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AIR POLLUTION ASPECTS OF EMISSION SOURCES: FERROUS FOUNDRIES A BIBLIOGRAPHY WITH ABSTRACTS

Air Pollution Technical Information Center

ENVIRONMENTAL PROTECTION AGENCY
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INTRODUCTION

The Air Pollution Technical Information Center (APTIC) of the Office of Air Quality Planning and Standards prepared, selected, and compiled the approximately 235 abstracts in this bibliography. The abstracts are arranged within the categories listed in the Contents. The abstracted documents are thought to be representative of available literature, and no claim is made to all-inclusiveness.

The subject and author indexes refer to the abstracts by category letter and accession number. The author index lists all authors individually, primary authorship is indicated by an asterisk. Generally, higher accession numbers have been assigned to more recent documents.

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*"Air Pollution Abstracts", Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20460. Subscription price: $27.00 per year; $6.75 addition al for foreign mailing. (More than 6300 abstracts, subject and author indexes are included in each issue, plus two separate indexes.)

A. EMISSION SOURCES

11012

Steffora, T. J.

INDUCTION FURNACES, PREHEATERS, AND AIR POLLUTION. Foundry 96(8):82-86, Aug. 1968.

A basic reason for the growth of induction melting during the last decade has been the general belief that it offers relief from air pollution legislation pressures. That opinion has been based chiefly on the facts that no fossil fuels are used and that no serious metal oxidation takes place during melting. This article describes the results of a series of tests to determine how induction melting and preheating meet air pollution control regulations. In essence, the tests confirmed that the coreless induction melter and the charge preheater can be operated in most installations without pollution control devices, yet comply with existing or pending emission limits. (Author's abstract)

18085

Davis, J. A., R. Clark, and W. A. Gibeaut

GAS INJECTION LOWERS CUPOLA MELTING COSTS, INCREASES MELTING RATES. Foundry, 97(6):66-73, June 1969.

A conventional commercial cold-blast cupola was operated for 10 days under 20 different sets of operating conditions to determine the economic and metallurgical effects of replacing a portion of the regular coke charge with natural gas injected and burned above the regular tuyeres. Several tests were made during which natural gas was burned (mostly with stoichiometric amounts of air) in place of 20, 30, 40, and 60 percent of the normal coke charge. The conventional No. 9 1/2 cupola used in the experiments had a normal melting rate of about 14 1/2 tons per hour with a normal coke charge. The following article details the steps and conditions of the experiment and lists several definite conclusions that can be drawn from the results of the authors' work. A companion paper on the construction and operation of the gas-injection burners will be published in a later issue. (Author's Abstract)

26929

Wedin, Bertil

FIGHTING AIR CONTAMINATION--CLEANER AIR AN URGENT NECESSITY. Svenska Flaktfabriken Rev., vol. 6-7:201-207, 1963-1964.

Natural and man-made pollution, dispersal and concentration, and pollution control are discussed. Oil refineries, steelworks, foundries, cement works, plastic and fertilizer factories, and power stations are typical generators of pollutants in larger or smaller emissions. Sulfur-containing oils and benzopyrenes have received too little attention in Sweden. While the threat represented by deep valleys of Scandinavia has been clearly demonstrated in many instances, Sweden's forests probably play an important role as pollution control agents, since both deciduous and coniferous trees can absorb considerable quantities of airborne contaminants. While some pollutants display synergistic characteristics causing greater injury together than could the individual pollutants alone, there is evidence that certain airborne substances can reduce the injurious effects of other contaminants.

28371

Masek, Vaclav

THE COMPOSITION OF DUSTS ON WORK SITES AND IN THE CLOSE VICINITY OF IRON WORKS. (Ueber die Zusammensetzung der Staeube an den Arbeitsplaetzen und in der nahen Umgebung von Eisenhuettenwerken). Text in German. Staub, Reinhaltung Luft, 31(2):66-68, Feb. 1971. 15 refs.

The grain size distribution, specific surface area, soot content, 3,4-benzopyrene content, arsenic content, and chemical and roentgenographic composition of dusts collected at work sites and in the vicinity of blast furnaces, steel works, rolling mills, and foundries of the industrial area of Ostrava in Czechoslovakia were determined. The dust contained around 30% silicon dioxide, 7% calcium oxide, 3% magnesium oxide, 15% aluminum trioxide, 15-50% ferric oxide, and 0.25% manganese. The share of the dust of a grain size below 1 micron fluctuated between 3 and 24% and above 4 micron, between 5 and 32%. The specific surface of the dust fluctuated between 1.2 and 14.1 sq m/g; the soot content, between 7 and 64%; the 3,4-benzopyrene content, between 0.1 and 13%; and the arsenic content, between 0.02 and 1.18%. Most of this dust falls on cultivated land.

30446

Sebesta, William

FERROUS METALLURGICAL PROCESSES. In: Air Pollution. Arthur C. Stern (ed.), Vol. 3, 2nd ed., New York, Academic Press, 1968, Chapt. 36, p. 143-169. 40 refs.

Coke, sinter, iron, and steel production and foundry operations are discussed, including process emissions and their control. Bessemer converters, open hearth furnaces, electric arc furnaces, basic oxygen furnaces, and scarfing are included in reviewing steel manufacture, and cupolas and electric melting furnaces are considered in foundry operations.

30613

Wasilewska, Janina and Urszula Krause

PROPERTIES OF DUST EMITTED BY METALLURGICAL PLANTS. (Wlasnosci pylow emitowanych do atmosfery przez urzadzenia hut zelaza). Text in Polish. Wiad. Hutnicze (Katowice), 27(2): 57-61, 1971. 16 refs.

Chemico-physical properties of dust emitted into the atmosphere by metallurgical plants were studied. The method of determination of these properties is described, as are the method of sample collection and apparatus used. The chemical composition and density of the dust were determined; its fractional analysis was performed. The gases emitted into the atmosphere by metallurgical industry contained mostly carbon, silicon dioxide, and iron oxides; the relative amount depended on the character of a specific plant. Thus gases emitted from blast furnaces contained 33% carbon, 23% SiO_2, 7% iron oxides; those from steel works, 51-55% iron oxides; and gases from foundries, 89-92% SiO_2. The latter appear to be most hazardous to human health, since the gas causes fibrosis of lungs. A quantity of 45% dust from foundries consisted of particles with a diameter less than 20 micron. Fractional composition of dust varied according to plant; the finest is the dust from steel works. The fraction with a diameter lower than 5 micron formed 60%, out of which a considerable part was of a diameter between 0.5-1 micron. Because of its fine structure, the dust emitted by steel works does not settle to the ground, which indicates the necessity of using dust collectors. Further utilization of the steel works dust rich in iron oxides is suggested such as sintering the dust and returning it to production in this form.

32040

Krause, U. and J. Wasilewska

INVESTIGATIONS OF DUST AND SULPHUR DIOXIDE EMISSION INTO THE AIR FROM VARIOUS DEPARTMENTS OF STEELWORKS. Hutnik (Prague), 36(3):128-132, 1969. 7 refs. Translated from Polish. Iron and Steel Inst. London (England), British Iron and Steel Industry Translation Service, 9p., Oct. 1969.

A steelworks manufacturing finished products and using natural gas as its main fuel was monitored for emission of pollution in flue gases. Emissions of dust and sulfur dioxide in smoke and fumes were measured from an electric furnace, open-hearth furnace, cupola, reverbatory furnace, and drying installations at the iron foundry and steel foundry manufacturing rolling-mill rolls, all potential sources of emission of a steelworks. Dust concentration was measured by sampling, and the amount of SO_2 in the fumes was determined by the iodimetric method. The principal emission sources were the electric furnace in the roll-casting foundry, the open-hearth furnace in the roll-casting plant, and the cupola. The reverbatory furnace and the drying ovens discharged only small amounts of dust into the air. The total dust emission from all steelwork emission sources was 51.6 kg/hr (250.5 Mg/t/year). The total SO_2 emission was about 671 g/hr (approximately 3.2 Mg/t/year).

32252

SYSTEMS ANALYSIS OF EMISSIONS AND EMISSIONS CONTROL IN THE IRON FOUNDRY INDUSTRY. VOLUME III. APPENDIX. Kearney (A. T.) and Co Inc., Chicago, Ill., Air Pollution Control Office Contract CPA 22-69-106, 260p., Feb. 1971. 735 refs. NTIS: PB-198350

An investigation was undertaken to define the air pollution problems of the iron foundry industry, and to set priorities for research and development work that will lead to improved emission control capabilities at reduced cost. An extensive search of the literature was conducted to identify and list in a single bibliography of published material pertinent to the subject of this study. In addition to the list of 735 references, all the data compiled on the foundries are contained in the data bank which is a part of this appendix. Information pertaining to material and heat balances of foundry melting furnaces is also included. Development of a mathematical model and the nature of input required are discussed. A sample of the material balance and heat balance outputs and the chemical reactions considered in the model are given. A listing of the FORTRAN IV computer program of the material and heat balance is included. The curves used to determine the cost of pollution control equipment are presented, as well as recommended emission test procedures. A glossary of terms is presented.

32351

Lemke, Eric E., George Thomas, and Wayne E. Zwiacher

PROFILE OF AIR POLLUTION CONTROL IN LOS ANGELES COUNTY. Los Angeles County Air Pollution Control District, Calif., 66p., Jan. 1969.

A profile of air pollution sources, the effectiveness of the control program, and a projection for the future in Los Angeles are presented. The Federal Clean Air Act of 1967 figures prominently in the future projections, because it is assumed that California will set motor vehicle emission standards more stringently than the Federal standards. About 13,500 tons of air contaminants are still being emitted daily, primarily because of automobile emissions which comprise approximately 90% of the uncontrolled emissions. Major sources are listed with data on type and amounts of particulates emitted, and the amounts prevented. Motor vehicle sources include exhaust, blowby, and evaporation in gasoline-powered engines and diesel-powered engines; the prevention methods for motor vehicle emissions include crankcase and exhaust control. Other sources include organic solvents (surface coating, dry cleaning, and degreasing), chemicals (sulfur and sulfuric acid plants), incineration, non-ferrous metal production, cupolas, electric steel furnaces, open hearths, mineral production (including asphalt), and petroleum (refining, marketing, and production). Rule 62 prevents contamination from power plants and other fuel combustion processes. Jet and piston driven aircraft, ships, and railroads are also sources. Contaminants include nitrogen oxides, sulfur dioxide, carbon monoxide, hydrocarbons, and particulates. The distribution of chemical processing equipment, boilers, heaters, paint bake ovens, incinerators, metal melting equipment, concrete batch plants, petroleum processing equipment, rendering equipment, and power plant boilers are shown. Daily emissions from fuel oil, natural gas, and refinery make gas are shown. Also, steam and electric power plants are discussed. When motor vehicle exhaust reacts with the air, photochemical smog can be formed which causes eye irritation; the California Pure Air Act has set standards which should eliminate this. Stationary and mobile sources, air monitoring stations, seasonal changes, ozone concentrations, wind effects, daily concentration levels, oxidant levels, and alerts are also discussed.

32489

Giever, P. M.

CHARACTERISTICS OF FOUNDRY EFFLUENTS. Preprint, American Foundrymen s Society, Des Plaines, Ill., 3p., 1970. 7 refs. (Presented at the Total Environmental Control Conference, Ann Arbor, Mich., Nov. 16-19 1970.)

Effluents from the numerous types of foundry furnaces and products vary over a wide range of physical and chemical characteristics including visible plumes, particulates, irritating fumes, and gases, as well as explosive dusts. Approximately 90% of the gray iron melting furnaces are cupolas and only 15 to 18% of these have air pollution control devices installed. One of the most important characteristics of cupola effluent is the high temperature. In addition to particulates, the effluent from cupolas contains gases which are primarily carbon dioxide and nitrogen with some excess oxygen and varying amounts of sulfur dioxide. Smoke, oil vapor, and fumes make up the remainder of the emissions. Emissions from electric arc furnaces and non-ferrous foundries are also discussed. These include zinc dust, ammonium chloride, carbon monoxide, carbon dioxide, fumes, sulfur oxides, sulfides, sulfates, metal oxides, aluminum oxides, odors, particulates, and many others. Particle size can be an important aspect.

32716

Tanaka, Yasunobu and Mamoru Sakata

X-RAY MICROANALYSIS OF AEROSOL AND EXHAUST DUST. (Funjin baijin no X sen maikuro anarishisu). Text in Japanese. Shimazu Hyoro (Shimazu Rev.), 28(2):71-79, June 1971.

The elemental composition and characteristics of fine particles of exhaust dust and aerosol, gathered from steel mills and an expressway, were studied by an electron microprobe x-ray analyzer. Tests were performed to determine the presence of carbon, magnesium, aluminum, silicon, sulfur, calcium, manganese, iron, and their compounds. A relation was established between the results and the type of pollutant source. Exhaust gas from the flue, because of very high temperatures, was blown into a solution, and the trapped dust was dried. The results, therefore, could differ from the analysis of dust emitted into the atmosphere. Exhaust gas emitted after the burning of heavy oil contained dust consisting mainly of carbon and some iron and manganese. Dust from the neighborhood of a foundry contained very little silicon; the little that was present as large particulates differed from the dust found in urban areas. The presence of large amounts of calcium monoxide was related to the iron-making process. Dust gathered at the intersection of a highway contained fine carbon particulates, due to tire friction, and large amounts of iron; the dust differed from that near the iron foundry or from the flue gases.

33762

Weber, Helmut

ANNUAL SURVEY UNALLOYED AND ALLOYED AND LOW-ALLOYED CAST STEEL (EIGHTH SUCCESSION). (Jahresuebersicht Unlegierter und niedriglegierter Stahlguss (8. Folge)). Text in German. Giesserei (Duesseldorf), 58(20):624-633, Oct. 1971. 96 refs.

Smokeless refining has gained great importance for smaller foundries since costly dust collectors can be avoided. Oxides of iron, or if the composition of the melt permits it, of nickel oxide and molybdenum oxide can be injected with a pressurized air jet thus avoiding the development of dust. The brown smoke which arises at the oxygen lancing of the melt consists primarily of iron oxides with a particle size of less than five micron of which a sizeable portion is below one micron. For fume and smoke the maximum allowable emission is 115 mg/cu m; for dust between 1 and 76 micron and for grit with a particle size of more than 76 micron, the maximum allowable emission is 460 mg/cu m. If the reactions leading to the development of brown smoke are known, refining methods which avoid it can be used. Considerable smoke reduction can be achieved by mixing the oxygen with steam. Fast and smokeless refining is feasible by using oxygen oil burners.

35128

Hall, H. T.

THE ROLE OF THE STEEL FOUNDRY INDUSTRY IN ENGENDERING BETTER STANDARDS OF HEALTH, SAFETY AND WELFARE IN STEEL FOUNDRIES. Brit. Foundryman, vol. 64:283-292, Aug. 12 1971. (Presented at the Steel Castings Research and Trade Association, Annual Conference, Newcastle, England, June 1971.)

The role taken by the steel foundry industry in engendering better standards of health, safety, and welfare in steel foundries is described. A new steelmaking process has been developed which depends upon the injection of iron oxide, e.g., millscale, for the removal of carbon and other metalloids. One of the principal advantages is that metalloids can be removed without fume and thus without thy need for fume collection or fume cleaning equipment. Ventilation has contributed to diminishing the risk of steel foundry workers contracting respiratory diseases. Particular problems pertain to silica dust, hydrogen and exposion hazards, and other respirable dusts. Dust sampling is mentioned. Personal protective devices must be capable of reducing dust concentrations to safe levels while also being acceptable to the wearer. The generation and suppression of noise in steel foundries are discussed. Legislation and dust surveys in steel foundriess are also described.

