda are known as the cites of dust pollution, and Tokuyama and Nanyo of the petrochemical industry are polluted by gaseous pollutants. However, the recent trend in the soluble and non-soluble components of the pollutants, the seasonal wind direction, the decline in the use of coal in Ube and Onoda, and the general tendency in the industry to use more and more petroleum, have all contributed toward the increasing similarity in the nature of pollution in the two groups of cities. In addition, the similarity of the rates of chronic bronchitis affliction in the two general areas indicate that it is related to the similarity of the proportions of soluble components in the settling dusts, especially the pH values, in Ube and Nanyo, and Tokuyama and Onoda. This can be seen in the regression line of the bronchitis affliction rate versus the pH of soluble components, the data points being taken from all four cities and other major bronchitis-prone cities as Yokkaichi and London.

24392

Novakova, Eliska

THE INFLUENCE OF INDUSTRIAL POLLUTION ON ANIMAL COMMUNITIES AND THE USE OF ANIMALS AS BIO-INDICATORS. (Influence des pollutions industrielles sur les communautes animales et utilization des animaux comme bioindicateurs). Air Pollution. Proc. First European Congr. Influence Air Pollution Plants Animals, Wageningen, Netherlands, 1968, p. 41-48. 9 refs. Translated from French. Belov and Associates, Denver, Colo., 11p., Sept. 15, 1970.

Analyses made on blood samples from hares shot during the fall hunting season confirmed the possibility of using hares as indicators of industrial air pollution and of the presence of certain pesticides. The distribution of harmful emissions can be estimated by analyzing some elements of the erythrocytes (hemoglobin, hematocrit, and eventually globular saturation). In general, the blood values decrease with increased pollution, except in a few cases of very high SO2 emissions. The pH of the urine varies: in cement-producing areas, it is over 7.0; in SO2 areas, it is below 7.0. A good practical criterion is the multiplication coefficient calculated from the number of young and full-grown hares killed. For hares in an area of mixed ash and sulfur dioxide pollution, the multiplication coefficient was 30% lower than for controls. In contrast, the coefficient was higher by 35% in an area rich in cement dust. The present investigations, which covered mainly the influence of gaseous SO2 and hydrogen fluoride, point to a decrease in the number of insects (without an actual decrease in the number of species) with increasing pollution. The differences in the taxonomic groups are not pronounced: the decrease in number is almost uniform in all categories. However, a slight increase was noted in the Phytophaga in the most polluted zone and in the Zoophaga in a less polluted zone.

24708

Einbrodt, H. J., H.-J. Dietze, E. Korchhoff, W. Oberthuer, and D. Hentschel

DUST FALL IN THE VICINITY OF CEMENT FACTORIES AS IT RELATES TO POSSIBLE HEALTH HAZARDS; PART 2. (Ueber den Staubanfall in der Umgebung von Zementwerken im Hinblick auf moegliche Gesundheitsschaeden. II. Mitteilung). Text in German. Arch. Hyg Bakteriol. (Munich), vol. 151:211-220, Aug. 1967. 13 refs.

The properties of cement dust of interest to the biologist are discussed and the dust content of cement plants analyzed, together with an analysis of its chemical and mineralogical composition, attention is given to the effects of the dust on human health. Despite excessively high concentrations of this dust in the respiratory tract, fibrous changes in the lungs of people residing in such an area is not attributed to the presence of Si02, due to the relatively low quartz content in the dust. Preliminary studies of the incidents of bronchitis indicate that women residing in the cement plant area do not experience a higher bronchitis rate than those residing in other communities of a comparable size. When the data were broken down according to the seasons of the year, there was again no significant difference to be found in the comparison. When classified in terms of age, however, it was discovered that the bronchitis rate reached a peak among younger people in areas not related to the cement industry, while there was a higher incidence among older people in the area adjoining the cement plant.

H. EFFECTS-PLANTS AND LIVESTOCK

00127

E. F. Darley

STUDIES ON THE EFFECT OF CEMENT-KILN DUST ON VEGETATION. J. Air Pollution Control Assoc. 16, (3) 145-50, Mar. 1966.

Most of the recent work on the effects of cement-kiln dust has been confined to Germany and results differ considerably. There appears to be little doubt that naturally deposited dust from certain cement plants is responsible for leaf injury to deciduous and coniferous species and occasionally for death of the latter. Injury results from the combination of a relatively thick crust deposit and the toxicity of alkaline solutions formed when dusts are deposited in the presence of free moisture. The results of several hand-dusted field experiments, however, are not so conclusive; dusts are reported as either harmful, harmless, or even indirectly beneficial. In the present laboratory investigation, the comparison of CO2 exchange in the leaf between dusted and nondusted leaves, as well as occurrence of obvious tissue damage, were used as the criteria of dust effects in short term experiments. The results demonstrated that the finer particles of certain cement-kiln dusts collected from electrostatic precipitators do interfere with CO2 exchange and in some cases cause considerable leaf injury . The results further suggest that calcium content alone may not be the only indicator of whether a dust might be injurious, and that much more needs to be known about the effects of the interaction of chemical composition, particle size, and deposition rate. (Author)

03224

Raymond, V. and R. Nussbaum

ON CEMENT-PLANT DUST AND ITS EFFECTS ON MAN, PLANTS AND ANIMALS. ((A propos des poussieres de cimenteries et leurs effets sur l'homme, les plantes et les animaux.)) Pollut. Atmos (Paris), 8(31):284-294, July-Sept. 1966. 39 refs. Translated from French. Joint Publications Research Service, Washington, D. C., R-8979-D, 11p., Jan. 16, 1968.

