

THE AIR POLLUTION STORY IN A METROPOLITAN AREA¹

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Many metropolitan areas are presently concerned with the mounting number of problems being created by our increasingly polluted atmosphere. This concern is warranted on the basis of the effect that air pollution has on the economic, biologic, and sociologic aspects of a community.

Economically, polluted air places a real, though sometimes intangible, burden on our society. Most of us have encountered some of the direct effects of air pollution. Dust or soot will soil laundry and dirty our homes. In heavily polluted areas, curtains must be laundered and walls and ceilings must be washed or painted at frequent intervals. The American public spends about \$3 billion a year in laundry and cleaning bills. People living in large cities with dirt laden atmospheres pay a considerable portion of this expense.

Air pollution has a marked effect on our urban environment. Exposed surfaces deteriorate faster in cities than in rural areas. This is partly due to sulfur compounds which corrode every kind of building material, including stone. The cost of corrosion of metal by rust has been estimated by the paint industry to total \$7½ billion a year. More than 300 million gallons of paint used by Americans each year cannot keep pace with this blight. Haze reducing visibility decreases the amount of healthful sunlight and increases the need for artificial light. Thus, it is realized that polluted air can be a factor in the deterioration of property value or other forms of community blight, which make necessary the cost of urban renewal.

Rural areas of this country have also been affected. Damage suits have resulted from pollution emissions which have caused severe injury to farm animals and farm crops. Damage to farm crops in various areas of the country, including the northeastern United States, amounts to more than one million dollars each year as a direct result of air pollutants.

In many industries, including the foundry, chemical and utility industries, the cost of air pollution control equipment is a significant percentage of the capital investment and operating expenses. About \$300 million is being invested by industry each year in the United States for air pollution control and research.

Although the price of pollution control is high, the cost of neglect is higher still. Authorities have estimated that polluted air costs each American between \$10 and \$65 annually. On this basis, Philadelphia's bill would be between \$20 million and \$130 million per year.

Along with the increase in industrialization and population density, there has been an increase in the occurrence of air pollution episodes having fatal consequences. Air pollution has been a direct factor in the numerous deaths occurring in communities like Meuse Valley, Belgium; London, England; Denora, Pennsylvania, and New York City. The occurrence of these severe air pollution episodes illustrates that fatal consequences can result from the short term exposure to high levels of air-borne contamination.

On more frequent occasions, pollutants have concentrated sufficiently to cause eye irritation, the reduction of sunlight, pungent odors or a combination of such offenses to our senses. Such temporary episodes have been classified as nuisances, since no lasting health damage is readily apparent. Likewise, pollutants exist in the air which are not readily detectable by human senses. The long term exposure to low concentrations of these substances is of increasing medical concern, since there is a growing amount of evidence which indicates a positive correlation between certain non-detectable but common air pollutants and some specific diseases. Such ailments as chronic bronchitis, asthma, emphysema, and lung cancer are among the most common.

The foregoing introduction has outlined some of the reasons for my belief that there is an urgent need for action to combat the pollution of our atmosphere in all metropolitan areas. This will undoubtedly require the combined efforts of local, regional, state, and federal government agencies, as well as the positive contributions of well-informed industrial and community leaders.

The sources of pollution that can be found in any metropolitan area can be attributed to all segments of the community. Control efforts are usually initiated on the basis of an obvious effect that these emissions may have on people or personal property. Thus, one may classify a category of air pollution problems which would refer to the situation where a specific source has released some obvious or detectable pollution which results in a definite nuisance or some other effect in the community adjacent to

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that source. A smoking stack which soils laundry is a typical example of this type of problem. There is an equally important category of air pollution problems which must be considered and dealt with by a community with a comprehensive air pollution control program. This category includes those sources which may be emitting pollution that is not readily detectable in that there is no direct correlation between these emissions and an observed effect. The automobile is a good example of this type of problem since emissions from an individual car will be of no concern. There may, however, be a very drastic change in air quality resulting from the accumulative effect of pollution emissions from hundreds or thousands of these widely-spread individual sources.

As an important guide to any community's effort toward controlling pollution emissions, some indication of the order of magnitude and the relative contribution of each of the various sources is helpful. A listing of the types of sources and the relative contribution from each can be obtained by means of a source inventory or survey within the community. The data can be presented in a form of charts which indicate these relative magnitudes of contribution.

In the northeastern United States, the major contributor to the air pollution problem can be classified as fuel combustion processes. This is logical when considered from the point of view that the combustion processes represent a community's major use of the atmosphere as a raw material and a waste disposal medium. By supplying oxygen for supporting the burning processes, the air supplies a raw material and, as a receptor for the noxious products of combustion, the atmosphere must be used as a waste disposal medium.