35574

Vandegrift, A. E. and L. J. Shannon

PARTICULATE POLLUTANT SYSTEM STUDY. VOLUME II - HANDBOOK OF EMISSION PROPERTIES. Midwest Research Inst., Envrionmental Sciences Section, Air Pollution Control Office Contract CPA-22-69-104, MRI Proj. 3326-C, 607p., May 1, 1971. 288 refs. NTIS: PB 203522

Particulate air pollution with respect to defined stationary emission sources, chemical and physical characteristics of the particulates and the carrier gas, and current control practices was investigated. Determining factors in the study of effluent characteristic included particle size distribution, toxicity, corrosivity, soiling potential, and optical properties; particle and carrier gas properties included particle distribution and shape, density, electrical resistivity, volumetric flow rate, gas temperature, and humidity. Cyclones, wet scrubbers, electrostatic precipitators, fabric filters, and afterburners were investigated for efficiency, application, cost, and advantages. The major sources of particulate emissions examined were stationary combustion processes (coal fuel oil, and gas), including electric power generation, industrial power plants, and domestic heating; crushed stone, sand, and gravel industries; agricultural operations, e.g., field burning, grain elevators, alfalfa mills, and cotton gins; iron and steel industry; cement manufacture; forest product industry; lime manufacture; primary nonferrous metallurgy; clay products; fertilizer manufacture; asphalt plants, ferroalloy manufacture; iron foundries; secondary nonferrous metals industry; coal preparation plants; carbon black; petroleum refining; acid manufacture; and incineration. Cost relationships were derived for the control methods and corresponding sources. derived for the control methods and corresponding sources.

35897

Gutow, Bernard S.

AN INVENTORY OF IRON FOUNDRY EMISSIONS. Mod. Casting, 61(1):46-48, Jan. 1972.

Estimates of iron foundry emissions in 1969 were made during a study of melting and non-melting operations. Amounts of particulate and gaseous emissions were determined by molten iron production. Federal data were obtained on total 1969 gray iron casting tonnage for each of nine geographical regions, and the percents of casting tonnage produced from iron melted in cupolas, electric arc, and other furnaces were calculated for each region. The high concentration of iron foundries in the Great Lakes states accounts for almost 70% of the national molten iron production and approximately 72% of the particulate emissions emitted from melting and non-melting operations. About 73% of the carbon monoxide emitted from iron foundries occurs in the Great Lakes states, and an additional 10% of carbon monoxide emissions occurs in the east south central states for a combined total of almost 83%. The results of the total nationwide emissions estimated to come from iron foundries are tabulated. (Author summary modified)

35925

Greenberg, J. H.

SYSTEMS ANALYSIS OF EMISSIONS -- THE IRON FOUNDRY INDUSTRY. Chem. Technol., 1(12):728-736, Dec. 1971. 2 refs. (Presented at the American Institute of Chemical Engineers, Cincinnati, Ohio, 1971.)

Characteristics and sources of emissions in various iron foundry departments are presented, in order to set priorities for research and development that will lead to improved emission control capabilities. A general, simplified process flow for all iron foundries includes raw material storage, preparation and charging, metal melting, molding, pouring, and shakeout, sand conditioning and reclamation, cleaning, heat treating and finishing, and coremaking. Of techniques available to control foundry pollutants, particulate collection equipment systems are the most significant. These systems include dry centrifuges, wet collectors, catalytic combustion, fabric filters, and electrostatic precipitators; they vary widely in design, capabilities, cost, and application. Specific emissions for the various processes include dust, vapors, smoke, hydrocarbons, fly ash, metallic oxides, sulfur compounds, carbon monoxide and fumes. Particle size, concentrations, and control costs are mentioned. Cupola furnaces, electric arc furnaces, and boilers also cause pollution.

36123

Dept. of Commerce, Washington, D. C., Economic Development Administration

ENVIRONMENTAL IMPACT STATEMENT FOR HILLSDALE FOUNDRY COMPANY, HILLSDALE, MICHIGAN. (FINAL REPORT). 15p., May 20, 1971. NTIS: PB 199455F

The potential environmental impact of a proposed iron foundry in Hillsdale, Michigan is reported with comments and memos by the state public health department and concerned federal agencies. Environmental aspects under consideration included availability of transportation; waste disposal means; water supply; effect of noise, vibration, and noxious odors on wildlife; and foundry emissions. Smoke from the cupolas and dust and sand from the moulting area would be collected in a bag house. Captured solid material and slag from the melting process would be disposed of in a landfill. The foundry would rely on remoteness from inhabited areas and on the prevailing winds to carry stack emissions over sparsely inhabited areas. The particulate-free stack emissions may be slightly malodorous in the vicnity of the foundry but negligible at any distance.

37642

Schock, D. and A. Dahlmann

EMISSION REDUCTION IN CUPOLA FURNACE THROUGH NATURAL GAS SUPPLEMENTAL FIRING. (Emissionsminderung an Kupoloefen durch Erdgaszusatzfeuerung (Kurzauszug). Text in German. Luftverunreinigung, 1969:10-14, Oct. 1969. 4 refs.

Experiments were carried out over a year-long period to determine to what degree natural gas can be partially substituted for coke in an iron foundry in order to reduce undesirable emissions. An 800 mm diameter cold-blast cupola furnace was used. The furnace was equipped with four nozzles for coke combustion and six tunnel burners for the complete combustion of natural gas at a fuel-air ratio of 1.05. The sulfur dioxide concentration dropped from 0.25 g/cu m at 15% coke to 0.10 g/cu m at 6% coke. However, the overall dust emission increased with an increase in the percentage of natural gas substituted for coke. The coarse dust fraction (greater than 36.39 micron) rose from 45.2% at 15% coke to more than 77.6% at 9% coke and to 87.3% at 6% coke. Decreases in carbon and sulfur and increases in manganese and silicon in the metal were noted with a decrease in coke, when using gas in combination with coke. Two possibilities exist for reducing emissions without lowering the quality of the end product: afterburning of the reduced gases by the addition of air above the gas burners or operating a furnace solely with gas.

39140

Shaw, F. M.

IRONFOUNDRY AIR POLLUTION IN THE UNITED KINGDOM. Brit. Foundryman, 65(3):90-105, March 1972. 20 refs.

The acts, regulations, recommendations, and directives affecting iron foundries in England are summarized. Emissions from iron foundry processes and control methods are also examined. Legislation controlling iron foundry air pollution includes the Public Health Act of 1936, the Clean Air Acts of 1956 and 1968, the Alkali Act of 1906, regulations issued under the Clean Air Acts, and recommendations issued by the Ministry of Housing and Local Government. Cupola gases contain grit, dust, carbon dioxide, nitrogen, carbon monoxide, and sulfur dioxide. The major constituents of cupola dust are silicon dioxide, iron oxides, calcium oxide, zinc oxide, aluminum oxide, manganese oxide, and sulfur. To reduce emissions from cold blast cupolas, wet arresters, increased discharge heights, and stack gas combustion must be incorporated as specified by regulations. High efficiency cyclones, electrostatic precipitators, and fabric filters for dust collection may also be used. Projected costs and power consumption are computed for cupola gas control methods; hoods and scrubbers for electric furnaces; high energy scrubbers for rotary, air, and reverbatory furnaces spray cleaners, fans, and fabric filters for clay-bonded sand plants; special combustion chambers to reduce smoke; and spray cleaners, exhaust systems, and fabric filters to remove dust from fettling and cleaning operations. The efficiency, operation, and advantages of the control methods are reviewed.

39460

PARTICULATE POLLUTANT SYSTEM STUDY. VOLUME I - MASS EMISSIONS. Midwest Research Inst., Kansas City, Mo., Air Pollution Control Office Contract CPA 22-69-104, MRI Proj. 3326-C, 372p., May 1, 1971. 198 refs.

A program to assess particulate air pollution from stationary sources in the continental United States and to advance the capability of control equipment for particulates was conducted. All significant sources of particulate pollutants are identified and the most important sources are evaluated. Future problem particulate emission sources, determined by projecting production trends, control efficiency, and control equipment application trends, were identified. Research and development plans were formulated to fill in the knowledge gaps pinpointed during the study. From the list of significant sources, a ranking of the most important sources by total tonnage emitted was developed by calculating total emissions using emission factor techniques and other calculation methods. Important sources by tonnage are fuel combustion in stationary sources; crushed stone, sand, and gravel; operations related to agriculture; iron and steel manufacturing; cement plants; forest products; lime; clay products; primary nonferrous metals; fertilizer manufacturing; asphalt; ferroalloys; iron foundries; secondary nonferrous metals; coal preparation plants; carbon black; petroleum refining; and acid manufacturing. Sources and air pollutants were ranked by objectionable properties. In order they were: carcinogens, beryllium and mercury, toxic metals, mercaptans, isocyanates, asbestos and silicates, very toxic metals, fluorides, alkyl amines, hydrogen sulfide, calcium oxide, mineral acids (hydrochloric, nitric, sulfuric, and phosphoric acids), sulfates, nitrates, sulfur oxides, organic sulfides, pyridines, nitrogen oxides, chlorine, soot, smoke, carbon black, less toxic metals, fly ash, inert particulates, oxidants such as ozone, olefins, aldehydes, phenols, aniline, aromatics, chlorocarbons, mixed organics, ammonia, hydrocarbons, and carbon monoxide.

39461

Midwest Research Inst., Kansas City, Mo.

PARTICULATE POLLUTANT SYSTEM STUDY. VOLUME II - FINE PARTICLE EMISSIONS. Air Pollution Control Office Contract CPA 22-69-104, MRI Proj. 3326-C, 335p., Aug. 1, 1971. 87 refs.

A program was conducted to quantify fine particle emissions (0.01 to 2 micron) from particulate pollution sources. The primary objective was to use the best data currently available on particle size distributions of particulates from uncontrolled and controlled sources, fractional efficiency curves for specific control devices, and the degree of application of control equipment on specific sources to estimate the mass and number of fine particles emitted from particulate pollution sources. Secondary objectives were the assessment of the applicability of standard sampling and particle sizing methods to the fine particle regime, and the current understanding of the adverse effects of fine particulate pollutants on human health. Major sources were stationary combustion (coal, fuel oil, natural gas, and liquified petroleum gas used in industries and electric utilities); crushed stone; iron and steel manufacturing (sintering, open hearth furnaces, basic oxygen furnaces, electric arc furnances); kraft pulp mills; cement plants and rotary kilns; hot-mix asphalt plants; ferroalloys; lime plants; secondary nonferrous metallurgy; carbon black; coal preparation plants; petroleum refining; incinerators; fertilizer manufacturing; iron foundries and cupolas; and sulfuric and phosphoric acid manufacturing. Efficiency of control equipment including electrostatic precipitators, fabric filters, wet scrubbers, and cyclones is also discussed. Projections of particulate emissions to the year 2000 and modifications of the atmosphere by particulate pollution are mentioned.

39462

Midwest Research Inst., Kansas City, Mo.

PARTICULATE POLLUTANT SYSTEM STUDY. VOLUME III - HANDBOOK OF EMISSION PROPERTIES. Air Pollution Control Office Contract CPA 22-69-104, MRI Proj. 3326-C, 626p., May 1, 1971. 302 refs.

Details of the methodology employed to obtain data concerning the kind and number of stationary particulate sources, the chemical and physical characteristics of both the particulates and carrier gas emitted by specific sources, and the status of current control practices, are presented. Emission factors and rates, chemical and physical properties of effluents, and control practices and equipment are given for stationary combustion processes (power generation and furnaces); mineral processing; agricultural operations (field burning, grain elevators, cotton gins); iron and steel manufacturing; cement manufacturing; forest products industry (sawmills, pulp industry); primary nonferrous metallurgy (copper, lead, zinc, and aluminum smelting and refining); clay products; fertilizer manufacturing; asphalt; ferroalloy manufacturing; iron foundries; secondary nonferrous metals industry; coal preparation; carbon black manufacturing; petroleum refining; acid manufacture (sulfuric acid and phosphoric acid); and incineration. The control equipment includes cyclones, wet scrubbers, electrostatic precipitators, fabric filters, mist eliminators, and afterburners. Effluents include dusts, particulates, fly ash, sulfur oxides, hydrocarbons, and other noxious gases. Costs for control equipment purchase and operation are given. This handbook constitutes a reference source for available information on the distinguishing features of the various particulate pollution sources and should be of value to air pollution regulatory agencies, control equipment manufacturers, and industrial concerns.

40180

Kearney (A. T.) and Co., Inc., Chicago, Ill.

AIR POLLUTION ASPECTS OF THE IRON FOUNDRY INDUSTRY. Office of Air Programs Contract CPA 22-69-106, Rept. APTD-0806, 260p., Feb. 1971. 18 refs.

A study directed at the iron foundry industry, with particular emphasis on the melting area, was undertaken in order to examine those aspects pertinent to air pollution. Pollutants commonly discharged by such industries include smoke, metallic oxides, oil vapors, carbon monoxide, sand fines, metal dust, and coke dust, odors, fluoride fumes, vapors, and facing fumes. Particulate emissions have been a point of focus for concentrated efforts in air pollution; however, gaseous emissions and odors from the foundries have not been given much attention, and the foundry industry now has to take steps to suppress these discharges into the atmosphere. The physical difficulties of satisfactory collection of pollutants are not easily solved and, in most cases, costs of satisfactory collection are quite high. A lack of correlation between standard furnace design factors and emission levels indicates a variance in operating factors. One group of variables is related directly to cupola operation, including specific blast rate, blast temperature, type of lining, and operating variables of the afterburner. A second group of variables concerns the quantity and quality of charge materials. Reproducibility of test results is difficult with any given technique, even for a stable emissions producing system. Compounded further by the use of different techniques, equipment, and testing companies to obtain data for comparison and analysis, the confidence level of the data must suffer, despite the high degree of professionalism of the laboratories performing the tests. Control methods include centrifuges, scrubbers, filters, afterburners, preheaters, hoods, and electrostatic precipitators.

41650

Environmental Engineering, Inc., Gainesville, Fla. and PEDCo Environmental Specialists, Inc., Cincinnati, Ohio

BACKGROUND INFORMATION FOR ESTABLISHMENT OF NATIONAL STANDARDS OF PERFORMANCE FOR NEW SOURCES. GRAY IRON FOUNDRIES. Air Pollution Control Office Contract CPA e0-142, Task 2, 63p., March 15, 1971. 31 refs.

Gray iron foundries produce metal castings by mixing gray iron, pig iron, scrap, and trace additives. The need for particulate controls is great, but average profits of approximately 6.9% do not provide much margin for elaborate controls. New plants seem to be able to economically justify air pollution control; old plants cannot. All devices now in use are designed to control particulate matter. No attempt is made to control nitrogen oxides, and in many cases emission levels have not been determined. The only sulfur dioxide removal is that which takes place during particulate scrubbing. The concentrations of SO2 in top gases from cupola furnaces range from 300 to 470 ppm. Quantitative analyses of fluoride emissions are not reported. Reduced S compounds are not generated in any gray iron processes. Odors originating from the oil, wax, and resins used in molding have not been measured. Uncontrolled cupola melting results in variable opacity which approaches 100%. Electric arc melting also produces a visible plume. Other processes have plumes during charging and when fluxes are added. Four foundries are either planned or in production within stringent particulate emission regulations; eleven foundries operate with 99% efficient controls. Emission limits recommended for new or modified sources are: sulfur oxides-500 ppm, NOx--325 ppm, particulates--0.03g/scf, and visible emissions-less than 10% equivalent opacity. Control methods include venturi scrubbers, fabric filters, baghouses, afterburners, and electrostatic precipitators.

42683

Ministerium fuer Arbeits, Gesundheit und Soziales des Landes Nordrhein-Westfalen, Duesseldorf (West Germany)

IRON AND TEMPERING FOUNDRIES. (Eisen- und Tempergiessereien). Text in German. In: Reine Luft fuer norgen. Utopie oder Wirklichkeit, Moehnesee-Wamel, West Germany, Verlag K. von Saint- George, 1972, p. 38-40.

The present situation and future trends for a period ending in 1980 in the output and emissions of iron and tempering foundries in North Rhine-Westphalia are described. The iron and tempering foundries in North Rhine-Westphalia now account for 44% of the total production volume in West Germany; their growth is expected to slow down during the next decade. The basic pollutants emitted by foundries are dust, sulfur dioxide, and gaseous fluorine compounds, and melting furnaces as well as mold preparation represent the chief emission sources. The maximum allowable specific dust emission from melting furnaces will be lowered from 1.5 to 1.0 kg/t of iron by 1980. New furnaces can be now provided with total dust separation, and the proportion of such furnaces is expected to rise to 20% by 1980. Cupola furnace throat gases contain, on an average, 700 ppm of SO2, corresponding to a specific emission of 1.6 kg/t. A decrease of about 33% in SO2 emission by 1980 can be expected, as coke will be increasingly replaced by natural gas and electricity. The gaseous fluorine emissions are due to fluorine contents in coke (20 ppm) and in dolomite and lime (about 100 ppm). While the fluorine emissions (less than 10 t/year are relatively low), separation techniques with a minimum efficiency of 90% are available. A further decrease in fluorine emissions due to the decreasing proportion of basic hot-blast cupola furnaces is predicted.