A summary is given of the principles of cement manufacture during which dust is produced (consisting of fine powders of partially decarbonated calcium carbonate, silicates, and sulfates) and the studies of the dust's effects on plants (little importance with respect to wild animals). Lung diseases, bronchitis, and emphysema have been noted among cement workers, but negative results were obtained from the rare studies of the neighboring population of cement works. The paper is a summary of classical information in the field. (Authors' summary)

03849

E. F. Darley

STUDIES ON THE EFFECTS OF THE DUST FROM A CEMENT FURNACE. Studi Sugli Effetti Della Polvere di Cemento da Fornace. Fumi Polveri (Milan) 6, (1)) 274-81, Oct. 1966. Text in It.

Experiments were made in Germany on the effects of powder (or dust) from cement furnaces on the leaves of green beans. The leaves were sprayed with powder (from 0.6 3.8 g/sq m) for a period of 8 hr. The spraying was done for 2-3 days. Humidity was increased in the area of the leaves during the major part of the experiment. The method used for applying the powder allowed only the finest particles to be deposited on the plants. Later it was established that most of the particles were less than 10 micron in diameter. The criterion for determining the effect of the powder was by comparing the rate of exchange of CO2, or the apparent photosynthesis, between the leaves that were covered with dust and those that were not. All three powders used in this experiment (the powders containing varying amounts of SiO2, Al2O3, TiO2, P2O5, Fe2O3, Mn2O3, CaO, MgO, SO3, S, K2O, Na2O, Cl, CO2, C, H2O) reduced the rate of exchange of CO2 and in most cases this was reduced by more than 30%. One of the powders caused considerable damage to the leaves, probably because KCl was present in a high concentration. The powders differed considerably in their chemical composition, in particular in Ca, K, and sulfates, and since the chemical composition varies with the size of the particle, the reciprocal action of composition and size and the rate of deposit, require an accurate investigation.

06641

A. T. Czaja

ON THE PROBLEM OF THE EFFECT OF CEMENT DUST ON PLANTS. STAUB (Duesseldorf)), 22 (6), 228-32 (1962). Ger. (Tr.) (Translated as JPRS-R-8486-D.)

The investigation of plants in the sedimentation area of several cement factories definitely proved the formation of cement crusts on the leaves and needles of a wide variety of plants, in other words, it proved the direct action upon the plants. The lime hydrate, which is released during the setting of the cement dust with the water on the surface of the leaf epidermis, however, by definition of the term toxins is a very strong caustic poison and, after penetration through the stomas of the conifer needles or penetration of the upper epidermis of leaves that only have stomas on the other side, directly corrodes the living content of the leaf cells and thus directly damages the plants (leaves). A critical review of the literature and the investigations described here tell us that previous investigations using artificial mechanical dusting of cement preparations over plants, under uncontrolled weather conditions, are not suitable for reasons of methodology and because of the selection of the location for the experiment; these methods are thus not suitable in answering the question as to the direct effect of cement dust upon the plants in the vicinity of cement factories. The action upon the soil is not discussed here.

10914

A. T. Czaja

EFFECT OF DUSTS, SPECIFICALLY CEMENT KILN DUST, ON PLANTS. ((U- ber die Einwirkung von Stauben, von Zementofenstaub auf Pflanzen.)) Translated from German. Source unknown, pp. 106-120, ((1966)), 8 refs.

The 'aggressive' propensities of cement kiln dust on living cells are examined. The cells discussed included those of the human and animal organisms, but specifically those of plants. Through pictures and graphs of the reaction of cement kiln dust with water, the author shows that chemicals harmful to living cells are pro duced. The Mnium test is expounded as a means of identifying the farmful types of dust, which are highly alkaline and resistant to carbonatization, therefore calling for precautionary measures.

11434T

Schoenbeck, H.

THE EFFECT OF INDUSTRIAL EMISSIONS ON THE SUSCEPTIBILITY OF PLANTS TO DISEASE. ((Beobachtungen zur Frage des Einflusses von industriellen Immissionen auf die Krankheitsbereitschaft der Pflanze.)) Translated from German. Berichte aus der Landesanstalt fur Bodennutzungsschutz des Landes Nordrhein-Westfalen, ((1962?)) 89-98. 28 refs.

The effect of cement mill dust (containing 36% CaO, 15% SiO2) from an electrostatic precipitator on the susceptibility of sugar beet plants to disease was studied in field tests. Scale sketches were made of random samples of beet plants on dusted and non-dusted plots of ground, and a leaf destruction rating, ranging from 0 to 4 was applied. The data and their statistical evaluation are tabulated. The results showed that the incidence of cercospora leaf-spot disease (cercospora beticola) was enhanced in the presence of dust. Also the beet yield from the dusted areas was lower. The cause of the intensified attack by the cercospora fungus was found in the disturbance of the plant's physiological equilibrium due to the dusting. No effect of the dust on sugar content was found but undusted leaves had a higher carotene and crude protein content.

16157

Bergmann-Lehnert, Ilse

METHOD FOR DETECTING DUST DEPOSITIONS ON LEAVE SURFACES. (Methoden zum Nachweis der Verschmutzungen von Blattoberflaechen). Text in German. Wiss. Z. Tech. Univ. Dresden, 11(3):571-574, 1962. 7 refs.

