

poorly equipped units include sintering plants, oxygen lanced open hearth furnaces, Bessemer furnaces and electric furnaces.

One of the knotty problems faced by the industry is that of cleaning up or preventing emissions from by-product coke ovens. These emissions, consisting of smoke, dust, sulfur gases, carbon monoxide and a host of organic compounds, are usually emitted when coal is charged to the oven and again when the coke is removed from the oven and quenched with water. Control of these copious emissions has not yet been accomplished to any significant degree. Further effort by the industry in this regard is needed. It may be that a radically new method of making coke will be required.

Some idea of the cost of controlling emissions from the steel industry can be obtained from the program underway in the Chicago Metropolitan Area. In March of 1965 the major steel manufacturers in the area entered into a 7-year agreement with the local regulatory agency to prevent emission of some 88,000 tons of dust annually. The total cost of the control program will be about \$50,000,000. A similar program underway in Northwest Indiana will take 9 years to complete. When finished more than 186,000 tons per year or 29 percent of the potential emission is captured.

A third major industry, Mr. Chairman, the inorganic chemicals industry, includes those industries engaged in the manufacture of nitric acid, phosphoric acid, caustic, chlorine, and phosphate fertilizers. Pollutants include such well known compounds as sulfur dioxide, nitrogen dioxide, gaseous fluorides, acid mists and many other less common inorganic gases, mists and dusts. Control of emissions is normally effected by using wet collectors to remove pollutants from the discharged gases.

The technological ability to control pollution from this class of industry is fairly well advanced but some difficult problems remain. This is illustrated by the phosphate fertilizer industry and its captive sulfuric and nitric acid plants. Production of phosphates is increasing at a tremendous rate; an increase of 57 percent is predicted in the next 5 years. Wet scrubbers to remove fluorides can be designed for greater than 99 percent removal and dusts can be controlled to a similar or better degree using wet collectors or bag-houses. Acid mists can be removed using fiber mist eliminators at efficiencies up to 99.9 percent depending on particle size and energy expended. Sulfur oxides from sulfuric acid plants are difficult and costly to remove from effluent gases, and can best be curtailed by process control through a high rate of conversion of sulfur dioxide to sulfur trioxide and hence, sulfuric acid. New plants approach and equal this high degree of control in many cases. Older plants seldom do.

A particularly difficult problem in the fertilizer industry is the control of the continuous gaseous fluoride emission from fertilizer curing and storage structures. Scrubbers with gas flow rates up to 400,000 cubic feet per minute are required. Extensive piping is required to adapt these structures to control. Installations may cost \$1 to \$3 per cubic foot of gas exhausted. Since there is no return on the investment, industry has been slow to provide controls on these buildings. A better means of controlling emissions is badly needed.

Fluoride scrubbers are a continuous source of maintenance due to pluggage. Industry has overcome much of the corrosion problems but, with no monetary return on the control equipment, most companies are lax in maintenance of control equipment. Little research and development in control techniques is conducted by industry since no salable product is recovered.

The rapid growth of this industry will necessitate improvement in abatement efficiency just to maintain status quo on total emissions, particularly since the industry tends to cluster in a relatively small area near existing phosphate rock mining operations.

A fourth major industry, which I will classify as non-steel metallurgical, includes gray iron foundries, non-ferrous foundries, metal reclaiming operations and smelters of all types. The major pollutants are dusts, oil vapors, metallic fumes, sulfur dioxide and nitrogen oxides.

These industries contribute significantly to the general air pollution of many of the urban areas of the country. The metal casting industry, for example, ranks fifth among all manufacturing activities in the United States. Capital investment for new plant facilities exceed \$12,000,000 per month. In 1960, there were over 6,000 foundries employing about 425,000 people. Control of pollutants from foundries is particularly difficult since the exhaust gases are normally at high temperatures and much of the particulate is of extremely small size.