42751

Kearney (A. T.) and Co., Inc., Chicago, Ill.

AIR POLLUTION ASPECTS OF THE IRON FOUNDRY INDUSTRY-FEBRUARY, 1971. Air Pollution Control Office Contract CPA 22-69-106, 156p., Feb. 1971. 18 refs. NTIS: PB 204712

Despite recent advancements in the technology of making iron castings, the cupola is still the predominant melting unit employed in the iron foundry industry. Emissions from the industry include metallic oxides, oil vapors, and carbon monoxide from melting furnace operations; from other dust-producing operations come sand fines, metal dust, and coke dust. Odors and gaseous compounds such as fluoride fumes, vapors, and facing fumes come from both sources. The lack of correlation between standard furnace design factors and emissions levels requires that the explanation for the wide variance in type and quantity of emissions lie with cupola operating factors, rather than cupola design. Operating factors are broken down into two distinct groups: methods of operations, such as blast rate and temperature, type of lining, and operating variables of the afterburner; and the quality of charge materials, including metal to coke ratio, use of oxygen or natural gas, and the use of briquettes. Recommended practices for testing particulate emissions from cupolas are also included. Control devices include centrifuges, scrubbers, fabric filters, afterburners, preheaters, electrostatic precipitators, furnace hoods, and ventilation.

43198

I Anson, J. E., C. J. Bradley, and D. L. Robertson

GRAY IRON FOUNDRIES TAKE THE STAND. West. Metals, 8(3):23-24, 1950.

The salient features of the California Assembly Bill No. 1 concerning the control and suppression of air pollutants are reviewed together with Los Angeles County emission standards. The objectives of a voluntary association of 38 gray iron foundries in Los Angeles County, in relation to pollution control regulations, are presented. To determine the contribution of the gray iron foundry industry to Los Angeles smog, the foundries consumption of metallics, coke and limestone was survived, and particle sizes in emissions were analyzed. Of the 6.30 tons/day of particulates emissions from 49 cupolar, 0.432 tons were less than 5 micron. The 0.432 tons (or 966 lbs) are the only probable contribution of the gray iron foundry industry to the smog problem.

44849

Matveev, V. A. and D. P. Filimontsev

SOURCES OF DUST AND TOXIC GASES IN FOUNDRIES. Russ. Cast. Prod. (English translation from Russian of: Liteinoe Proizvd.), vol. 6:251-253, June 1961.

Cupolas are commonly considered the only source of dust-containing toxic gases from foundries, and special measures are taken for purifying cupola waste gases without regard for the large volumes of toxic gases, dust, and odorous vapors discharged directly from the foundry itself. As a result, a study was made of the sources of dust and toxic gases in an iron foundry and of atmospheric conditions at various distances from the cupola and the foundry shop. There is a sharp increase in atmospheric carbon monoxide at a distance of about 300 m from the cupola. The otherwise uniform drop in the CO concentration with increasing distance from the source is evidence of the presence of a ground-level current of gases from the foundry. At 12 m from the cupola and a level of plus 1.5 m, the atmosphere contains 4 mg/cu nm of dust with the cupola in operation and 1.3 mg/cu nm at other times, indicating that the cupola is not the only source of dust in the foundry. The curve of atmospheric dust content indicates that the value does not fall to the permissible maximum of 0.5 mg/cu nm until 400 m from the walls of the foundry. The permissible dust content in a foundry is 2 mg/cu m, but the content in the barrel-cleaning section with the barrel in operation is 180 mg/cu m; that in the sand preparation section 110 mg/cu m. Very high dust contents are also found near the discharge section on the conveyor, near the elevators, and elsewhere in the foundry. The dust-laden and polluted air is discharged from the foundry, without cleaning, through open fanlights in the windows, skylights in the roof, and exhaust chimneys which are carried an insufficient distance over the roof.

44929

McElwee, R. G.

REPORT OF THE ACTIVITIES OF THE A.F.S. CUPOLA RESEARCH COMMITTEE. Trans. Am. Foundrymen s Soc., vol. 57:384-385, 1949. 15 refs.

Slag studies, coke quality studies, and cupola tests conducted by the American Foundrymen s Society Cupola Research Committee are reviewed. Slag viscosity is indicated to be a factor in carbon pick-up and had some relationship to the amount of combined carbon in the iron as well as to the final structure of it. A study of slag color is reported. The Committee is also making a survey of the ordinances which pertain to cupola emissions, including the quantity and size of the particles emitted and the equipment that is being marketed for the removal of this material. As a criterion of cupola operation the chill test has been adopted by the cupola operator.

47883

Taft, R. T.

THE FIRST TWELVE MONTHS OPERATION OF A TOTALLY GAS-FIRED CUPOLA. Brit. Foundryman, 65(9):321-328, Sept. 1972. (Presented at the Institute of British Foundrymen, Annual Conference, Eastbourne, England, June 1972.)

The program of development leading up to the conversion of a production cupola to gas firing is briefly outlined. Design of the gas cupola is discussed, as well as the actual conversion and operation. Properties of the iron from the gas cupola and the essential qualities of the gas cupola itself are indicated. Refractory wear inside the furnace was much less than in a coke cupola. In addition, there was no visible emission and no visible smoke plume. Since melting was under reducing conditions, there were no brown fumes resulting from an excess of iron oxides, although there were some iron oxides in the gases emitted. Various problems and experiences in operating the gas cupola over the first twelve months operation are examined. The cost of conversion and the operating cost are considered. The gas cupola has a place in the foundry industry for its present and future melting requirements. (Author abstract modified)

B. CONTROL METHODS

02020

A. Archer

CLEAN AIR AND THE IRON FOUNDRY. Proc. (Part I) Intern. Clean Air Cong., London, 1966, 99-102. (Paper IV/8.)

The paper describes some of the processes carried on in the iron foundry that may give rise to air pollution problems. The operation of the cold blast cupola is discussed and reference is made to the absence of official guidance as to the best practicable means for reducing pollution. It is suggested that there is a need for standards relating to permissible emissions from foundry processes. (Author)

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.

02771

M. Sterling

CURRENT STATUS AND FUTURE PROSPECTS - FOUNDRY AIR POLLUTION CONTROL. Proc. Natl. Conf. Air Pollution, 3rd, Washington, D.C. 1966. pp. 254-9. (Also published as: 'Looking at Foundry Air Pollution Problems.' Foundry 95, (3) 136-8, Mar. 1967.)

The air pollution problems confronting the foundry industry generally are amenable to control by application of existing technology. Future emphasis will have to be placed on simplification of cupola collector designs with markedly reduced maintenance and operating expenses, especially for systems required by the smaller foundry operators. The use of electric induction and arc furnaces will reveive increasing interest and use especially by the smaller foundry operator as an answer to the question of whether to install non-productive collector devices or utilize new melting techniques. The odor and fume problems associated with core making and the newer molding processes must receive additional attention, as practical and economical abatement systems are not presently available to solve these problems. Not only must government assume its basic responsibility to enact and enforce legislation to control foundry emissions to protect the health, comfort and welfare of the public, but is must also share in the responsibility of developing with the industrial community, new approaches, methods, and/or equipment to reduce air pollution. Such incentives as rapid tax write-off and tax exemptions on air pollution control facilities are worthwhile government contributions in the joint government- industry partnership of achieving cleaner and more tolerable air for our citizens.

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.

06853

FOUNDRY FUME DISAPPEARS - GAS CLEANING AT FORD'S LEAMINGTON PLANT. Iron Steel (London), 40(1): 8-9, Jan. 1967.

A dry plate electrostatic precipitator is used in eliminating fumes from a steel foundry. The fume as generated had a high electrical resistivity and the precipitator was selected on the basis of a water vapour content of 10% by volume in the waste gases at peak conditions. Under off-peak conditions the site measurements indicated that water conditioning would be less complete or non-existent, and precipitation conditions correspond- ingly less favorable. Fume from the converters is collected in conical unlined mild steel hoods connected into a rectangular head- er from which it is conveyed to the top of the cylindrical condi- tioning tower, and fume-laden gas from the roof-mounted hood of the electric arc furnace is delivered by the existing hood exhaust fan to the base of the conditioning tower. Precipitator effi- ciency was measured three weeks after commissioning. The tests were carried out during normal operation and inlet loadings were generally in line with those measured during the preliminary site survey. As was to be expected, they were considerably lower than those allowed for completely overlapping oxygen-enriched blows, but this is reflected also in the outlet loadings, and the collection efficiency was up to the design figure of 99%, within the limits of experimental accuracy.

07062

Parkes, W. B.

MEASUREMENT OF AIRBORNE DUST CONCENTRATIONS IN FOUNDRIES. Am. Ind. Hyg. Assoc. J., 25(5):447-459, Oct. 1964. 11 refs.

The general problem of sampling, measuring and evaluating dust exposures in iron foundries in England is discussed. Of the various types of samplers the Hexhlet elutriator is considered to have many advantages. The use of this dust sampler is considered in detail in reference to efficiency, dust standards, and a dust control program. Other topics discussed are: (1) Existing dust standards; (2) Methods of sampling; (3) Composition of foundry dust; (4) Dust parameters; (5) Respirable dust and its measurement; (6) Dust samplers; (7) Use of Hexhlet samplers; and (8) A dust control program. (Author's abstract, modified)

09797

Hammond, William F. and James Rt. Nance

IRON CASTING. 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. 258-270, 1967. GPO: 806-614-30

Control of the air pollution that results from the melting and casting of iron is considered according to the type of furnaces employed, namely, the cupolas, electric and reverberatory furnaces. The air pollutants are similar. The primary differences among th control systems are in the variation in hooding and the necessary preparation and treatment of the contaminated gases from the furnaces. Essentially the air pollution problem becomes one of entraining the smoke, dust and fumes at the furnaces and transporting these contaminants to suitable collectors. The hood and ventilation requirements, control equipment, and the air pollution problems associated with cupolas and electric furnaces are discussed. Test results of a small reverberatory furnace charging clean metal indicate a low rate of particulate discharge. No air pollution control devices have been necessary for the operations conducted in this type of furnace melting iron. An example problem illustrates typical calculations involved in designing a cupola control system. Tables giving the following data are included: general recommendations for operating commercial cupolas; dust and fume emissions from gray iron cupolas; micromerograph particle size analysis of two samples taken from a baghouse serving a gray iron cupola furnace; qualitative spectrographic analysis of two samples taken from a baghouse serving a gray iron cupola furnace; and some collection efficiencies of experimental small scale control devices tested on gray iron cupolas.

16681

Willet, Howard P.

PROFIT ORIENTED SYSTEMS FOR POLLUTION CONTROL. American Institute of Chemical Engineers, New York, N. Y., American Inst. of Mining, Metallurgical, and Petroleum Engineers (AIME), New York, N. Y., American Society of Civil Engineers, New York, American Society of Heating, Refrigerating and Air Conditioning Engineers, New York, American Society of Mechanical Engineers, New York, and American Society for Testing and Materials, Philadelphia, Pa., Proc. MECAR Symp., Design and Operation for Air Pollution Control, New York, N. Y., 1968. p. 75-85. (Oct. 24).

The development of pollution control systems that provide an economically profitable return on control costs is described; it is believed that such processes will enhance control activities by establishing an economic incentive to add to the public pressures on polluters to install control equipment. Profit-oriented control systems are described for blast furnaces and the basic oxygen processes in steel fabrication, for foundry cupolas, kraft pulping, and for sulfur dioxide recovery from power and sulfuric acid plants. Venturi scrubbers, used to clean blast furnace gases, make it possible to obtain higher hot blast temperatures for preheating air blown into the furnaces and thus improve the economics of their operation. Gas take-offs installed below the charging door on foundry cupolas reduce the size of the gas cleaning equipment required and permit the gas to be used as fuel for preheating air blasts to the cupolas. A new method recently introduced from Japan, called the OG Process, has a great profit potential in its application to the basic oxygen process in steel-making, primarily by collecting carbon monoxide without combustion. A series of pollution control techniques can be applied to the kraft pulping process to reduce capital and operating costs. An absorption system to eliminate SO2 pollution from sulfuric acid plants and to increase plant profits is nearing completion, and a concept called the Central Processing Approach is described, involving the establishment of central processing plants, to permit the profitable recovery of elemental sulfur from the sulfur oxide emissions of both large and small power producers.

17824

Kane, J. M. and R. V. Sloan

FUME CONTROL-ELECTRIC MELTING FURNACES. Am. Foundryman, 18(11):33-35, Nov. 1950.

A three-ton, side-charged acid furnace in a steel foundry was tested which operated on a two-hour cycle with charges of approximately 7500 lb. Test No. 2 used heavily oxidized scrap from the bottom of the scrap pile and represents the heavier loadings that could be expected under poorer scrap conditions. The furnace was equipped with hood exhausting fumes from charging door and around electrodes. The pouring spout was plugged so that no escapement occurred at this point. Essential data from four tests conducted during four complete 2-hr melting cycles are tabulated. Dust loading in exhaust gases varied with the point in the melting cycle, with the heaviest loading occurring during the boil and refining cycle. Variation in loadings of the four tests are shown. Samples taken periodically during the test runs were checked with the electron microscope, and it was indicated that approximately 95% of all particles, were less than 0.5 micron, with practically no particles above 2 microns. Agglomerating tendency of the material was pronounced. A local exhaust wet type dust collector was installed for the two furnaces which guaranteed to meet solids removal requirements. Test data during a 97-min period, including the boil and refining periods of both furnaces, indicated a loss from the exhaust system discharge of 3.35 lb/hr as compared with an allowable 8.39 lb/hr. From this study, emission of solids of the order of 5 to 8 lb/hr/ton of metal melted can be expected from electric melting furnaces in steel foundries. Reduction of this quantity by about 75% can be obtained with wet dust collection equipment.

19484

Karpati, Judit and Gyoergy Mathe

DUST CONTROL EXPERIMENTS WITH SAND PREPARATION PLANTS IN STEEL FOUNDIRES. (Acelontodei homokelokeszito portalanitasaval szerzet tapasztalatok). Text in Hungarian. Ontode, 100(10):226-231, Oct. 1967. 4 refs.

A study was made of the design and operation of dust-collecting equipment in sand preparation plants serving steel foundries. The belt system transporting the sand from the screens takes the prepared sand to a storage bin. Envelopes were employed at points where used or fresh sand gives off dust, and the dust was first aspirated from these and the aspirated air purified in a wet cyclone before release. By way of ascertaining the efficiency of the equipment, dust exposure was studied at various places of work, with and without the use of the aspirator, before and after the beginning of work, using a konimeter for dust measurements.

20248

Public Health Service, Cincinnati, Ohio, National Air Pollution Control Administration

A STATUS REPORT: PROCESS CONTROL ENGINEERING; R & D FOR AIR POLLUTION CONTROL. 37p., Nov. 1969.

The various phases of the work of the Process Control Engineering Division of the National Air Pollution Control Administration are described as of late 1969. These include sulfur oxides control (dry and wet limestone processes, coal cleaning, and new processes such as those employing molten alkali carbonates), industrial process control (nonferrous smelting, iron and steel, sulfuric acid, papermaking, graphic arts, iron foundries, aluminum smelting, etc.), combustion emissions control (e.g., fluidized-bed combustion, nitrogen oxides), applied equipment research (wet scrubbers, fabric filters, electrostatic precipitators, incinerator control), supporting measurements (detection, spectroscopy, dust- and gas-sampling analysis, holographic determinations, continuous monitors, etc.), and advisory and supporting services. A special report is also given on the alkalized alumina process for control of SO2. A list of 110 specific research projects and 11 services is given. More than eleven million dollars was budgeted for the Process Control Engineering programs in 1969. The 1970 budget is expected to be more limited, necessitating an emphasis on sustaining rather than new programs.