Dust emissions from industrial plants affect vegetation in various ways: the incident light may be attenuated; the soil may be changed chemically; the leaves may be injured by deposition of toxic dust; and plant assimilation may be weakened by crusts of indifferent dusts on the leaf surface. In the latter case, objective determination of the degree of dust settlement on the leaves is necessary. An exact replica of the leaf surface is used without dislocating the dust particles. A simple method proved to be very efficient for field tests. Adhesive tape is applied to the leaf or leaf section and pressed on with the finger to avoid any air bubbles. A folder with a larger number of loose leaves of oleate paper is recommended for collecting the leaves. They dry out less rapidly if stored this way, which is important for the removal of the tape. For the microscopic study, another adhesive tape of the same width is applied to the replica, which can be placed into glycerine gelatine, Canada balsam, and glycerine chloral hydrate. For isolation of the dust particles for a physical or chemical analysis, the tape is put into benzene or xylole. The light attenuation by the dust from a cement kiln on an ivy leaf was measured; it reached more than 50%.

17977

Pajenkamp, H.

EFFECT OF CEMENT KILN DUST ON PLANTS AND ANIMALS. (Einwirkung des Zementofenstaubs auf Pflanzen und Tiere). Text in German. Zement-Kalk-Gips (Wiesbaden), 14(3):88-95, 1961. (Presented at the fall meeting of the Association of the German Cement Industry, Sept. 13, 1960, Salzburg.)

Various tests for determining the effect of cement kiln dust on plants and animals are reviewed. Cattle, sheep, and rabbits fed with fodder laden with dust from a nearby cement kiln for 60 days showed no effects. Each animal received between 2.5 and 11 g cement kiln dust per day. In a second series of experiments, the daily consumption of dust was increased to 33 g. But again, no clinical symptoms were observed. At the end of several other experiments, it was concluded that this kind of dust has no pathological effect on animals. Field experiments conducted in 1958/1959 by the Agricultural Chemical Institue, Goettingen with clover, oats, beets, and darnel also showed no direct influence of the cement kiln dust on the growth of these plants. An average quantity of 0.75 g of dust was strewn over the plants per square meter per day. The dust contained 29.3% CaO and 3.1% K2O. The alkaline components of the dust raised the pH of the soil. It is recommended to fertilize such soils with an acid fertilizer.

19460

Scheffer, Fritz, Eberhard Przemeck, and Werner Wilms

INVESTIGATIONS PERTAINING TO THE INFLUENCE OF AIRBORNE DUST COMING FROM CEMENT FURNACES ON SOIL AND PLANTS. (Untersuchungen uber de Einfluss von Zementofen-Flugstaub auf Boden und Pflanze.) Staub (Duesseldorf), 21(6):251-254, 1961. 8 refs. Translated from German by Belov and Associates, Denver, Colo.

The effects of cement furnace dusts on plants and soil were investigated. Barley, German weidel grass, sugar beets, and Hungarian red clover were used in the experiments. No damage to the plants was observed over a two-year period. The soil pH increased, and during the second year, when the cement dust had a high potassium content, its lactate soluble K20 content increased with increasing dust quantity. Barley showed a small decrease in yield with increasing dust. For the German weidel grass and Hungarian red clover, the increased alkalinity caused by the dusting process had a favorable effect on the mass yield. Sugar beets also showed an increased mass yield, and the plant contents remained unchanged. The possibility exists of an indirect influence on plant yield and the substances contained in the plants by the soil and by changes in the soil reaction and nutrient. Under certain circumstances this may lead to impairment of plant production. The dust sedimented in the vicinity of cement factories appears to have no immediate danger for plants as long as its influence can be counteracted at the right time. The best counteraction can be achieved by the application of physiologically acid fertilization.

21293

Przemeck, E.

EFFECTS OF CEMENT KILN DUST PRECIPITATION ON SOILS USED FOR AGRICULTURAL PURPOSES. (Wirkungen von Zementofenstaub-Immissione auf landwirtschaftlich genutzte Boeden). Text in German. Zement-Kalk-Gips (Wiesbaden), 59(3):119-124, March 1970. 7 refs. (Presented at the meeting of the Committee on Emissions of the Association of the German Cement Industry, Duesseldorf, Feb. 5, 1970.)

It is known today that airborne dusts from cement kilns affect the soil chemically, physically, and biologically through the calcium and potassium content. The quantities of these components vary in dusts from different kilns. Free CaO is converted to carbonate in the soil within a short time. The effect of dusts emitted from cement kilns was studied over a period of six years with five different soils. They ranged from humus-rich to humus-poor soils of clay to sandy composition. In the first two years, red clover was grown, followed by sugar beet, wheat, rye and rape-seed. The dust applied to the soil consisted of 38% CaO and 10% K2O. In the upper 15 cm of all types of soils, an accumulation of lactate soluble potassium was observed. In the sandy soil, more potassium penetrated to lower depth than with the clay types of soil. The presence of calcium raised the pH of the neutral to weakly acid soils and changed the content of active manganese and of water-soluble boron. It became apparent that the processes going on in the soil counteract the effect of the calcium brought into the soil with the cement kiln dusts so that the annually precipitated amounts do not compare in their effect with fertilization. Sugar beet, wheat, and clover which require neutral to alkaline pH grew better in the dust-sprayed soils than in the control soil, while rye reduced its yield.

24308

Mammarella, Luigi

PRINCIPAL EFFECTS OF POLLUTION AND DETERIORATION PHENOMENA DUE TO AIR POLLUTION. (I principali effetti degli inquinamenti e i fenomeni di deterioramento dovuti alle contaminazioni dell' aria). Text in Italian. In: L'inquinamento Atmosferico in Italia. Rept. 27, p. 54-69, 1970. 110 refs.