21324

Kato, Yujiro

PLANS AND OPERATIONAL EXAMPLES ON FILTER TYPE DUST COLLECTOR SYSTEM AT VARIOUS INDUSTRIES (VI). THE ROLE OF BAG FILTERS IN THE METALWORKING INDUSTRY. (Gyoshubetsu ni miru rokashiki shujin sochi no keikaku to unten jisshi rei (VI). Kinzoku kogyo ni okeru baggu firuta). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 4(10):663-668, Oct. 15, 1968.

The operational conditions of bag filters used for emission control in the metalworking industry are illustrated by examples. In the zinc refining industry, bag filters are used at various points. The baghouse for the independent electric power plant which is provided to allow the exhausted material to cool down is one example. Another is the baghouse for controlling emissions from a smelting furnace exhaust. The applications of bag filters to the aluminum industry is illustrated by the baghouse used to control emissions from an alumina coveying process. In a powdered lead manufacturing plant, a complete dust collector has to be provided since the lead dust is extremely toxic and cannot be allowed to escape into the atmosphere. Complete hooding is also necessary. In the nonferrous metal working industry, emissions are commonly worth recovering. High efficient dust collectors are adequate for this purpose. In the iron and steel industry, the collected material from the exhaust is generally of little value, but dust collectors are necessary for air pollution control. Their use is typified by baghouses equipped for controlling emissions from electric-arc steelmaking furnaces and from electric furnaces for ferro-alloy manufacture. In the metal processing industry, bag filters are also used for controlling emissions from various processes. An example is the baghouse equipped for controlling emissions from the finishing process of iron casting.

27036

Shaw, F. M.

EMISSIONS FROM IRONFOUNDRIES. Foundry Trade J. (London), 106(2218):439-444, April 16, 1959. 9 refs.

The air pollution problem posed by the iron foundry industry is caused mainly by the melting process--notably cupola melting. The application of cyclones, wet scrubbers, electrostatic precipitators, and fabric filters to cupola dust is noted together with the efficiencies obtainable with each category of equipment. Low-velocity electrostatic precipitators, bag filters, or high-pressure drop venturi scrubbers offer the only known methods of removing fume from cupola gases, and combustion the only way of removing smoke in a cold cupola blast. Other foundry processes, in particular annealing, can cause difficulties, but these processes account for only four % of the industry's output. Where it can be applied, electric furnace annealing has the advantage of being smokeless. No economical or satisfactory method yet exists for removing the odorous fumes liberated by core drying and mould pouring.

27896

Attwood, W. A. and W. B. Lawrie

THE FORMATION AND PREVENTION OF ATMOSPHERIC CONTAMINATION IN FACTORIES. Trans. Manchester Ass. Eng., 1953-1954: 19-64. 27 refs. (Presented at the Manchester Association of Engineers Meeting, Oct. 16, 1953.)

Atmospheric contaminants exist in the form of dust, smoke, fumes, sprays, vapors, and gases and are being produced in ever increasing quantities as a result of the development of new processes and of modernization of old processes. The hazards fall into two main categories: danger to health from specific diseases and also from many forms of industrial poisoning; and danger from fire and explosions. The latter danger arises with many different everyday dusts and also from vapors of inflammable liquids. This paper identifies processes producing there hazards and methods of reducing them. Part I is devoted to a brief summary of the general problem and of legal requirements. Part II provides a more detailed description of the methods adopted in iron and steel foundries, where the problems are particularly difficult. Special attention is paid to local exhaust ventilating systems, such as those for grinders. A new technique, which allows dust of the respirable size-range to be both seen and photographed on a fine film, makes it possible to explore the aerodynamics of local exhaust ventilation systems, by reference to dust movement. It would appear, therefore, that local exhaust ventilation systems should be designed and tested with reference to dust flow rather than air flow.

29108

Greenberg, H. H. and R. E. Conover

IRON FOUNDRY EMISSIONS: A STUDY. Foundry, 99(4):AP-18 to AP-23, April 1971.

Iron foundry processes fall into the following areas: raw material storage, preparation, and charging; metal melting; molding, pouring and casting shakeout; sand conditioning and reclamation; coremaking; and cleaning, heat treating, and finishing. Emissions from each area are classified as to type, concentration, particle size, relative control liability, and relative control cost. In addition, 10 research and development projects are recommended to bridge the gap between existing technology and that required for improved emission control capacities. Iron melting operations, especially cupola melting, are identified as among the areas of highest priority with regard to additional development work. Particulate emissions from iron melting have been estimated at 243,000 tons/yr with approximately 182,000 being discharged to the atmosphere.

29212

Higgins, R. I. and J. A. Bright

BCIRA SYSTEM OF DUST CONTROL FOR A HIGH-SPEED PEDESTAL GRINDER. Foundry Trade J. (London), 130(2824):73-77, Jan. 21, 1971. 2 refs.

When iron castings are ground on a pedestal grinder, metal is removed in the form of separate particles which cover a continuous range of sizes from several thousand micron to one micron. The basic principles of effective dust control on pedestal grinders and methods of capturing primary and secondary dust streams are described and considered in relation to high-speed grinding. A very efficient system of dust control has been developed for the Richards 30 by 3 inch pedestal grinder operating at a constant speed of 12,500 surface ft per min. This system of dust control consists of a flexible airtight seal between the spindle housing and the grinding wheel casing, as well as an extraction hood complete with an integral louvred or perforated adjustable tongue on top of the casing. An air extraction of 1000 cu ft/min at 4.5-inch wg hood suction is applied to this arrangement. Also, an air extraction of 1500 cu ft/min at 4.5-inch eg hood suction is applied to a 7 1/2 by 5-inch spigot located at the back of the machine hopper. (Author summary modified)

29231

Nakai, Yoshiyuki and Tetsuya Yokokawa

ACTUAL EXAMPLES OF KANAGAWA RESEARCH INDUSTRIAL INSTITUTE TYPE DESULFURIZING UNIT FOR WASTE GAS. (Shin ko shi shiki haien daturyu sochi no gutaiteki jitshi rei). Text in Japanese. Kagaku Kogaku (Chem. Eng.), 35(1):36-42, Jan. 1971.

Practical Kanagawa Research Institute type desulfurizing units for waste gas classify roughly into nonrecovering and recovering gas absorbing units. The nonrecovering type uses fresh or sea water as the absorbing solution for sulfur dioxide. The absorbing solution is released in a harmless condition without recovering the SO2. The recovering type effectively uses absorbed SO2 without causing a public nuisance. The gas and absorbent contact, but the liquid s surface tension causes them to form a thin surface on the wire mesh. Gas sucked into the unit cannot pass through without contacting the liquid plane. Also, the gas-liquid rate can be arbitrarily decided. If a greater rate of gas to liquid is needed, the quantity of flowing liquid is increased. Pressure loss at the contact surface is not related to the change of the liquid-gas rate. An actual example is the use of desulfurizing with hydrogen in the final gas treating unit in petroleum refining. When hydrogen sulfide produced by hydrogen desulfurization enters the combustion furnace for waste gas and becomes sulfurous anhydride, the desulfurizing unit is needed for high concentrations. Another application is the treating unit for waste gas from sintering furnaces in iron foundries. This gas is of fairly high concentration. Further, the gas includes many powder dusts but the KRI-wet-type has a good ability to manage for the structure without kinetic parts. Also, the waste gas treatment unit from the boiler in paper mills makes a caustic soda solution absorb sulfurous anhydride in waste gas. The produced sodium sulfate is used as a medicine for a pulp steam bath.

29602

Miwa, Chikamitsu, Yoshinori Shoji, and Toru Kadowaki

PREVENTION OF AIR POLLUTION ON IRON FOUNDRY. (Seitetsusho no taiki osen boshi). Text in Japanese. Kagaku Kogaku (Chem. Eng.), 35(1):42-47, Jan. 1971.

The prevention of air pollution in iron-works was discussed. To control powder dust, use is made of iron-ore, limestone, and coal. The color of the dust must also be controlled. During steel and pig-iron production, corpuscles of oxidized iron are easily produced at high temperatures. Secondary dispersion for the treatment of dust should be considered for sites. The consideratio of dust storms is also required at seaside iron-works. Gas by products can be utilized as a source of heat. The sulfurous components from the sintering furnace and heavy oil must be considered. The selection and layout of arrangements must be examined because of the equipment producing smoke and soot. The technical level for the prevention of air pollution should be high because of a wide variety of equipment, the diversity of the powdered dust, and characteristics such as high temperatures, and continuous operation. Air-pollution from pig- and steel iron-works is powder dust and sulfurous anhydride. Dust control measures include the collection of dust and the suppression of powder- dispersion from storage places of coal and ore. A wet-scattering collector was used to collect dust and large sprinklers were used t prevent powder dispersion. Sulfur dioxide is controlled by the desulfurization of the materials used in sintering and pellet making, of fuels, and of waste gases, and by installing higher stacks to improve smoke diffusion.

31754

Miller, William C.

REDUCTION OF EMISSIONS FROM THE GRAY IRON FOUNDRY INDUSTRY. Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 33p., 1971. 8 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 64th, Atlantic City, N. J., June 27-July 2, 1971, Paper 71-134.)

The various particulate control methods and types of basic process equipment available to the small gray iron foundry are discussed and emission quantities, economic aspects, operating and maintenance procedures, and product quality control are compared. The most common method used for melting metal for gray iron casting is the cupola process. Other furnaces used include the electric arc furnace, electric induction furnace, and a gas- or oil-fired reverberatory furnace. The four basic types of control equipment used on gray iron foundry cupolas are wet cap, multiple cyclone, wet scrubber, and fabric collector. In order for the small jobbing foundry to compete with larger plants and remain in business, the control equipment addition method of reducing air pollution emissions from the cupola melting furnace must be abandoned in favor of a more reasonable approach. The most satisfactory solution is the replacement of the cupola melting process with an oil- or gas-fired reverberatory melting furnace.

32247

SYSTEMS ANALYSIS OF EMISSIONS AND EMISSIONS CONTROL IN THE IRON FOUNDRY INDUSTRY. VOLUME II. EXHIBITS. Kearney (A. T.) and Co. Inc., Chicago, Ill., Air Pollution Control Office Contract CPA 22-69-106, 180p., Feb. 1971. NTIS: PB 198349

An investigation was undertaken to define the air pollution problems of the iron foundry industry, and to set priorities for research and development work that will lead to improved emission control capabilities at reduced cost. Graphs, illustrations, and tables are presented in this volume. They pertain to iron foundry production trends, population trends, and the geographical distribution of foundries. Cupola and electric furnace trends are also indicated. Characteristics and sources of emissions are depicted for various foundry operations. Process specifications and process flow diagrams are presented. Various types of furnaces are illustrated. The Ringelmann scale and other measurement methods are included. The effect of various operating parameters on emissions are presented. Control equipment and costs are considered. Control equipment mentioned includes cyclones, collectors wet collectors, venturi scrubbers, impingers, fabric filters bag filters, afterburners, catalytic afterburners, and electrostatic precipitators.

32251

SYSTEMS ANALYSIS OF EMISSIONS AND EMISSIONS CONTROL IN THE IRON FOUNDRY INDUSTRY. VOLUME I. TEXT. Kearney (A. T.) and Co., Inc. Chicago, Ill., Air Pollution Control Office Contract CPA 22-69-106, 286p., Feb. 1971. 84 refs. NTIS: PB 198348

An investigation was undertaken to define the air pollution problems of the iron foundry industry, and to set priorities for research and development work that will lead to improve emission control capabilities at reduced cost. An extensive search of the literature was conducted to identify and list in a single bibliography published material pertinent to the subject of this study. Emission sources in the foundry are indicated, as well as control capability. The majority of the foundries use cupolas, with only about 15% of production using other forms of melting. Metallic oxides, silicon and calcuim oxides, and combustible materials are the major components of particulate emissions. A technical and economic analysis of control technology is presented. Trends are projected.

35958

Engels, Gerhard

STATE OF THE ART OF DUST ELIMINATION IN FOUNDRIES. (Stand der Staubbekaempfung in der Giessereiindustrie). Text in German. Staub, Reinhaltung Luft, 31(11):436-438, Nov. 1971.

In the Federal Republic of Germany about 800 iron and steel foundries and 900 non-ferric metal foundries existed in 1970. They produce 75,000 tons of dust/year, of which 55,000 tons are retained in dust collectors. The dust collection during sand preparation and distribution, emptying of molds, and old sand return has been technically solved. At a cost of five million dollars/year for investment and operation about 20,000 tons of dust/year are collected. Of the 800 cupola furnaces in existence in 1964, about 30% have been equipped with dust collectors. Twenty percent of the furnaces were replaced by electric furnaces. The costs for dust collection at cupola furnaces between 1964 and 1969 amounted to 10 million dollars. According to the effective regulations, new cupola furnaces may emit only a maximum of 1.5 kg/ton of iron depending on the melting capacity and the operating hours. At older furnaces, the dust emission has been limited to a maximum of 3.0 kg/ton of iron. The amount of cast iron obtained through furnaces equipped with dust collectors and through waste gas free electric furnaces is approximately 70%. The costs for operation and maintenance of the dust collectors for cast iron run at six million dollars/year; dust collection at the production of other foundry products over two million dollars/year.

36756

Cowen, P. S.

THE IRON FOUNDRY INDUSTRY. Tennessee Univ., Knoxville, Dept. of Civil Engineering, Proc. Ind. Air Pollut. Control Conf., Annu., 1st, Knoxville, Tenn., 1971, p. 109-124. 10 refs. (April 22-23.)

Emissions and their control in the iron foundry industry are reviewed. The chief documented source of emissions is the iron melting process using the cupola. Cupola emissions include particulates, sulfur oxides, and carbon monoxide and cause visibility problems. Effluent characteristics, including control considerations, of the emissions are described. Cupola dust is composed of silicon dioxide, calcium oxide, aluminum oxide, manganese oxide, iron oxides, magnesium oxide, and ignition losses (carbon, sulfur, and carbon dioxide). Control techniques for cupola dust must consider control of the carrier gas temperature. Afterburners and maintenance of secondary combustion as control techniques are discussed. Control methods for opacity include dispersion techniques, exhaust exits, and raising of stack gas temperatures.

39698

Erickson, O. E.

ELECTRIC STEEL FOUNDRIES CONTROL DUST EMISSIONS IN LOS ANGELES AREA. J. Metals, 5(12):1625-1626, Dec. 1953.

Equipment used in electric steel foundries to control dust emissions in the Los Angeles area was described. Wet collectors are unable to handle dust particles less than five micron in size. The air stream from electric furnaces contains some sulfur compounds which caused corrosion in the equipment. Baghouse collectors are also not successful. Despite the high collection efficiency, the dust tends to adhere to the fabrics. Electrostatic precipitators cannot put enough charge on the particles to make them stick to the collecting devices in the filter and to prevent them from passing on to the atmosphere. This is particularly true of the air stream from electric furnances because of the high molecular activity of the particles at that high temperature. The most successful system is a tube-type bag filter using Orlon bags and combining an adequate reverse air flow with mechanical shaking. It requires little maintenance or manual cleaning.

39747

American Foundrymen s Society, Des Plaines, Ill., Air Pollution Control Committee

CONTROL OF EMISSIONS FROM METAL-MELTING OPERATIONS. 26p., 1954. 47 refs.

The reduction of air pollution through control of emissions from metal melting operations is discussed. The types of metal melting equipment which produce the most obvious sources of air pollution are the cupola, open-hearth furnace, electric-arc furnace, and the air or reverberatory furnace. In non-ferrous melting the extent of pollution generated depends upon the type of metal being melted. Effective control of emissions from melting furnaces is complicated by a number of factors such as: the great number of ultrafine fume particles in stack gases; high temperatures of furnace stack gases; the large volume of gases; use of water spray equipment for stack gas cooling which frequently presents corrosion problems; and the added operating cost burden of air pollution control equipment. Dust particle size and the nature of solids in furnace stack gases are considered. Pollution codes and control ordinances are discussed for different states. Visible emissions are mentioned. Metallurgical stack emissions and cupola stack emissions are indicated, including cupola operational improvements. Stack burners and secondary combustion equipment, medium- and high-efficiency dust collectors, and cupola dust collector details are described. The screen-cage type of cupola cinder collector, simple spray washers, an improved cupola gas washer with cone, dry mechanical or centrifugal collectors, and high-efficiency wet collectors are included. Bag cleaning methods, filter materials for elevated temperatures, and collector installations are indicated for cloth dust collectors. Methods of preheating combustion air for the cupola are cited. Electrostatic precipitation is described. Control methods are also described for the other furnaces, as well as atmospheric sampling and analysis. Area sampling, stack or duct sampling, and particle size determinations are mentioned.

39795

Weber, Herbert J.

METHODS OF COMBATTING AIR POLLUTION IN FERROUS AND NON-FERROUS FOUNDRIES. J. Air Pollution Control Assoc., 7(3):178-181, Nov. 1957. (Presented at the Air Pollution Control Association, Annual Meeting, 50th, St. Louis, Mo., June 2-6, 1957.)

By its efforts to remove internal dust and fumes through the use of exhaust ventilation and dust-collecting systems, the castings industry became one of the foremost users of industrial dust collection equipment. During this period, the foundry industry, in conjunction with the dust control equipment industry, built up an excellent background of knowledge and experience in the techniques of effective dust and fume control within its plants. Shakeout, cleaning room, and pattern-making operations have been controlled in the foundry industry, but melting operations have presented an entirely new set of problems because of heat and corrosive gases. Operational changes are indicated as a basic step in air pollution control of hot emissions. Simple spray washers, an improved gas washer with cone, dry mechanical or centrifugal separators, high efficiency centrifugal collectors, fabric filters, and electrostatic precipitators are described to control cupola emissions. Control equipment for open-hearth furnaces is indicated, as well as methods to reduce emissions during the phosphorizing of copper and the inoculation of iron with magnesium. The carbon dioxide process for hardening cores and molds is discussed.

39953

McCabe, Louis C.

ATMOSPHERIC POLLUTION. Ind. Eng. Chem., 44(6):103A-104A, 106A, June 1952. 2 refs.

Data on gas volume, process weight ratio, sulfur dioxide content, and other constituents, grain loading, and particle size are summarized for stack gas emissions from gray iron foundries. Limited but favorable experience in complying with Los Angeles regulations on grain loading from this source is described for the electric furnace, gas- or oil-fired reverberatory furnace, and continuous gas-fired rotary melting furnaces. Two or more types of equipment may be required to control gases from these cupolas since there does not appear to be any single, inexpensive dust- recovery technique. Several possible combinations of equipment are noted. Several types of equipment, including the high-temperature baghouse, electric precipitator, and scrubber/closed-top cupola combination, seem to be potentially capable of satisfactory control. Capital and operating costs may be the deciding factor in the choice of methods adopted. The experience of one firm with a high-temperature baghouse is described.

39970

Specht, S. E. and R. W. Sickles

NEW USES OF ELECTRICAL PRECIPITATION FOR CONTROL OF ATMOSPHERIC POLLUTION. Air Repair, 4(3):137-140, 170, Nov. 1954.

The application of electrical precipitators for the removal of fly ash from central power stations boiler effluent is reviewed. New applications are discussed including the cleaning of ferromanganese blast furnace gas, open hearth precipitators, the recovery of dust from the combustion gases from iron ore sintering machines, cupola installations, and the recovery of dust from cement processing. Design criteria for these applications are considered. A precipitator consists of a shell in which are grouped two sets of electrodes; one, plates or pipes known as collecting electrodes, and the other, wires or rods designated as discharge electrodes. The latter are located in the center of ducts formed by the collecting electrodes in the case of the plate type precipitator, and in the center of the pipes in the case of the pipe type precipitator. A high voltage, unidirectional difference of potential is impressed across the two sets of electrodes which ionizes the gas, imparts a charge on the particles, and precipitates them on the electrode of opposite polarity.

40080

Pring, Robert T.

FILTRATION OF HOT GASES. Air Repair, 4(1):40-45, May 1954. 4 refs.

Particularly in the case of gases from open hearth and electric steel furnaces, a reduction in either the concentration or mass rate of emission of extremely fine solid particles sufficient to meet the requirements of most air pollution control ordinances has only a minor effect on the appearance of the stack discharge. Of the gas cleaning equipment presently operating on various types of metal melting furnaces, only cloth filters have consistently produced effluent discharges free from visible solids. Orlon and fiberglass fabrics are the most useful materials for hot gas filtration. The application of cloth filtration to the cleaning of furnace gases requires in most cases that the gases be cooled in order to protect the filter fabric and to ensure economical fabric life. Radiation and convection, tempering air, and spray cooling are employed singly or in combination. Examples of hot gas filtration include grey iron foundry cupolas, electric furnaces, and open hearth steel furnaces.

40553

Bloomfield, B. D.

EXPERIENCE WITH CUPOLA CONTROL FOR JOBBING AND LOW PRODUCTION RATE GREY IRON FOUNDRIES. Preprint, American Foundrymen s Society, De Plaines, Ill., 4p., 1970. (Presented at the Total Environmental Control Conference, Ann Arbor, Mich., Nov. 16-19, 1970, Paper IV-1.)

A considerable amount of working experience is being developed with all types of cupola collectors including systems that perform well on a sustained use basis. The dry centrifugal system and the wet cap collection system described are marginal performers. Their use should be on a special basis where the character of the neighborhood can accommodate the level of performance. The cupola melt rate appears to be a particularly limiting factor. When a decision to install a dry centrifugal or wet cap system is made, it should be with the understanding that there is no flexibility in the control approach. Unless additional equipment is added at a later date, performance cannot be improved to accommodate an increased melt rate, as would be the case with a high energy variable orifice type wet collector. An increase in melt rate would probably result in emissions which exceed a loading of 0.4 lbs/1000 lbs of gas. Particulate emission limits in Michigan, cost factors, and stack sampling are also mentioned.

40554

Wiedemann, C. R.

A CASE HISTORY OF COLLECTION EQUIPMENT. Preprint, American Foundrymen s Society, Des Plaines, Ill., 4p., 1970. (Presented at the Total Environmental Control Conference, Ann Arbor, Mich., Nov. 16-19, 1970, Paper IV-2.)

A case history of dust collection equipment in a Kentucky foundry was presented. All dust collectors are the orifice-type wet scrubbers, with individual sludge ejectors discharging into the respective sluicing systems. The foundry dust collector effluent is mainly silica dust with a percentage of metallics from the cleaning room. Due to the fact that the dust collectors use a separate water system, this effluent is in the nature of a slurry, which contains about 20% water by volume. The sludge then enters a settling tank.

40555

Downs, J. J.

OPERATIONAL EXPERIENCE WITH A DIRECT EVACUATION SYSTEM. Preprint, American Foundrymen s Society, Des Plaines, Ill., 3p., 1970. (Presented at the Total Environmental Control Conference, Ann Arbor, Mich., Nov. 16-19, 1970, Paper IV-3.)

A dust collector system for a jobbing steel foundry producing plain carbon and low alloy steel castings was described. The system is a knocked down pressure type, having a net cloth area of 5860 sq ft to filter 14,000 cu ft/min of electric furnace fume laden air at an air to cloth ratio of 2.39 to 1.0. Fumes are removed directly from the furnace through a hole in the roof to a stainless steel duct leading to a baghouse. There is a damper to control exhaust velocity in the system. A 100 hp blower draws fumes through the system and discharges them into the baghouse. Between the blower and the baghouse is a by-pass which directs the air flow to the atmosphere instead to to the baghouse during the times when the furnace fumes are not being collected or if the temper air damper cannot control gas temperature.

40568

Crabaugh, Hoyt R., Andrew H. Rose, Jr., and Robert L. Chass

DUST AND FUMES FROM GRAY IRON CUPOLAS--HOW THEY ARE CONTROLLED IN LOS ANGELES COUNTY. Air Repair, 4(3):125-130, Nov. 1954.

The characteristics of the pollutant involved in a control equipment design problem, and the characteristics of the gaseous conveying medium, are fundamentally a function of the process equipment under consideration, in this case a cupola producing gray iron. Pollutants discharged from a gray iron cupola are predominantly solids, and approximately 25% of the total weight discharged to the atmosphere is in the particle size range of 0-10 micron. Chemical analyses of the inorganic portions of the dusts and fumes discharged are indicated. Of major importance from a design standpoint is the temperature of the gas stream. Physical and operational limitations of the types of control equipment contemplated and the efficiency required must also be considered. In making an engineering evaluation necessary to design an effective control installation for a gray iron cupola, the problems of temperature control and gas conditioning are of prime importance. This phase of the problem is aided through the use of radiation and convective columns or through the use of evaporative coolers. Several examples utilized in the Los Angeles area are described: one employing radiation and convective cooling and a baghouse; a baghouse system and evaporative coolers; and electrical precipitator; and a gas-fired reverberatory furnace.

40608

Wiedemann, C. R.

A DISCUSSION OF SOME CUPOLA DUST COLLECTION SYSTEMS - PART 3. Mod. Casting, 57(1):72-74, Jan. 1970.

Electrostatic precipitators have not yet been successfully applied to gray iron cupolas because, at the elevated temperatures at which the precipitator equipment must be operated, the resistivity of the silica in the cupola effluents increases to the point where the gases must be wetted. In this moist environment, the iron oxides in the effluent gases tend to coagulate on the collector plate and are difficult to remove. In summarizing cupola dust collectors, some specific guidelines are given for applying cloth filters and scrubbers. In general, no one type of collector is applicable to all cupola operations, nor can any of the methods be applied to any one cupola. Rather, economic and engineering considerations must be evaluated for each case.

43200

Brechtelsbauer, O. J.

CUPOLA GAS SCRUBBERS. Am. Foundryman, 27:34-37, Feb. 1955

The performance of wet cupola gas scrubbers at various gray iron foundries is discussed. Guidelines are given for optimum scrubber performance. Cleaning and maintenance procedures and costs are reviewed. Effluent dust loading tests and analysis of particle size were conducted to check the performance of single spray nozzle units. Results of the tests in grains/cu ft at 500 F, which varied only 0.04 grains, indicate accuracy and reliability. The average of 12 samples was 0.11 grains/cu ft at 500 F, indicating that the scrubbers are reasonably effective. The analysis of particle size showed that only about 1% by weight of the escaping particulate matter exceeded 40 micron in diameter. Over 99% of the particles were less than 5 micron in diameter.

43202

Dok, Harry

SMOG CONTROL IN THE FOUNDRY. Am. Foundryman, 26:46-49, Dec. 1954.

Construction and operation details of a collection system for an electric steel foundry are presented. Smog control is defined as the collection of smoke, fumes, and dust and reducing the volume escaping into the atmosphere. Pollutants and their sources reviewed included sawdust, shavings, and dust sanders in the pattern and carpenter shops, grinding operations, sand blasting, and shot blasting; and smoke from the electric furnaces. The types of dust consist of steel particles, fine sand, and fine particles of the grinding wheels. Reclaiming and control equipment discussed are cooling towers, settling tanks, wet-type collectors, baghouses, and electric precipitators. A dry system using baghouses is described in detail.

43515

Kistler, Jules

TWO MODERN METHODS FOR ABATING AIR POLLUTION IN FOUNDRIES AND IRON AND STEEL WORKS. (Zwei moderne Verfahren zur Bekaempfung der Luftverunreinigung in Giessereien sowie in der Eisen- und Stahlindustrie). Text in German. Giesserei (Duesseldorf), 43(13):333-340, June 1956.

General problems of dust in foundries and iron and steel works as well as two methods of dust separation are described. Fine dusts, particularly when containing crystalline silicic acid, kieselguhr, chalk flint, aluminum, manganese dioxide, Thomas slag, or chromium compounds, are most dangerous since they can cause silicosis. Dust emissions are highest during mold opening and sandblasting. Finest foundry dust contains 2-15%, and courser dust, above 10 micron, 50-75% of silicon. More than 90% of foundry dust is made up of fine fractions. The maximum iron, zinc, and lead contents in dusts lie at 10.0, 15.0, and 0.15 mg/cu m. The dust concentration in foundries lies in a range of 4.4- 5.8 mg/cu m, corresponding to 5-7 kg/ton of iron, while the respective value for Siemens-Martin furnaces is 2.75 g/N cu m. Dust problems in foundries can be effectively solved by two different types of equipment. Pease-Anthony venturi scrubbers apply gas flow rates of 60-120 m/sec to agglomerate dust particles with finely dispersed water. Such scrubbers can be also applied to sulfur dioxide and sodium sulfide. The efficiency for open-hearth and blast furnace gases lies at 98-99%. Elex- Schneible type centrifugal wet separators, with low water consumption, can be used for cupola furnaces as well. The water is dispersed by turbine blades to form a curtain of fine droplets. Exhaust hoods installed in foundry facilities are a basic means of abating dust concentrations. The temperature difference between the ambient and the fresh air should not exceed 6 C.

43766

Ellison, William

CLEANUP OF WET-SCRUBBER EFFLUENT. Ind. Water Eng., 8(8):16-19, Oct./Nov. 1971.

The objectives of both air and water pollution control regulations can be met through judicious selection of wet-collector type and scrubbing water circuitry. Recirculation and reuse of scrubbing liquid is a necessary means of achieving the most economical control of water pollution and is a basic feature to many large wet collectors. Pollutants generally common to all scrubbing liquids and scrubber effluents are settleable, suspended, and dissolved solids. Solid constituents vary with application of wet scrubber. The wet collectors are extensively used in the steel industry, the ferrous and non-ferrous foundry industry, and the power industry. Effluent treatment for the various applications and ultimate disposal of effluents are reviewed.

44844

Miller, William C.

GRAY IRON FOUNDRIES WITHOUT CUPOLAS: OPERATING EXPERIENCE. Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 16p., 1972. 6 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 65th, Miami, Fla., June 18-22, 1972, Paper 72-80.)

Results of the control strategy developed for reducing particulate emissions from gray ion jobbing foundry melting operations in Philadelphia are presented. Two foundry operators were interviewed to determine their experiences and opinions since converting from the cupola melting furnace to a gas or oil-fired reverberatory furnace. Information was obtained concerning initial costs, prodoction costs, fuel utilization and availability, operating procedures, and quality control. A comparison is made between cupola and reverberatory furnace particulate emissions using emissions factors. A stack test of the largest reverberatory furnace installed was performed and the results used to verify the estimated emissions. The reduction of emissions from all foundry melting processes is on the order of 50 ton/yr of particulate matter and almost total elimination of carbon monoxide emissions. The basic equipment conversion, providing improved melting methods, and other related process improvements have demonstrated that the small jobbing foundry must be modernized to comply with strict particulate emission limitations while maintaining a satisfactory level of production. (Author abstract)

44931

Witheridge, William N.

FOUNDRY CUPOLA DUST COLLECTION. PART I - FERROUS CUPOLA EMISSION. Heat. Vent., 46(12):70-84, Dec. 1949. 27 refs. (Presented at the American Foundrymen s Society, East Lansing, Mich., Oct. 28, 1949.)

Methods for the removal of dust from cupola stack gases and the properties of emissions from the ferrous foundry cupola are discussed. The solid matter in ferrous cupola stack gas is heterogeneous in both size and composition. In size it ranges chiefly from 1 to 1000 micron; in specific gravity, from 1.5 to 7.5. It is partially magnetic, corrosive, and abrasive, and contains coke, ash, sulfur, silicon oxides, aluminum, calcium, magnesium, manganese, iron, zinc, lead, and possibly other elements getting in with the charge. An important factor in the design of cupola dust collection systems is the dilution experienced by the combustion gases as they rise past the open charging door and mix with the air induced at that point. The advantages of diluting the combustion gas with induced air including a cooling effect, a lower concentration of both gaseous and solid matter, a fresh supply of oxygen, and a ventilation effect on the charging floor. Methods of gas cleaning for open top cupolas and closed top cupolas are discussed and dry versus wet systems of cleaning are compared. Advantages of the wet system include improved collection of finer fractions, cooling effect of water, convenience of hydraulic transport of the dust, and reduction of abrasive effects. Advantages of the dry system include retention of sensible heat, minimum corrosion activity, and better dispersion of gas in the atmosphere.

45148

American Assoc. for the Advancement of Science, Washington, D. C., Air Conservation Commission

AIR POLLUTION CONTROL. In: Air Conservation. AAAS Pub. 80, p. 234-272, 1965. 11 refs.