The effects of pollution on human health, on natural resources and the economy, on building materials, and on plants and animals are reviewed. Reduced visibility and climatic changes resulting from air pollution ar also discussed. Among the materials damaged by pollution, the following are mentioned: building stone, textiles, metals, paints, rubber, leather, and paper products. A list is given of types of plants that are highly sensitive, moderately sensitive, and resistant to sulfur dioxide and to the fluorides. A tabulation is also given of the climatic effects of dusts and aerosols, SO2, carbon dioxide, and carbon monoxide, quoted from an American author.

25906

Strenk, F., A. Haba, and A. Rohovetsky

DOSING OF SMALL AMOUNTS OF DUST BY MEANS OF A DOSATOR WITH A GRANULAR BASE. (Dozirovaniye malykh kolichestv pyli s pomoschch'yu dosator s zernistym nositelem). Text in Russian. Gigiena i Sanit., no. 7:87-89, 1970. 5 refs.

An abrasion-resistant granular material (plastic) is used to carry test dust into a fluidized bed from which the dust is then carried by Bernoulli effect into an animal test chamber. Tests with cement, talc, and asbestos gave delivery rates stable within plus or minus 4%.

25964

Holobrady, K. and J. Toth

THE PROBLEM OF CEMENT FACTORY DUST FROM THE AGRICULTURAL STANDPOINT. Contemp. Agr. (English translation from Serbo-Croati of: Savremena Poljoprivreda), 17(7-8):87-96, 1969. 26 refs. NTIS: TT 69-51001/7-8

The greatest sources of dust pollution in Czechoslovakia are cement factories with rotary furnaces, discharging almost 100,000 tons of dust into the air annually. Dust discharge have an undesirable effect on the thermal balance of furnaces and, moreover, lower the production of clinker. If escaping dust can be trapped, there is the possibility of using it as fertilizer, because of its lime and potassium content. Samples of solid aerosols were obtained by means of passive sedimentation at sites distributed over areas subject to the influence of airborne particles from cement factories. Chemical tests were made using silicate analysis methods and spectrography. The pH factor was measured, and the rate of accumulation of organic carbon was determined. From the agricultural viewpoint, the following compounds obtained from passive sedimentation are of interest: calcium oxide, magnesium oxide, potassium monoxide, sodium monoxide, silicon dioxide, and the trace elements copper, boron, zinc, manganese, and molybdenum. The depression in the accumulation rate of organic carbon after the formation of an even layer of dust demonstrates that solid aerosol particles affect photosynthesis. On an electron microscope photograph, chloroplasts of dust-contaminated leaves have a blurred outline and the tilacoids are difficult to discern. While the action of dust pollution on sugar beet did not affect the yield, it did influence the quality of the beet.

I. EFFECTS-MATERIALS

19353

Schaffer, R. J.

ATMOSPHERIC POLLUTION IN ITS BEARING ON THE WEATHERING OF STONE AND SIMILAR BUILDING MATERIALS. In: Investigation on Atmospheri Pollution. Dept. of Scientific and Industrial Research, Cambridge (England), Rept. 2S, p. 111-121. 1960 (?).

Atmospheric pollution affects building materials in two ways: soot adheres to the surfaces, causing discoloration and disfigurement, while sulfur dioxide and ammonium sulfate bring about chemical changes. Except with magnesian limestone, the appearance of efflorescent salts on the surface of the stone indicates that the decay is to be attributed to some cause other than, or in addition to, atmospheric pollution, but the reverse statement does not apply. Buildings in towns are more disfigured by soot than those in country districts, and there are marked differences in behavior between different materials. With sandstones of good quality, surface erosion does not occur and washing by rain is not effective in preventing soot deposition, while the degree of discoloration of limestones by soot varies with the aspect and degree of exposure. The only mineral constituents of building stones that are significantly affected by the acids in the air and rain water are the carbonates of lime and magnesia. Suitable choice and use of materials is the first safeguard against decay but is of little avail against discoloration by soot; those building stones that suffer most seriously in this respect are among the most durable. Oil paint, applied when the stone is dry and renewed every few years, has good protective qualities; limestone buildings can be hosed down with water at intervals; and the inhibition of skin formation and the removal of decomposition products should also enhance durability.

20421

Brenner, Raymond C, Richard Hooker, K. K. Stevens, Carlton Strong, and E. B. Lee

PAPERS ON THE EFFECT OF SMOKE ON BUILDING MATERIALS. Pittsburgh Univ., Pa., Mellon Inst. of Industrial Research and School of Specific Industries, Bull. No. 6, 1913, 58p. 7 refs.

Not until the general public is awakened from its apathy will the smoke nusiance, the greates blot on our industrial centers, be eliminated. Data has been accumulated for the following topics: chemistry of soot and the corrosive products of combustion; effect of smoke on outside painting; effect of smoke on paint coatings; effect of smoke on stone; stone and the smoke nuisance with special reference to the protection of stone; effect of smoke on metals; the question of light and smoke; the effect of smoke on the interior of buildings; and limitations placed by smoke upon the means of architectural expression. This monograph addressed to the general public presents the facts about air pollution by combustion products of bituminous coal as they were known in the year 1912. The papers on the effect of smoke on paint coatings are based on work done for the National Paint Manufacturers' Association. The last three papers describe the effects of covering of skylight windows, lighting fixtures, wall paper, painted interior walls, lace curtains, silk hangings, floor coverings, etc. etc. by soot, In general, the simplest possible form of architecture is to be advised. Under-cutting, delicacy of incised line and sharpness of angular forms must be forgone, for the soot deposited will, in time, fill up the crevices and mar the beauty of the outline, causing considerable alteration of the original forms and make the building degenerate into a mere mass of dirty, shabbey masonry.