Currently utilized equipment and procedures for air pollution control are reviewed. Some tail-end control techniques are settling chambers, target boxes, baffled chambers, cyclones, filters, electrostatic precipitators, scrubbers, gas washers, open-flame afterburners in refractory chambers, solid adsorbers, catalytic afterburners, and vapor retention devices. Control techniques that involve changes in equipment or method are also described. There are many areas in which engineering science has the technology to enable control of pollutants from various industrial sources, but costs have discouraged the development of the necessary devices. Control techniques for motor vehicle pollution include tail-end exhaust control devices, restriction on fuel additives, derating of diesel engines, and development of fuel-cell powered automobiles. The development of the California Ambient Air Quality Standards is described, and the adverse, serious, and emergency levels for various pollutants are discussed. Cost and operating data for cyclones, electrostatic precipitators, fabric filters, and scrubbers in the grey iron foundry, steel production, chemical drying operations, petroleum refinery, and coal-fired heating and power plants are presented along with typical costs of basic and control equipment installed in Los Angeles County.

45177

Yoda, Fumio

AIR POLLUTION CONTROL MEASURES FOR CUPOLA, HEAT TREATMENT, AND SAND TREATMENT. (Kyupora netsu shori suna shori no taiki osen taisaku). Text in Japanese. Kinzoku Zairyo (Metals in Engineering), 12(5):127-131, May 1972.

Air pollution control at a cast-iron plant is reported. The major sources of pollutants are the cupola furnace, thermal-treatment furnace, and sand-treatment apparatus, and the pollutants consist mainly of sulfur oxides, nitrogen oxides, hydrocarbons, particulates, and soots. Sulfur oxides from the cupola are largely reduced by using a wet dust collector, while the particulate concentration is reduced to 0.005-0.05 g/N cu m by using the combination of an inertial force dust collector and a bag filter. The sulfur oxides concentration in flue gas from the thermal-treatment furnace was reduced to 0.4% by converting from heavy oil to kerosene. Dusts from sand-treatment apparatus, such as shake-out machine, mixer, and sand mill are collected by air tumblers, hydrofilter and bag filter.

45364

Mitsch, G. L. and R. A. Wright

THE ELECTROSTATIC PRECIPITATOR AND THE CUPOLA -- 1971. Trans. Am. Foundrymens Soc., vol. 79:257-260, 1971. 3 refs.

The selection, performance, operating variables, and costs of an electrostatic precipitator for an emission control system applied to a gray iron foundry cupola are reviewed. Scrubber, baghouse, and precipitator performance and efficiency data are compared. Complete capital, maintenance, and operating costs are documented and compared with those for other control devices. A test cupola at one foundry produces 12 t/hr on a 4-5 hour shift for 5 days/wk. The precipitator handles 35,000 cu ft/min at 500 F with a maximum inlet grain load of 3 g/cu ft/min; precipitator efficiency is 99.2%. Stack emissions are significantly lower than the maximum allowable emission standards. The annual additional operating cost of the system is $0.70/t of iron produced. (Author abstract modified)

45554

Guthmann, Kurt

DUST PROBLEMS IN FOUNDRIES. (Staubprobleme in Giessereien). Text in German. Giesserei (Duesseldorf), 43(18):572-579, Aug. 30, 1956. 16 refs.

Dust problems in foundries and different dust separation techniques, especially as applied in the U. S., are reviewed. Dust collectors in small foundries in the U. S. must have an efficiency of 80%, while collectors in foundries with a minimum output of 1 ton/hr must have an efficiency of 90%. Dust emission standards for different metallurgical processes, and dust sedimentation rates as a function of stack height, are given. Dust concentrations in throat gases from hot-blast cupolas are 0.9-1.0 g/N cu m, with very fine dust being present in large proportions. The average dust emissions from cold-blast and hot-blast cupolas are 3.65-12.6 and about 2.7 kg/ton of iron, respectively. Only bag filters and electrostatic precipitators are able to meet the present requirements regarding dust emissions. Bag filters, e.g., those made of polyacrylnitrile fibers, are able to treat waste gases cooled to about 140 C temperature at 99% or higher efficiency. Dry electrostatic precipitators, used primarily for hot-blast cupolas, accept waste gases at 60-350 C. Waste gases from electric-arc furnaces, containing dust in concentrations of 2-10 g/N cu m, can be purified by means of bag filters, usually at 60-105 C. Dust collecting techniques based on disintegrators or venturi scrubbers are briefly reviewed.

45977

United Nations, New York, Economic Commission for Europe

AIR AND WATER-CLEANING INSTALLATIONS USED IN THE IRON AND STEEL INDUSTRY. In: Problems of Air and Water Pollution Arising in the Iron and Steel Industry. p. 19-50, 1970.

The design and operation of the most recent or satisfactory air and water-cleaning installations used in different production processes and in different sizes of iron and steel production installations are reviewed. The following main stages of production are considered: cokeries, burden preparation, pig-iron and ferro-alloys, crude steelmaking, rolling and finishing, and ancillary activities. Control equipment includes cyclones, scrubbers, electrostatic precipitators, exhaust hoods, absorption systems, and various non-mechanical collectors and filters. The effects of gas pressure and suspended particulate granularity in the blast-furnace gas-flow are discussed. Some of the nations for which experiences with pollution control equipment are described include Russia, France, Germany, Poland, England, United States, and Sweden. Water pollution, the emission of cyanides sintering, coke ovens, open hearth furnaces, electric furnaces, and foundries are also discussed.

47125

Yoshihara, Tadashi, Toshiaki Sakurai, and Takeshi Imura

FOUNDRY OF CAST IRON, SAYAMA FACTORY, HONDA MOTOR CO. - REMARKABLE FEATURE REGARDING TO THE COUNTERMEASURES FOR PUBLIC NUISANCE. (Honda giken kogyo (kabu) sayama seisaku-sho chuzo kojo - kogai taisaku ni tokushoku). Text in Japanese. Imono (Foundry), 44(7):593-597, July 1972.

A new melting process at a cast iron foundry uses a cupola of the heating-water-cooling type with a 5 ton/hr capacity. The entire exhaust gas is treated in a recombustion furnace, then the exhaust gas goes through a heat exchanger, and is cooled again by a gas cooler to 400 C. Microparticle dusts go through a wet chamber and then are sent to an electrostatic precipitator. The final gas emission contains less than 0.05 g/cu cm of dust. The radical operation system previously used fluorite and created the problem of fluoride gas. It was replaced by an alumina base solvent specially developed by this plant. Good results are obtained.

47328

Kubota, K., K. Kobayashi, N. Yoshikawa, H. Tosaki, and M. Tsuda

SOME PROPERTIES OF GRAY CAST IRON MELTED BY LPG FURNACE FOR PURPOSE OF FEW AIR POLLUTIONS. (Teikogai taisaku o mokuteki to shita LPG-ro yokai chutetsu no ni, san no seishitsu). Text in Japanese. Imono (Foundry), 44(9):724-726, Sept. 1972. 2 refs.

A newly designed liquefied petroleum gas burner was adopted to a furnace combining the shaft type and a reactor, and a pilot furnace was constructed for a capacity of 1.5 ton/hr. The properties of the gray cast iron product from this furnace were examined. The products were stable and satisfactory. From the economical standpoint, the furnace is very desirable. The amount of dust emission was much lower than an ordinary foundry, and a gas chromatography test proved that no treatment was necessary for the exhaust gas.

47711

Makigushi, Toshisada

THE PRESENT STATE AND THE FUTURE OF COUNTERMEASURES FOR PUBLIC NUISANCE AT FOUNDRY FACTORY. (Imono kojo ni okeru kogai taisaku no genjo to shorai). Text in Japanese. Kinzoku Zairyo (Metals in Engineering), 12(9):85-98, Sept. 1972.

Questionnaires were sent to foundries concerning various forms of public nuisance and answers were obtained from 74 factories. Sixty-five percent (48) answered that they were having problems presently; 81% (61) replied that they expected problems in the future; 54% (40) answered that previous problems have been treated, and 57% (42) answered that some countermeasures have been taken. The types of the present problems are noise, vibration, dust, and soot. Problems anticipated in the future are in the areas of toxic gases, bad odor, and the treatment of waste liquid. The types of factories with problems of dusts and soot are cupolas, electric furnaces, and sand treatment. The composition of dusts from cupolas is mostly approximately 30% silicon dioxide; the particle size distribution range from 40 to 200 micron. The dust quantity from electric furnaces used at foundry is 7.09 to 10.84 g/N cu m. The chemical composition of this type of dust is 27.26% SiO2, 0.6% alumina, 60.13% ferrous oxide, 26% calcium oxide, and 0.47% manganese oxide, with traceable heavy metals. Examples of dust collection systems presently used and their efficiencies include the wetcap type (72.9%), a wetcap and cyclone combination (71.9%), jet spray scrubber (87.5%), low pressure venturi scrubbers (90-92%), venturi scrubber and cyclone combination (94.5%), high pressure venturi scrubbers (90-94.5%), bag filters combining water and air coolers (99%), the double-water cooling bag filters (99.4%), and the dry electrostatic precipitators (97.5%).

48272

Hall, H. T.

IMPROVEMENTS IN STEEL FOUNDRY EQUIPMENT, MATERIALS AND TECHNIQUES OVER THE LAST DECADE. Brit. Foundryman, 65(10):378-381, Oct. 1972. (Presented at the Institute of British Foundrymen, Annual Conference, Session D, Eastbourne, England, June 1972.)

During the last decade the number of steel foundries has decreased by 20%. Modern industrial conditions and the cost of re-equipping favor large firms. Scrap is often used in steelmaking now. During the last decade, pollution control equipment has been added to many of the steel foundry processes. For example, cupolas must be wet scrubber systems to eliminate the fume. The electric arc steel-making S.C.R.A.T.A. process is being used increasingly for fumeless refining; in it, iron oxides are injected which cause a reducing atmosphere above the liquid steel bath, thus eliminating fume formation. New analytical systems have helped improve monitoring and control of steel processes. Several deoxidizers have been developed which improve cleanliness of the steel. New equipment and processes are also being used in mold-making and fettling. In the past decade, the traditional lung diseases of foundrymen have disappeared because of improved air quality. Future problems in steel foundries are mentioned.

48424

Weisburd, Melvin I.

FERROUS AND NON-FERROUS FOUNDRIES. In: Field Operations and Enforcement Manual for Air Pollution Control. Volume III: Inspection Procedures for Specific Industries. Pacific Environmental Services, Inc., Santa Monica, Calif., Office of Air Programs Contract CPA 70-122, Rept. APTD-1102, p. 7.9.1-7.9.31, Aug. 1972. 4 refs.

The products of the ferrous and non-ferrous metallurgical industries are oriented to consumer or industrial use while smelters and refiners provide alloys in ingot form to be used by the foundries. While furnaces and melting practices have long been treated as major sources of air pollution from foundries, other operations also contribute. Among these are core making, sand handling, grinding, buffing, and plating. Melting operations produce smoke and condensed fumes while the other operations produce dust, mists, organic gases, and vapors. Processes and inspection points are described for grey iron foundries, as well as for copper-base alloys, aluminum, and zinc foundries.

C. MEASUREMENT METHODS

07045

R. I. Higgins, P. Dewell

A GRAVIMETRIC SIZE-SELECTING PERSONAL DUST SAMPLER. Proc. Intern. Symp. Inhaled Particles Vapours, II, Cambridge, England, 1965. pp. 575-585, (1967.) Also: British Cast Iron Research Assoc., Alvechurch (Birmingham), BCIRA-908, 8p., March 1968. 8 refs.

The Hexhlet is a very satisfactory apparatus for measuring respirable dust concentrations in the general atmospheres of iron foundries, but it is unsuitable for measuring the concentration of respirable dust actually breathed by an individual foundryman. The need for an apparatus which will measure true personal dust exposure is outlined, and a gravimetric size-selecting personal sampler which gives results in close agreement with the Hexhlet, is described. The apparatus operates without attention, is convenient to wear, and samples continuously from the man's breathing zone for a full working shift. (Authors' summary)

33045

Triplett, Gary

ESTIMATION OF PLANT EMISSIONS. Preprint, p. 15-27. 1970 (?). 21 refs.

There are times when it is not possible or practical to determine emission rates by stack sampling; in these cases emission rates may be estimated by utilizing available emission factors. An emission factor is the statistical average of the mass of contaminants emitted/unit quantity of material handled, processed, or burned. The emission factor may also be expressed as the quantity of contaminant/unit quantity of final product or effluent volume. These factors have been developed through stack testing or by material balance calculations. Emission factors are normally given in terms of uncontrolled emissions. Therefore, the type and effectiveness of control equipment must be considered when calculating emissions from controlled sources. Particle size distribution and effective stack height should also be considered. Emission factors are given for coal, fuel oil, natural gas, and wood burning; solid waste disposal; incinerators; paint manufacturing; the food and agriculture industry; primary metallurgical processing including iron and steel manufacturing, open hearth furnaces, basic oxygen furnaces, electrical arc furnaces, and blast furnaces; smelting and foundries for aluminum, brass, lead magnesium, steel, and zinc; mineral processing of asphalt, calcium carbide, cement, concrete, glass and lime; petroleum production, and the kraft pulp industry. (Author abstract modified)

39898

Bloor, W. A.

REDUCTION OF DUST IN STEELFOUNDRY OPERATIONS. Foundry Trade J. (London), 91(1819):31-40, 46, July 12, 1951. 22 refs. (Presented at the Institute of British Foundrymen, Newcastle-upon-Tyne, England.)

Recent methods for measuring and continuously recording dust concentrations in steel foundries are described. The most widely used control methods are those of local exhaust ventilation at the dust sources and the complete enclosure of dust producing processes with provision of exhaust ventilation. To minimize metal dust produced by the stripping and fettling of castings by pneumatic tools, it appears desirable to employ molding materials of as fine a grain size as possible consistent with the maintenance of adequate resistance to general sintering. Animals experiments on the effects of dust inhalation on respiratory diseases are discussed. Concentration estimations, photographic scales, print comparison, screen image comparison, and free silica determinations are described. Using Owens jet apparatus and a salicylic acid filter with the methods of estimation described, existing conditions in steel foundries were surveyed and a wide variety of conditions. Dust concentrations vary from under 200 particles per cu cm to over 6400/cu cm. The free silica content of airborne dusts vary from 11 to 73%. The results were partly dependent on the amount of general atmospheric pollution associated with the area in which the foundry was situated. Many processes showed high concentrations due to contamination of the atmosphere by adjacent dusty processes.

41048

Drasche, H. and H. W. Beckenkamp

DETERMINATION OF DUST AT WORKSHIFT FROM THE OCCUPATIONAL MEDICINE POINT OF VIEW. (Mesures des poussieres au poste de travail sous l angle de la medecine da travail). Text in French. Arch. Maladies Profess. Med. Trav. Securite Sociale (Paris), 32(3):283-288, March 1971.

Measurement of the exposure of workers to airborne dust in their work requires care to insure that the measurement is actually of the dust to which the worker is exposed. Use of the usual dust measurement methods does not readily allow a close correlation to be established between measured values and the amount of dust absorbed by men. In order to obtain results more closely approaching actual dust absorption, gravimetric measurements by means of fixed instruments at workplaces and by means of portable instruments attached to workers backs; konimetric measurements; and measurements obtained with filter masks worn by workers were conducted in an iron foundry. Measurements taken by means of portable gravimetric instruments are valuable. For greatest efficiency, measurements must be taken throughout the working day; over a 5-day period; since the varying degree of effort entailed by different tasks affects the dust absorption rate, this must be taken into account when evaluating exposure.

42735

Clark, G. L. and H. C. Terford

X-RAY ANALYSIS OF FOUNDRY DUSTS. FLUORESCENT SPECTRAL ANALYSIS FOR IRON. Anal. Chem., 26(9):1416-1418, Sept. 1954.

Because of the importance of iron determinations in foundry dusts in the diagnosis of siderosis, as contrasted with silicosis, and because of the extremely laborious and unsatisfactory analysis by most chemical methods, recourse must be taken to fluorescent spectral analysis. Foundry dusts were analyzed with the General Electric SPG fluorescent spectrometer with the XRDa3 x-ray diffraction unit. The calibration curve is considered.

D. AIR QUALITY MEASUREMENTS

45624

TNO, Delft (The Netherlands), Research Inst. for Public Health Engineering

INDOOR AIR POLLUTION. (Binnenlucht). Text in Dutch. In: IG-TNO Annual Report 1969-1970. p. 26-33, 1970.