20507

Pepper, Leonard

INFLUENCE OF ALKALI CONTENT OF FLY ASH ON EFFECTIVENESS IN PREVENTING EXPANSION OF CONCRETE. Army Engineer Waterways Experiment Station, Vicksburg, Miss., TR-6-627, 26p., June 1963. 6 refs. CFSTI, DDC: AD 687367

Eight mixtures containing various ratios of high- or low-alkali fly ash and cement, and two control mixtures were made to determine the influence of the alkali content of fly ash on its effectiveness in preventing expansion of concrete due to alkali aggregate reaction. Mortar bars made from the mixtures were cast and their lengths measured at 2, 14, and 28 days, 6 months, and 1 year. Data from this and a previous investigation using a medium-alkali fly ash indicated that the approximate minimum percentage replacements of portland cement needed to reduce expansion of mortars made with high-alkali cement and very reactive aggregate by 75% at 14 days for the low-, medium-, and high-alkali fly ash are 33, 46, and 47%, respectively. Although the high-alkali fly ash will increase the expansion of an inocuous combination, the expansion will not be so great as to render the resulting mixture deleterious. The data from the mortar-bar expansion test were too variable, both within and between batches, for the test to be used in research on aggregate reactions in concrete. Results of this investigation did not confirm conclusions from an earlier study, and indicate the need for further research. (Author abstract modified)

21473

Moraru, D. and I. Timar

ATMOSPHERIC AGGRESSION TOWARD CONSTRUCTION MATERIALS ALONG THE BLACK SEA COAST OF RUMANIA AND ITS CLASSIFICATION BY ZONES. (Agresivitatea atmosferica asupra constructiilor de pe litoralul romanesc al Marii Negre si zonarea ei). Text in Romanian. Revista Constructiilor si a Materialelor de Constructii, 20(10):527-535, 1968. 1 ref.

Atmospheric salinity, influenced by the salt content of the Black Sea is measured and studied; the area up to 20 kilometers from the coast is divided into zones, on the basis of the need for protection of certain building materials (metals and concrete) affected by the atmospheric salinity.

22410

Buchanan, D. R.

THE CORROSION OR DETERIORATION OF CONCRETE. Australasian Corrosion Eng., 14(5):5-15, May 1970. 9 refs. (Presented to the Australasian Corrosion Association, 10th Annual Conference, Perth, Nov. 10-14th, 1969.)

Concrete consists of two materials, aggregate, and sands and pastes (water and cement). Concrete deterioration is a result of either internal agents (incorrect mixing or material selection) or external agents or environments which affect the durability of the cement paste. Internal agents which affect aggregates include organic impurities, sulfide ores, sulfate minerals, and alkali reactive materials. Water can be contaminated by suspended matter, or by various salts and other chemical compounds. Chemical attack of concrete is carried out by sulfates, sea water, acids, and frost. Impermeability of concrete will protect it from many chemical attacks. Fire or other severe temperature exposure can crack concrete due to differences in thermal expansion. Various types of cement are tabulated, as well as the effects on concrete of many chemical compounds.

25465

Winkler, E. M.

THE IMPORTANCE OF AIR POLLUTION IN THE CORROSION OF STONE AND METALS. Eng. Geol., 4(4):327-334, 1970. 11 refs.

Evidence is presented that polluted air not only affects life but also stone, concrete and metals as well. The important corrosive agents in the process of weathering, however, are Carbon dioxide, sulfur dioxide and sulfur trioxide combined to sulfates, chlorine and possibly nitrogen dioxide. Carbon dioxide is considered the most important ingredient, whereas carbon monoxide and the organic irritants aldehydes and ketones are only of minor importance as stone corrodents. Evidence is presented that the ionic increase almost doubled in the Great Lakes St. Lawrence River drainage basin, whereby about 20-50% of the ions are believed to be contributed from polluted atmospheres surrounding the lakes. Improvement of automotive combustion will eliminate toxic CO and smog-producing unburned hydrocarbons, but on the other hand will augment CO2 and NO2 to such a high level that the corrosion of stone and metals probably will increase rapidly unless a switch to new power sources is accomplished. (Author summary modified)

J. EFFECTS-ECONOMIC

15889

Kohn, Robert E.

A MATHEMATICAL PROGRAMMING MODEL FOR AIR POLLUTION CONTROL. School Sci. Math., June 1969:487-494. (Presented at the Central Association of Science and Mathematics Teachers, Annual Convention, St Louis, Nov. 30, 1968.)

Mathematical models are proposed for computer processing to determine the least possible cost of pollution controls in an airshed. Advantages of the models are their simplicity, emphasis on economic efficiency, and appropriateness for the type of data normally available. One model considers a hypothetical airshed for a single industry, cement manufacturing. Annual production is 2,500,000 barrels of cement; two pounds of dust are emitted for every barrel produced. The least cost solution to the emission problem would be to install a four-field electrostatic precipitator on kilns producing 1,000,000 barrels and a five-field precipitator on kilns producing 1,500,000 barrels. A second model concerns the five major pollutants in the Saint Louis airshed in 1970: sulfur dioxide, carbon monoxide, hydrocarbons, nitrogen oxides, and particulates. Among the possible control methods included in the model are exhaust and crankcase devices for automobiles, the substitution of natural gas for coal, catalytic oxidation of sulfur dioxide to sulfuric acid at power plants, and the use of low sulfur-content coal. Pollution reduction requirements are itemized. The computer-derived solution of this model indicates the cost and efficiency of each reduction method. A third model evaluates the effects of air pollution on humans, vegetation, and materials. It can be used to determine whether the relative damaging effects of pollutants are proportional to their control cost.

17203

Oels, Heinriche

AIR POLLUTION PROBLEMS IN WEST GERMANY AND THE ROLE OF INDUSTRY. (Luftforurensningsproblemer i Vest-Tyskland industriens innsats). Text in Norwegian. Tek. Ukeblad (Oslo), 116(45):1245-1247, Dec. 1969.

West Germany has been occupied in the last decade with reducing emissions of dust and smoke. Effectiveness of dust filters has increased threefold, and filtration is more economical. The dust content can now be reduced to 150 mg/cu m for an emission rate of 100,000 cu m/hr. In 1950, the dust output from the West German cement industry was 3.5% of the clinker produced; in 1967, it was 0.15%. Dust output from the manufacture of calcium carbide was reduced to 3 mg/cu m of exhaust gases. Attention now centers on reducing sulfur dioxide emissions. An electric power plant in Essen absorbs it with a new type of activated carbon, recovering the SO2 for the manufacture of H2SO4, the cost per 1000 kWh being about 1 DM (25 cents), and this can be further reduced. Government standards now limit the sulfur content of fuel oils to 1.8%. About 20% of the total SO2 emission in West Germany comes from sulfuric acid plants. A new 'double contact' process can reduce SO2 emissions of such a plant from 17 to 3 kg per ton of H2SO4 produced. Nitrogen oxides emitted from nitric acid plants have been reduced by 50% with special absorption equipment. New legislation sets a maximum average of 2 mg/cu m for fluorine emissions, or 5 mg for short intervals. Readings as high as 2.7 mg have been recorded above the Ruhr from January 1, 1966, to December 31, 1968. During that period, industry in North Rhine-Westphalia invested 4,000,000,000 DM on air pollution problems related to existent operations and about 275,000,000 DM on those related to new ones. Exhaust purification for the 2-year period cost 3,000,000,000 DM, plus an additional 30,000,000 for research this in comparison with a gross national product of 300,000,000,000 DM per year. The total amount spent by industry is small compared with the damage caused, which amounts to 50 DM per capita per year, or 3,000,000,000 for the entire republic, not including losses due to sickness or sanitation problems.

K. STANDARDS AND CRITERIA

06679

F. E. Ireland

ALKALI INSPECTORATE - ALKALI ETC. WORKS REGULATION ACT 1906 AND ALKALI ETC. WORKS ORDER 1966. (NOTES ON BEST PRACTICABLE MEANS FOR CEMENT WORKS EMISSIONS.) Ministry of Housing and Local Government, London (England). (June 28, 1967). 5 pp.

Restrictions are set forth covering emissions from cement works. Included are: particulate emissions and hydrogen sulfide from kiln waste gases; stack height; sampling methods to be used; and miscellaneous cement works operations.

16116

Koehler, W.

PRESENT POSITION IN COMBATING AIR POLLUTION AND NUISANCE IN THE CEMENT INDUSTRY. (Stand der Emissionsbekaempfung in der Zementindustrie). Text in German. Zement-Kalk-Gips (Wiesbaden), 58(11):493-500, Nov. 1969. 12 refs.

Prior to a discussion of present achievements in combating pollution and noise in the cement industry, the composition of emissions by this industry is reviewed. Apart from dust, waste gases from cement kilns contain nitrogen, carbon dioxide, oxygen, and water vapor. The sulfur dioxide concentration is low because it is chemically bound as sulfate in the clinker and the dust. No gaseous fluorine emissions have ever been determined; the carbon monoxide concentration is negligible. Dust emissions sank from about 3.5% in 1950 to 1.5% in 1957, and to 0.15% of the clinker production in 1967, although the production increased from 11 million tons to 33 million tons. In the vicinity of the Westphalian industrial center comprising 15 cement plants, an average dust fall of 0.75 g/sq m/day was measured in 1950; now, the annual average is down to 0.42 g/sq m/day. The VDI (Association of German Engineers) Guideline 2094 recommends a maximum allowable emission concention of 150 mg dust/standard cu m. In 1950, only 15% of the rotary kilns were equipped with electrostatic precipitators; in 1967, more than 93% had precipitators. The VDI Guideline 2058 provides for noise abatement in the cement industry. It recommends limitation of noise in primarily industrial centers to 70 dB and in residential areas with interspersed cement factories, to 55 dB/day and 40 dB/night.

L. LEGAL AND ADMINISTRATIVE

06708

V. E. Wessels

STATEMENT OF VINCENT E. WESSELS, VICE PRESIDENT OF RESEARCH, IDEAL CEMENT CO. 90th Congress ('Air Pollution--1967, Part 3 (Air Quality Act)' Senate Committee on Public Works, Washington, D. C. Subcommittee on Air and Water Pollution, April 19, May 2-4, 8-10, 1967.)

The statement in the title of the original act that 'Prevention and control of air pollution at its source is the primary responsibility of State and local governments' is endorsed. In setting standards in excess of those required to protect health, abatement costs should be weighed against anticipated benefits. Standards on an area basis were suggested. Research on air pollution abatement by the Federal Government should be enhanced. Special tax consideration should be given on installations of air pollution abatement equipment. The statement of the American Mining Congress as presented by Mr. Coons is endorsed.

14337

Baccanari, Samuel

LEHIGH VALLEY AIR POLLUTION CONTROL DISTRICT. (Appendix 8 to: Effect of Area on Air Pollution Control Programs.) Pennsylvania State Univ., University Park, Center for Air Environment Studies, NAPCA Grant AP-00458, Final Progress Rept., 9p., Nov. 30, 1968.