A statistical design was drawn up for an investigation of iron and steel foundries to be conducted in cooperation with the European Coal and Steel Community, and the results of measurements in ceramic industries in and around the town of Gouda is being prepared. Personal air samplers were evaluated for their ability to measure the concentrations of dust in the vicinity of individual workers who carried them on their backs, and research was carried out on methods to sample and measure solvent vapors in factories. The storage capacities of several types of plastic bags were determined for trichloroethylene in the 60 ppm range; the determination of quartz in dust was investigated, along with methods to measure bis(tributyltin)oxide and trichloroethylene in air.

E. ATMOSPHERIC INTERACTION

32850

Fiksinski, Rajmund

EMISSION AND IMMISSION OF DUST AND FUMES IN A STEEL FOUNDRY. (Emisja oraz imisja pylow i dymow w odlewni staliwa). Text in Polish. Przeglad Odlewnictwa, 21(4):141-146, 1971. 12 refs.

The emission and diffusion of pollutants in a steel foundry was studied in connection with occupational health protection. Emissions outside of the plant and within the factory were measured, including dust and sulfur dioxide. The methodology, measurement methods, and results are discussed. Maps of the dust depositions were constructed with isolines of equal dustiness. Two and a half years of measurements showed dependence between production volume and the amount of outside emissions between the buildings and the plant area.

G. EFFECTS-HUMAN HEALTH

01093

S. Tanaka and J. Lieben

COMMUNITY CHEST X-RAYS FOR PNEUMOCONIOSIS PREVENTION. Arch. Environ. Health 12, 10-4, Jan. 1966.

Among 395,961 70 mm chest photofluorograms taken over the three-year period of 1961-1963 in 23 Pennsylvania Counties, there were 428 cases in which films were read as pneumoconiosis, silicotuberculosis, and generalized fibrosis. Of these, 111 of the persons were between ages 25 and 54. These were investigated further. Of the 111 persons studied, 43% were coal workers, 14% worked in brick and stone industries, and 9% in foundries. About 28% gave no history of occupational dust exposure. Thirty of the 48 coal workers came from one coal region county. The overall rate of medical follow-up was 88%. In the dust exposed group, about 50% of those followed were found to have non-occupational diseases of the lungs. All nine women in the study had no dust exposure. Neigher had the 14 cases that had been read as 'generalized fibrosis.' On the basis of 31 confirmed pneumoconiosis case reports, investigation for the source of dust exposure was conducted in 20 various-sized establishments; 14 are in current operation and are scheduled to be surveyed or to have recommendations for proper corrective measures.

01094

C. Zenz, J. P. Bartlett, and W. H. Thiede

ANALYSIS OF VENTILATION IN OLDER WORKERS IN FOUNDRY, MACHINE SHOP, AND OFFICE. J. Occupational Med. 7, (9) 443-6, Sept. 1965.

Clinical pulmonary spirometry has been evaluated in 206 working men. Physical examinations, chest X-ray films, and ventilatory-function tests during this special survey detected no new respiratory aberrations in the group. Occupation appeared to have virtually no effect on ventilation; no significant changes were detected in the pulmonary function after exposure to foundry, office, or machine-shop environment, even after an average 30 continuous years of exposure. (Author summary modified)

01536

J. Knowelden R.H. Kastell

SURVEY OF RESPIRATORY PERFORMANCE OF STEEL-FOUNDRY EMPLOYEES. Foundry Trade (London) 121(2592):177-181, Aug. 11, 1966.

A British Steel Founders' Association radiological survey carried out upon the respiratory tracts of steelfoundry personnel is discussed. The objective was to discover if there was any evidence of disturbance in ventilatory functions associated with occupation, smoking habits or radiological abnormality. Conclusions indicated that although individual men varied widely in their ventilatory capacity there was little difference between firms or occupations. A decline in capacity was associated with severe radiological abnormality or with heavy cigarette-smoking but there are probably many other factors unconnected with steel-foundry employment which accounted for difference in performances of individual men who were subjected to testing. (Author summary)

11899

Ciuhandu, G., M. Diaconovici, L. Kiss, and V. Rusu

THE RELATIONSHIP BETWEEN CARBON MONOXIDE EXCRETION IN EXHALED AIR, AND OCCUPATIONAL EXPOSURE. ((Die Beziehung zwischen Kohlenmonoxidausscheidung in der Ausatemluft und beruflicher Exposition.)) Text in German. Zentr. Arbeitsmed. Arbeistsschutz, 18(6):172-176, June 1968. 9 refs.

Attempts to determine carbon monoxide blood content by analysis of exhaled air have been made. In earlier attempts the authors measured the total amount of CO exhaled in 5 minutes. Breathing was performed in the closed system of a spirometer containing 10 liters of oxygen. The dependence of exhaled CO volume on the gas concentration of the blood corresponds with a slow rising curve of concentration. Using this relationship, an indirect determination of the blood CO is possible. The relationships between CO exposure and CO elimination in the exhaled gas mixture was studied in 272 persons who worked at different jobs in one steel and 2 iron foundries. Exhaled carbon monoxide quantities in smokers as opposed to nonsmokers are generally higher; therefore, smokers and nonsmokers were observed separately. In each occupational group there is an increase in the gas elimination following exposure. In nonsmokers the gas volume is somewhat lower at the beginning of the work shift. With exposure excretion levels increase. In smokers the CO levels were higher at the beginning of the shift - the rise in excretion levels following occupational exposure is the same in the smokers as in nonsmokers. Marked individual variations in the levels occur, but overall figures in groups of exposed workers are stable. After work exposure, CO is excreted and levels become lower in nonsmokers and return to the original prework shift levels. Smokers continually add to their CO content even after their occupational exposure. By analysis of exhaled gas, the carbon monoxide impregnation during a given work period can be measured. The gas content in 100 ml. blood is of the same order of magnitude as that excreted in the air in 5 minutes. It can be determined with the aid of a reference curve. The procedure does not require serial blood sampling while permitting the observation of carbon monoxide levels in exposed workers.

11970

Langmann, R.

THE EFFECTS OF AIR POLLUTANTS ON SELECTED POPULATION GROUPS. (Die Wirkung von Luftverunreinigungen auf ausgesuchte Bevoelkerungsgruppen). Oeffentl. Gesundheitsdienst, 22(5):179- 184, 1960. Translated from German. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 13p.

Various studies were undertaken to determine the transient effect of industrial dust on lung function. In one test, healthy male subjects averaging 25 years of age were exposed for six hours in a working area of a steel and iron foundry to 18 ppm carbon monoxide and 0.08 ppm sulfur dioxide. No worker demonstrated the onset of any acute loss of respiratory function. Only one difference was noted in MTV values as determined by the Fowler Test before the start and after the end of the working day. The difference was not statistically significant. Tests were also conducted with workers exposed to 0.24 ppm in the foundry pit. No detectable changes were recorded with respect to vital capacity, maximum expiration value, and respiratory minute volume. However, respiration rate increased by 11.9% and depth of respiration declined by 9%, suggesting that dust potentiates SO2 action. The effects of chronic exposure to dust in a study concerned with measurement of pulmonary function in a group of older persons need to be taken into account. Subjective reactions to SO2 concentrations less than 1 ppm were noted in older emphysema patients when the weather was foggy and small amounts of hydrogen sulfide were present in the atmosphere.

42136

Vanhoorne, M., R. Dams, J. Bressers, and C. van Peteghem

SMOKE OF THE TRIGGER PROCESS IN THE PRODUCTION OF NODULAR IRON AND ITS POSSIBLE EFFECTS ON MAN. Int. Arch. Arbeitsmed., 29(2):102- 118, June 1972. 38 refs.

Following complaints of foundry workers about the smoke released by the triggering process in the production of nodular iron, the composition of this smoke and its possible effects on man were investigated. Nondestructive neutron activation analysis showed 34 elements, all in concentrations below threshold limit values. The possible acute effects of this smoke on man were investigated in 10 workers. Eight workers had subjective complaints, mainly respiratory discomfort. Determination of iron in serum and lead in blood of workers before and after exposure to the smoke showed no significant differences. Clinical laboratory investigations and body temperature readings indicate that metal fume fever did not occur. All subjects showed to a different extent a decrease of vital capacity shortly after exposure to the smoke. Forced expiratory volume in one second showed no consistent changes. Long term effects of repeated short exposures are unknown.

42736

Clark, G. L. and L. E. Holly

X-RAY ANALYSIS OF FOUNDRY DUSTS. INTERPRETATION OF RESULTS AND CORRELATED MEDICAL OBSERVATIONS. Anal. Chem., 26(9):1418-1420, Sept. 1954. 6 refs. (Presented at the American Chemical Society, National Meeting, 123rd, Los Angeles, Calif., 1953.)

An intensive study was made in all sections of a large midwestern steel foundry of the concentrations and compositions of dusts which may constitute a hazard upon inhalation to the workers, especially in development of silicosis. Since alphaquartz is the established cause of this disease, quantitative analysis of dusts must be made by x-ray diffraction techniques. Two sets of dust samples collected from the same areas, one a year after the other, were analyzed on two different Geiger diffractometers by two observers. Iron was determined chemically and by fluorescent spectral analysis in all the dust samples to ascertain any lung effects defined as siderosis. Dusts varied in quartz content from 0 to more than 80%, and in general the amount of iron varied inversely. Since many workers in the foundry had been employed for more than 16 years in the same duties and the same areas and since lung radiographs periodically made over a period of 16 years were available for each man, it was possible to study the development and progression of evidence of silicotic nodulation and of siderotic changes, supposedly benign, which are often difficult to distinguish from silicosis, as related to the hazard of the particular occupation. The effects of ventilation and of aluminum dust therapy were thus ascertained. (Author summary modified)

43510

Einbrodt, H. J.

ASBESTOSIS AND PSEUDOASBESTOSIS BODIES (FERRUGINOUS BODIES). (Asbestose- und Pseudoasbestosekoerperchen (ferruginous bodies)). Text in German. Pathol. Anat. Hals, Nasen, Ohren, Zahnheilkd. (Stuttgart), 41(4):504-506, 1970. 18 refs.

Studies on asbestosis, pseudoasbestosis, and asbestos-like bodies are reviewed. Asbestosis bodies, containing a longitudinal asbestos fiber, pseudoasbestosis bodies without longitudinal orientation, and asbestos-like bodies of 20 micron or larger have a similar morphology and chemical structure in consisting of ferrous phosphate. Pleural mesothelioma due to filamentous asbestos, a highly carcinogenic substance, was observed. Pseudoasbestos bodies in the lungs of workers exposed to rutile, talc, and cork dust, and asbestos-like bodies in foundry workers were detected.0 The presence in the lung of ferruginous bodies was found to be associated with pulmonary fibrosis. Ferruginous bodies in 15% of populations not exposed to dust in industrial areas were detected, which suggests no relationship between such bodies and fibrotic and carcinogenic effects.

46757

Zahorski, Witold, Kazimierz Marek, Aleksandra Kujawska, Marek Zacharewicz, Antoni Gwara, Joana Kubicka, and Adam Konca

EVALUATION OF THE HEALTH STATE OF IRON MILL EMPLOYEES. (Ocena stanu zdrowia zalogi walcowne zelaza). Polski Tygod. Lekar. (Warsaw), 25(27):993-996, 1970. 8 refs. Translated from Polish. 12p.

Taking into account characteristics of the work environment in a foundry, an attempt was made to determine the relationship between chronic bronchitis, high blood pressure, ulcers, and neurotic syndromes with the possible influence of pathogenic, occupational, and non-occupational factors. The employees examined consisted of 561 men between 19 and 64 years of age, 40% of whom had worked at the iron mill less than 5 years and 33% of whom had worked there over 15 years. Factors which were considered included age, smoking, alcohol consumption, earnings, marital status, living conditions, and the various occupational factors such as duration of employment and type of job. Morbidity is discussed, as well as absenteeism.

J. EFFECTS-ECONOMIC

12394

Woodcock, Kenneth R. and Larry B. Barrett

ECONOMIC INDICATORS OF THE IMPACT OF AIR POLLUTION CONTROL: GRAY-IRON FOUNDRIES, A CASE STUDY. Preprint, Air Pollution Contr Association, New York City, 23p., 1969. 6 refs. (Presented at the Air Pollution Control Association Annual Meeting, 62nd, New York, N. Y., June 22-26, 1969.)

Two gray-iron foundries are used as models to illustrate how economic indicators can describe the direct impact of air-pollution control expenditures and help determine what is efficient and equitable. A set of 14 indicators (financial, engineering, production effectiveness) is used in the analysis. By relating control costs to the various economic and engineering characteristics of a firm, the study provides a means for determining relative measures of impact, which is defined as either the value of any investment in an air-pollution control system or the value of capital and current costs allocated annually to the control system. Control costs for any given type of industrial process normally increase with the size of the process as well as the efficiency of the control system. In general, the impact indicator increases with increasing collection efficiencies of control systems. However, this direct relationship does not always hold true for the variable of size because certain economies are often found with increasing size. A discussion of these principles as measured by impact indicators is included. The indicators are capable of broader application then the presented comparison of two plants in the same industry. They can also be used to compare different plants in the same industry.

17059

Weber, Herbert J.

THE IMPACT OF AIR POLLUTION LAWS ON THE SMALL FOUNDRY. J. Air Pollution Control Assoc., 20(2):67-71, Feb. 1970.

Various air pollution laws in the United States and Canada are compared and the cost of complying with them for the small iron foundry is discussed. The question of why gray iron foundries do not replace cupolas with electric melting furnaces is answered by presenting an analysis of cupola melting costs and electric melting costs. Gross melt costs for arc melting are 6 to 21% higher and induction melting costs, 8 to 19% higher than cupola melting. The financial plight of the small foundry is typified by the case of five Rhode Island foundries that are required to have collection efficiencies higher than 99%. The net worth of the foundries ranges from $30,000 to $175,000. The installed cost of air pollution equipment comes to $135,000 and combined financing and maintenance costs, to $38,168 per year. However, a breakthrough in cheaper control of cupola effluents appears imminent. A Chicago foundry has obtained a pronounced reduction of the effluents by the use of coke-fired cupolas with natural gas injected just above the tuyeres. The gas burners above the tuyeres deliver 14,000,000 BTU/hr, reducing the amount of coke used by 27%. The system is installed on a malleable iron cupola. Whether it will be successful on a gray-iron cupola remains to be determined.

17193

Woodcock, Kenneth R. and Larry B. Barrett

ECONOMIC INDICATORS OF THE IMPACT OF AIR POLLUTION CONTROL. J. Air Pollution Control Assoc., 20(2):72-77, Feb. 1970. 6 refs.

Because the cost of air pollution controls should be examined relative to denominators common to emitters, desirable indicators of economic impact are those permitting comparisons between emitters. Indicators which facilitate such comparisons are suggested and their usefulness illustrated by application to two model gray iron foundries. Four alternative control systems are proposed for each model plant. The indicators are formed by comparing the investment and annual costs of the control systems to the financial, engineering, and production characteristics of the plants as well as to the effectiveness measures of the control systems. The characteristics of the model are represented by data on the following: investment in melting equipment, plant assets, retained earnings, value of castings, net income, melt rate, control system gas volume, annual quantity of castings shipped, and annual quantity of particulates captured. The indicators permit judgements on the equity and efficiency of various levels of air pollution control and make it possible to obtain a more equitable distribution of costs.

21968

Linsky, Benjamin

CASE STUDIES OF COSTS (QUALITY AIR--LUXURY OR INEXPENSIVE NECESSITY). Virginia Polytechnic Inst., Blacksburg, Water Resources Research Center, Seminar on the Economics of Air and Water Pollut., Blacksburg, Va., 1969, p. 195-208.

A series of case studies relating pollution control costs, equipment, and effects are discussed. A breakdown of the consumers dollar in terms of what air and water pollution actually cost him is included. A system of concepts and phrases used in considering air pollution is presented. Proposals, reports, and local ordinances relevent to the discussion are included. Estimated costs for air pollution control for the gray iron foundry cupola (afterburners, scrubbers, baghouses, and electrostatic precipitators), steel plant (scrubbers, baghouses, and electrostatic precipitators), and chemical drying operation (primary cyclone, secondary multiple cyclones, secondary wet scrubbers. and baghouses) are subdivided into the following breakdown: air pollution emissions (particulates and droplets, gases); collection efficiency or recovery; and cost (capital investment, operating costs, and plant investment).