The Lehigh Valley Air Pollution Control District, an interjurisdictional air pollution control program established in 1957 under ordinances enacted by the municipalities of Northampton and Nazareth, is described. The communities, located in the southeastern portion of Pennsylvania, comprise the Lehigh Valley cement belt, which extends for 25 miles and includes about 75 square miles. Prior to establishment of the control district, residents had tolerated a long-standing condition of excessive dustfall from the cement industry. The entry into the district of additional communities has caused the district to expand its scope to include control of other pollution sources as well. The program has two full-time employees: a director who, as a professional engineer, enforces the individual municipal ordinances, and a secretary. In each municipality there are citizen air pollution control boards of five members appointed by the elected representatives. Public funds are obtained by levying service charges on participating governments according to an established formula. The program has been judged effective on the basis of both significant expenditures by industrial plants for air pollution control equipment and a steady decline in the annual dustfall in the area under the District's jurisdiction. Data is included on annual dustfall survey averages and on cement plants in the District. Administration of the program emphasizes persuasion and conciliation, with enforcement powers, for the most part, held in reserve.

17927

Thayer, J. M.

THE CONTROL OF GRIT, DUST, AND FUME EMISSIONS FROM INDUSTRIAL PROCESSES. Conf. Filtration Soc., Dust Control Air Cleaning Exhibition, London, 1969, p. 10-15. 8 refs. (Sept. 23-25.)

Atmospheric pollution from industrial sources in England and Wales are controlled in part by the Clean Air Acts of 1956 and 1968 and the Alkali Act of 1906. The 1956 Clean Air Act prescribes standards for the emission of smoke from chimneys and prohibits smoke darker than Ringelmann 2, except for certain specified periods. The 1968 Act adds to this by prohibiting the emission of dark smoke from industrial and trade premises as distinct from chimneys. The 1956 Act deals with dust and soot only in general terms. The 1968 Act, covering emissions of grit and dust from furnaces, applies to a wide range of furnaces burning solid, liquid, or gaseous matter, excluding small domestic boilers. The recommended standards for furnaces burning fuel equivalent to 100 to 50,000 lb per hour of coal are illustrated graphically. Recommendations are also offered for reducing grit and dust emissions from cold blast cupolas at iron foundries. These involve minimizing emissions by suitable arrestors fitted at the top of the shaft or dispersing fumes from chimneys not less than 120-ft high. The Alkali Act is a measure to control emissions from virtually all the heavy chemical industries, the fine chemical industry, petroleum refining, and petro-chemicals, nonferrous metallurgy, iron and steel production, power stations, coke and gas works, and certain ceramic and lime works. The Act provides for the establishment of grit, dust, and fume emission standards and requires suitable equipment for obtaining these standards. Arrestment to a specific standard by dispersal of waste gases at inadequate height is given in some detail for cement works, iron and steel works, lead works, and electricity works.

17940

Kester, Bruce E.

AIR POLLUTION-RULE AND REGULATION. Preprint, Inst. of Electrical and Electronics Engineers, New York, 10p., 1968. 3 refs. (Presented at the IEEE (Institute of Electrical and Electronics Engineers) Cement Indusry Technical Conference, St. Louis, Mo., May 21-24, 1968.)

The history of air pollution with respect to the cement industry is briefly reviewed from the early 1900's when pollution control was nonexistent and cement plants were generally far from populated areas, through World War II with vastly increased pollution levels, to the present situation of great public awareness and stringent control regulations. The application of process weight tables to dust emissions from cement plants presents many specific questions of interpretation which remain to be clarified. A comparison analysis is presented, showing the wide range of basic design criteria submitted by different manufacturers of electrostatic precipitators to handle one process and to meet the same efficiency. In addition, the daily efficiency of a cement kiln precipitator often is markedly lower than that determined during the acceptance test, and unless a dust collection system is designed with excess capacity anticipated, trouble develops as soon as production rates increase. More precise definitions, better test procedures, and agreement on basic design criteria are urgently needed.

19747

Kester, Bruce E.

AIR POLLUTION - RULE AND REGULATION. IEEE (Inst. Elec. Electron. Engrs.) Trans. Ind. Gen. Appl., IGA-5(3):237-241, May/June 1969, 3 refs. (Presented at the IEEE (Inst. Elec. Electron. Engrs.) Cement Industry Technical Conference, St. Louis, Mo., May 21-24, 1968, Paper 68 TP64-1GA.

A framework of increasing impetus for pollution control regulation and enforcement is established. The progression of air pollution control from early in-plant control of the working environment to community recognition of air pollution and black smoke control is traced. Today, in target areas of the nation, rules and regulations have been promulgated which govern particulate and sulfur dioxide emissions. In particulate emissions, the process weight table is being promoted. Manufacturers of pollution control equipment have asserted that they can install equipment in a cement plant to meet the process weight table. However, electrostatic precipitator manufacturers do not agree on basic design criteria to do the job. Glass bag collectors, while in basic agreement on cloth-to-gas ratio, get into equally confusing design differences as to preference of suction or pressure installations and many varied proposals for handling wet-process kilns. When the question of sulfur emissions from a cement plant arises, opinion with little factual data prevails. It is predicted that the process weight table will be uniformly applied in almost every air shed area. Sulfur dioxide will be restricted to the emission rates prevailing on the combustion of low sulfur coal. Studies of possible pollutants will be made, and air quality criteria established for nitrogen oxides, carbon monoxide, and other pollutants which do not directly concern the cement industry.

22330

Middleton, John T.

AIR QUALITY CONTROL. (Ueberwachung der Luftguete). Text in German. Schriftenreihe Ver. Wasser Boden Lufthyg. (Berlin), no. 33:159-175, 1970. Translated from English in: Mining Congr. J., Oct. 1968.

The Commissioner of the National Air Pollution Control Administration is interviewed concerning the work of his organization. He describes projected plans of the organization, dangers that must be given priority in the study programs, the responsibility of state governments in settling limits to define air quality, the importance of meteorological and topographical factors, the division of the country into air pollution control zones, aid from private organizations, governmental committees working in this area, the role of industry, some special problems of the cement and phosphate industries, the use of the Ringelmann scale, and the activities of Senator Muskie at the congressional level.

22466

Ordinanz, Wilhelm

A NEW AIR POLLUTION LAW. Staub (English translation from German of: Staub, Reinhaltung Luft), 29(9):8-10, Sept. 1969. 7 refs.

The Air Pollution Law of Michigan (1967) stipulates licensing for the erection, mounting, or alteration of combustion equipment or other working processes liable to emit pollutants. An application must be submitted with the following information: quantity and temperature of the waste gas or air; the composition of waste gases with or without scrubbing; prospective content of solids in the waste gases; point of emission; height and location relative to adjacent buildings; other factors liable to facilitate the diffusion or emission in the surroundings; and information on special effects of the pollutants. The gray value of smoke plumes from furnaces must be brighter than No. 2 on the Ringelmann scale, but gray value No. 2 must not prevail for more than 3 minutes every half-hour and gray value No. 3 for no longer than 3 minutes in an hour, though not more than three time in 24 hours. Permissible limits of dust emission are presented tabularly for combustion plants, garbage incinerators, steel production, cupola furnaces for cast iron, lime kilns, asphalt preparation, cement production, and pelletizing of iron ore. Several prohibitions are also listed.

23562

Damon, W. A.

THE TREATMENT OF WASTE GASES IN CHEMICAL INDUSTRY. Trans. Inst. Chem. Engrs. (London), 31(1):26-35, 1953. 16 refs. (Presented at the Institute of Chemical Engineers, Midlands Branch Meeting, England, Jan. 31, 1953.)

Statutory control of the atmospheric pollution arising from certain industrial processes is considered, and the possible means of implementing the requirements of the Alkali Act are discussed. Processes are described in which the control of pollution is difficult, and the means adopted to mitigate their effects are explained. The rate at which a gas diffuses when travelling downwind from its point of emission depends on the turbulence of the atmosphere, and this in turn is affected by the wind speed and the temperature gradient. Calculations of Bosanquet and Sutton relating to maximum ground concentrations and chimney discharges are cited. Cement manufacture, pollution by sulfur gases, petroleum refining, requirements for lead works, and various unregistered processes are discussed. Great difficulty has been experienced in the case of a plant for the recovery of magnesia from sea water, by reason of the discharge of a very foggy emission from the kiln chimneys. The discharge of fluorine compounds, coal combustion, pollution by coke ovens, and burning spoilbanks are also considered.

25329

Bergan, J. and J. Jasen

STATE OF NEW YORK COURT OF APPEALS (NO. 242) OSCAR H. BOOMER AND JUNE C. BOOMER, APPELLANTS V. THE ATLANTIC CEMENT COMPANY, INC., RESPONDENT (AND FIVE OTHER ACTIONS) (NO. 475) CHARLES J. MEILAK AND ANO., APPELLANTS V. THE ATLANTIC CEMENT COMPANY, INC. RESPONDENT. In: Air Pollution-1970, Part 2. 91st Congress (Senate), Second Session on S.3229, S.3466, S.3546, p. 854-861, 1970. 7 refs. (Hearings before the Subcommittee on Air and Water Pollution of the Committee on Public Works, March 19, 20, 23, 1970.)

One alternative in settling disputes between property owners and cement plants where vibrations and emissions of dust and smoke cause substantial property damage is to grant an injunction but postpone its effect to a future date to allow the defendent to eliminate the nuisance. Another alternative is to grant the injunction conditioned on the payment of permanent damages to the plaintiff. One opinion holds that the second alternative is the most effective stimulus to research into improved control techniques. Another opinion maintains that to permit an injunction to become inoperative upon payment of permanent damages is, in effect, licensing a continuing wrong.

25642

Mein, William Wallace, Jr.

THE CALAVERAS CEMENT CO. DUST SUIT. Mining Engineering, 3(6): 534-536, June 1951. (Presented at the American Institute of Mining, Metallurgical and Petroleum Engineers

Meeting, Los Angeles, Calif., Oct. 1949 and New York, Feb. 1950, Paper TP 3047H.

An account is given of the background, testimony, and outcome of a 1949 trial resulting from a suit by five landowners, all cattle ranchers, whose properties are located in the vicinity of a cement plant. The plaintiffs sued for dust damages of $120,338 and for an injunction preventing the company from casting dust on their properties in injurious quantities. Testimony for the plaintiffs was designed to establish that the flue dust had damaged the land and forage and had caused fluorine poisoining to the cattle, both results causing substantial loss of profits. Defense testimony sought to establish that the damage had been enormously exaggerated and should be limited to the much lower loss of rental values, and that the claim of fluorine poisoning was spurious. A jury verdict awarded the ranchers $7508 in damages and the court issued an injunction following the lines of a company proposal requiring a minimum stack dust recovery of 87%. The plaintiffs subsequently filed an appeal, contending that their proposed version of the injunction should be the one adopted by the court; this appeal was still pending at time of writing.

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