29879

Gutow, Bernard

HOW EMISSION CONTROL AFFECTS MELTING COSTS. Foundry, 99(5):76-80. May 1971.

Estimates are presented of capital and operating costs of emission control systems for iron foundry melting furnaces. The data are for foundries with cupolas controlled with high-energy wet scrubbers or fabric filters and for electric furnaces controlled with fabric filters. Differences in installation dates have been compensated for by converting investment costs to a common base of 1969 dollars. Capital costs considered include basic equipment, auxiliary equipment, engineering, and installation. Basic and auxiliary equipment costs are the main components of total capital costs, varying from 41 to 85% of total costs. Factors influencing capital costs of cupola control systems include construction materials, water supply and solid disposal, and erection costs. Costs of electric arc control installations are influenced by type of exhaust hood, complexity of the ductwork, and cost of baghouse. Total investment costs for both scrubbers and filters vary directly with gas volume throughput and increase with increased pressure drop. Operating costs considered include electrical power and makeup water. For wet scrubbers, these are the major costs. Cost-per-ton curves, comparing 1000, 2000, and 4000 hr/yr levels of operation, indicate that the cost per ton of melt rises rapidly as the size of the foundry operation decreases.

30696

LeSourd, D. A., M. E. Fogel, A. R. Schleicher, T. E. Bingham, R. W. Gerstle, E. L. Hill, and F. A. Ayer

COMPREHENSIVE STUDY OF SPECIFIED AIR POLLUTION SOURCES TO ASSESS THE ECONOMIC EFFECTS OF AIR QUALITY STANDARDS. VOL. I. (FINAL REPORT).

Research Triangle Inst., Durham, N. C., Operations Research and Economics Div., APCO Contract CPA 70-60, RTI Proj. OU-534, Rept. FR-OU-534, 395p., Dec. 1970. 328 refs. NTIS: PB 197647

Air pollution control costs for mobile sources are presented on a national basis and in terms of unit investment and annual operating and maintenance costs as well as total annual operating and maintenance costs. The analyses cover the estimated emissions and control costs for new cars for Fiscal Year 1967 through Fiscal Year 1976. Control costs for each stationary source, except for residential heating, are shown for 298 metropolitan areas by investment and annual expenditures by Fiscal Year 1976. The impact of control on selected industries and the Nation are also determined. Finally, an extensive bibliography is included. The pollutants from mobile sources selected for analysis are hydrocarbons, carbon monoxide, nitrogen oxides and particulates. The six pollutants for which control cost estimates are made for stationary sources are particulates, sulfur oxides, carbon monoxide, hydrocarbons, fluorides, and lead. Emission standards applied are considered stringent in comparison with many currently in use throughout the Nation. Mobile sources include automobiles and light and heavy-duty trucks. Stationary sources studied include solid waste disposal, commercial and institutional heating plants, industrial boilers, residential heating plants, steam- electric power plants, asphalt batching, brick and tile, coal cleaning, cement, elemental phosphorus, grain handling and milling (animal feed), gray iron, iron and steel, kraft (sulfate) pulp, lime, petroleum products and storage, petroleum refineries, phosphate fertilizer, primary non-ferrous metallurgy (aluminum, copper, lead and zinc), rubber (tires), secondary non-ferrous metallurgy, sulfuric acid, and varnish. Data essential for defining metropolitan areas, emission control standards, and relevant process and air pollution control engineering characteristics required to support the cost analyses for each source and the cost impact on each industrial process are presented and analyzed in separate appendixes to this report. (Author abstract modified)

40545

Commins (J. A.) and Associates, Inc., Fort Washington, Pa.

A LOCALIZED STUDY OF GRAY IRON FOUNDRIES TO DETERMINE BUSINESS AND TECHNICAL COMMONALITIES CONDUCIVE TO REDUCING ABATEMENT COSTS.

Office of Air Programs Contract OAP-EPA 68-04-0043, Rept. APTD- 1081, 177p., Jan. 1972. 45 refs. NTIS: PB 209291

The extent of technical and business commonalities in gray iron foundries which would be conducive to reducing air pollution abatement costs was examined on the thesis that economics of scale both in purchase and in financing costs might be available to members of the group, thereby lessening the financial impact to small foundries in complying with air pollution regulations. A sizeable portion of an air pollution control system can be substantially identical for foundries in Pennsylvania having commonalities of melt rate, blast rate, and stack exit temperatures. Installation problems are unique and are not amenable to the economies of scale. In some cases, process changes are an attractive alternative to control devices. A group of ten foundries of ten ton/hr melt rate could save $20,000 per each group member by group procurement. If group financing turns out to be possible, a group of ten foundries could save $15,000 for each member s financing charge. No precedent exists for this type of joint venture thus seriously inhibiting the adoption of groups with the goal of obtaining the savings previously mentioned. This problem can be overcome by conducting a program in gradual steps. As the program proceeds, previously unanswered questions are answered and the risk is eliminated or at least quantified and accepted, the parties would become more increasingly committed up to the last phase of firm commitment in a legally binding way (Author conclusions modified)

41352

Public Health Service, Raleigh, N. C., National Air Pollution Control Administration

ECONOMIC IMPACT OF AIR POLLUTION CONTROLS ON GRAY IRON FOUNDRY INDUSTRY. Publ. AP-74, 124p., Nov. 1970. 75 refs. GPO

Nationally, gray iron foundries rank as one of the largest industries in terms of value of shipments, employment, and particulate pollution. Emissions in 1966 amounted to 190,000 tons, which was 2.9% of the 5.9 million tons of particulates emitted by industrial processes into the nation s atmosphere. In 1967, particulate emissions were controlled from 204, or about 11% of the 1376 foundries in the gray iron industry. About half the foundries shipped less than $1.0 million in castings; and of those, only about 5% operate air pollution control systems. The four most common pollution control devices, in ascending order of collection efficiency, are wet caps, multiple cyclones, wet scrubbers, and fabric filters Nearly half the foundries with control systems use low-cost, low-efficiency wet caps, which do not usually satisfy stringent emission regulations. Industry considerations as to whether and how to control air pollution have been influenced by state and local regulations. Federal activity under the Clean Air Act will serve to intensify state and local efforts to combat air pollution. A comparison of pollution control costs determined from the interview survey with industry financial data provided by the Internal Revenue Service suggests that the impact of stringent pollution control on small firms is greater than on large firms. The annual cost of controlling air pollution, as a percent of profits before taxes, declines, as size increases, from 59% for a typical firm with value of casting shipments under $0.5 million to 11% for a typical firm with over $10 million in value of shipments. The possibility of foundries shifting air pollution control costs is limited by the price behavior in markets serving and served by the industry. The growth of larger foundries, the relative increase in casting prices and decrease in raw materials prices, and the increasing profit and capital shares of the industry will allow larger firms to distribute the burden of air pollution control more widely. (Author summary modified)

K. STANDARDS AND CRITERIA

44599

Statens Naturvardsverk, Stockholm (Sweden)

GUIDELINES FOR EMISSION ABATEMENT MEASURES TO BE APPLIED TO AIR POLLUTANT INSTALLATIONS. (Riktlinjer for emissionsbegransande atgarder vid luftfororenande anlaggningar). Text in Swedish. Rept. 2, 18p., 1970.

Guidelines issued July 1969 for emission abatement to be applied to old and new pollutant installations are presented. Guidelines for and calculations of the required height of stacks emitting sulfur dioxide and dust are reproduced. The maximum allowable SO2 concentrations are 0.14 mg/cu m (monthly average), 0.29 mg/cu m (daily average), and 0.72 mg/cu m (30-minute average). The dust and soot emission limits for oil-fueled facilities with thermal power outputs below 300 MW are 1.5 g and 1.0 g/kg of oil; while the limits for steam boiler units with outputs exceeding 300 MW are 1.0 g of dust and 20 g of SO2/kg of oil. The SO2 emission from sulfuric acid manufacturing plants should not exceed 5 kg/ton of sulfuric acid. Corresponding emission limits for iron and steel works, ferroalloy manufacturing, powder metallurgic plants, cement, lime, asphalt and cellulose plants, foundries, petroleum refineries, and gas turbine power plants have been established. A minimum temperature of 800 C is required for waste incinerators, and a maximum of 10% of the dust present in incinerator waste gases should be in a fraction above 40 micron.

46100

Engels, Gerhard

NEW DETERMINATION FOR EMISSION CONTROL AND OCCUPATIONAL PROTECTION IN FOUNDRY ENVIRONMENT. (Neue Bestimmungen zum Immissions- und Arbeitsschutz und ihre Auswirkungen auf Giessereien). Text in German. Giesserei (Duesseldorf), 56(21):621-624, Oct. 1969. 14 refs.

New regulations and emission standards imposed on metallurgical facilities in West Germany are reviewed. The maximum allowable dust emission from cupola furnaces is 1.5 kg/ton of iron, while a higher value of 2 kg/ton of iron is permitted for adverse cases. Measurements revealed that dust emissions from hot-blast and cold-blast cupola furnaces are largely in the same order of magnitude within a range of 10.01-10.30 g/N cu m, while the specific emissions, determined mainly by the quantity and quality of the coke charge, are 7.52-7.70 kg/ton of iron. Three maxima of the grain size distribution were found in the respective ranges of 2-5, 20-50 and 100-500 micron, and some 50% of the total dust was below 63 micron. The suggested maximum allowable concentrations for copper-melting furnaces are 150 mg/N cu m for electrostatic precipitators and scrubbers, and 100 mg/N cu m for tissue filters. Maximum allowable job site concentrations were elaborated for 323 different pollutants in 1968. The use of quartz sand for sandblasting has been prohibited. A noise standard of 90 dB, specified for foundries, is hard to comply with.

L. LEGAL AND ADMINISTRATIVE

08093

Bloomfield, Bernard D.

THE FOUNDRY - AND AIR POLLUTION CONTROL LEGISLATION. Mod. Castings, 52(4):93-97, Oct. 1967. 5 refs.

This paper discusses air pollution as created by foundries in Michigan, processes and equipment to combat these polluters and legislative procedures, now in force and proposed, in that State, and what must be done if air pollution is to be solved. The author points out that approach to zoning has to be on the basis of long term projection-on an orderly pre-determined basis for the good of all. The author feels it is likely that more governmental assistance and incentives are needed to encourage, or enable, installation of effective air pollution control equipment. (Author0s abstract)

09095

New York State Air Pollution Control Board, Albany

PART 188. CONTAMINANT EMISSIONS FROM FERROUS JOBBING FOUNDRIES. (STATUTORY AUTHORITY: PUBLIC HEALTH LAW, SS 1271, 1276.) 3p., Feb. 6, 1968.

A regulation stipulating maximum allowable emissions of particulate matter from ferrous foundry cupolas and open hearth furnaces in the State of New York is outlined. The regulation applies to all cupolas and open hearth furnaces in operation on or prior to February 6, 1968. The effective date of compliance is January 1, 1971.

09538

Walderman, Howard

LEGAL NOTE...AIR POLLUTION CONTROL. Public Health Rept. (U. S.), 83(2):118, Feb. 1968.

The Superior Court of New Jersey held than an expert opinion based on estimates of particulate emissions from the smokestack of a cast iron foundry was sufficient to find air pollution code violations by the defendant operator of the foundry. The Court also held that such evidence could support an order directing the defendant to cease discharging solid particles into the air in violation of the code. The Court thus rejected the defendant's attack upon the substantiality of the State's evidence, which evidence had consisted of assumptions found in 'respected' literature, in the form of reliably based percentages, of the solid particles emitted from the material fed into the operation if uncontrolled (emission factors), and of the efficiency of the air pollution equipment installed.

29975

Smaller Enterprises Promotion Corp. (Japan)

CASTING WORK ENVIRONMENTS AND PUBLIC NUISANCE. (Chuzo sagyo kankyo oyobi kogai). Text in Japanese. In: Report of Field Survey on Technical Standards of Smaller Enterprises. Pig Iron Castings Manufacturing Industry (70-70) Chapt. Rept. 419, p. 57-69, March 1971.

The shortage of labor, caused by generally poor working conditions, is an increasingly serious problem for the casting industry. A survey revealed that 100% of the enterprises in the pig iron casting industry admitted the need to make working environment improvements. Changes should include: the development of work procedures, machines, tools, and equipment that will not damage the working environment; the improvement of ventilation, lighting, and air conditioning to eliminate dust, heat, noise, and odor; and the development of high-performance, low-cost devices to improve the working environment. According to the opinion survey, 774 out of 1762 companies wanted something done about dust, 386 about heat, 364 about noise, 129 about vibration, 82 about odor, and 27 about other items. Dust is produced by sand screening, demolition of molds, grinding, and melting in a cupola furnace. Heat occurs in teeming, especially hand-teeming, melting in a cupola, and demolition of molds. Noise comes from compressors, melting, molding machines, and grinding. Vibration comes from molding machines, grinders, cupola furnaces, and others, while odor is from mold-making, especially shell mold-making, carbon dioxide, melting in a cupola, and demolition of molds. Dust, noise, vibration, exhaust gas, odor, and effluents from the casting industry also cause a public nuisance. Since most casting works are smaller enterprises and located in densely populated districts, the solution of the public nuisance problem is very difficult, particularly for economical reasons. It can only be solved through the cooperation of central and local governments, enterprises, and local inhabitants. The most popular public nuisance prevention devices in the industry are dust removers and sound insulation devices, followed by the suspension of night-time operations. Now 75.4% of the enterprises operate during daytime only.

38376

Engels, G.

LAW AND JURISDICTION. (Aus Gesetz und Rechtsprechung). Text in German. Giesserei (Duesseldorf), 58(26):824, Dec. 1971.

The catalogue of foundry processes which are subject to stringent emission limitations and thus must be licensed before they can be put into operation has been changed. All plants which melt crude iron or crude steel as well as plants for steel production must obtain a license. Excepted are plants operating on the vacuum melting principle with capacities to 5 tons. The list also includes melting plants for non-ferrous metals including plants for refining. Excepted are plants for vacuum melting and melting of up to 50 kg of light metals or 200 kg heavy metals and melting plants for precious metals, or alloys consisting solely of precious metals. Furthermore, the list pertains to iron, annealing, and steel foundries, foundries for non-ferrous metals with the exception of foundries for bell casting, and art foundries where metallic molds are used. The new list omits the small foundries for non-ferrous metals with the comment that air pollution by these plants is negligible.

44928

Reinhardt, Robert T.

WEST COAST. Iron Age, 163(15):104, 106, April 14, 1949.

The approximately 75 gray iron foundries in Los Angeles County are faced with the necessity for controlling smog, and three types of pilot plants are now in use to determine the most efficient methods. Steel foundries numbering about 20 in the area are likewise conducting experiments to meet legal requirements. Action is also being taken against the petroleum industry and open dumps burning rubbish. The Air Pollution Control Act of California is mentioned, including the system of issuing permits. The situation in San Francisco and the Pacific Northwest is mentioned. To aid western industry management attempting to eliminate or minimize industrial health hazards, the Public Health Service is setting up its first industrial hygiene field station outside of Washington, D. C., near the University of Utah campus in Salt Lake City.

N. GENERAL

06146

W. Rayher* and J. T. Middleton

THE CASE FOR CLEAN AIR (SPECIAL REPORT). Mill Factory 80,(4) 41-56, Apr. 1967.

The introduction in the form of a series of questions put to Dr. Middleton is of special interest in indicating the forward thrust of the Federal government in air pollution control since he is the Director of the National Center for Air Pollution Control which has the responsibility for the administration of the Federal air pollution control laws and regulations. His answers indicate vigorous activity by the Federal authorities where local authori- ties fail to act. The major provisions of the proposed Air Quality Act of 1967 are outlined as well as the existing Federal authority under the Clean Air Act of 1963. With this back- ground of increased Federal activity and especially with the issuance of emission standards, this definitive review continues with an outline of the various types of air pollutants, their sources, and the accepted methods of control. In the section covering what is being done by industry today, examples are given of the control measures in effect at a rubber processing plant, a cement plant, steel plant, and a foundry.

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15. SUPPLEMENTARY NOTES

16. ABSTRACT

Bibliography contains abstracts of the available literature pertinent to emissions from ferrous foundries, the effects of those emissions on man and his environment, and feasible technology for their control.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group

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