A combustion process can be conducted without the visible emission of pollution which is usually referred to as smoke or soot. However, visible emissions often result from the mechanical breakdown of the combustion equipment which obviously wastes fuel and is not an economical practice. A failure on the part of operational personnel can result in a similar occurrence. In a combustion process where there is no problem with inadequate combustion and all the heating value is being derived from the fuel the visible emission may be the non-combustion portion of the fuel or the ash which must be removed by control equipment. The control equipment is installed as an auxiliary to the combustion equipment. In one installation in the city of Philadelphia, the company spent approximately \$200,000 to remove the seven tons of flyash released to the atmosphere each day.

In addition to the visible emissions from these large combustion sources, there are, of course, the

invisible but equally important gaseous emissions such as carbon monoxide, sulfur dioxide, and oxides of nitrogen. Of major concern, is the problem of sulfur dioxide concentrations in many urban communities. The removal of sulfur as an impurity of the fuel before it is burned appears to be the most feasible method of controlling this emission at the present.

Open burning of refuse creates enormous quantities of pollution which can be adequately controlled by properly-designed incinerators. The handling of dusty materials and dusty processes can be controlled by appropriate changes in handling procedures. The production of petroleum or chemical products can likewise result in objectionable pollution emissions. For the most part, these emissions can be controlled to an acceptable reasonable degree by the application of: (1) good equipment design; (2) proper equipment maintenance; (3) good operational procedures on the part of responsible employees; or, if all the above are inadequate, (4) the installation of a device or system for controlling the emissions.

Domestic sources are usually a significant portion of the problem in any community. Proper operation and maintenance of home heating equipment and privately-owned automobiles must be emphasized in any comprehensive program. The burning of domestic refuse or leaves in open fires results in approximately fifty times the amount of air pollution that would be produced by a properly-designed municipal incinerator for the handling of an equal quantity of refuse. A comprehensive program must, therefore, inform and contact all segments of the community. In the City of Philadelphia, the Air Pollution Control Section within the Department of Public Health, has the primary responsibility for carrying out this program. Authority was granted in the Philadelphia Home Rule Charter and the Air Pollution Code of 1949 for the establishment of Philadelphia's Air Pollution Control program.

To most effectively deal with the types of problems indicated previously, the Section is divided into several operational units. The activities of our engineering unit stress the preventative aspect of air pollution control. Plans must be approved before certain types of equipment may be installed. This insures adequate control of sources when they are in the design stage, rather than after they are built and causing neighborhood nuisances. All combustion, incineration, and process equipment must be approved by the engineering unit prior to their installation within the City.

Our engineering staff works closely with industry in determining the engineering principles whereby emissions can be controlled or where suitable alter-

nate operations can be used to eliminate a problem. Whenever it becomes necessary to perform testing of specific pollution sources to determine if they comply with the Air Pollution Code, the engineering unit directs the testing program in cooperation with the Environmental Health Laboratory.

The laboratory also gives technical assistance with data collection during industry surveys and plant inspections, and conducts routine sampling and analysis of the air over Philadelphia.

Our investigations unit is involved in nearly two thousand specific investigations of complaints from citizens each year. Field investigators patrol our city twenty-four hours a day, seven days a week, looking for excessive pollution emissions. We use radio cars to assure rapid investigation of problems when they occur. The inspectors provide immediate correction of many faulty operations through assistance and instruction to the operating personnel. They also check combustible gas and gasoline leakage which could create explosion or health hazards.

Consultative services, in the form of office conferences, play an important role in the achievement of greater compliance with the Code. About 200 such conferences are held each year. In many instances, education and persuasion fail to bring results and legal action must be taken.

So that we can accurately and continuously measure our progress in improving the quality of the air over Philadelphia, thirteen sampling stations are located throughout the City. Data collected at these stations gives us an indication of how air pollution varies geographically within our community. Hourly, daily, and seasonal levels of pollution are also measured. In addition, this data are used in studies designed to correlate community activity, weather conditions and health, with air pollution levels. Such correlations, which are already underway or being planned, are an important tool in guiding the long-range goals of the Section.

In the past the Division of Environmental Health has assigned sanitarian personnel to specific air pollution control activities. It is our opinion that sani-

tarians with a limited amount of specialized training can provide significant services to an air pollution control program. The reporting of observed air pollution emissions from both stationary and vehicular sources and the development of public information material are areas in which sanitarians can play a vital role. The Division of Environmental Health of the City of Philadelphia plans to increase its utilization of sanitarians in the expanded air pollution control program.

Since 1956, in addition to the correlation of numerous smoke and special problems, the Section was instrumental in bringing about 160 major control installations which have resulted in the daily removal of approximately 85 tons of particulate matter formerly discharged to the atmosphere and the daily treatment for odors of an amount of air equivalent to that breathed by 2.1 million people.

Increased emphasis has been given to air pollution control throughout the country by the passing of the Federal Clean Air Act in 1964. Under this legislation, communities which have a planned and workable program are eligible for receipt of federal support and up to two federal dollars for each local dollar in cost of the air pollution control program. We feel that this has been an important factor in dealing with the problem on a national basis and Philadelphia's program has been increased within the last year with the assistance of the Clean Air Act's appropriations. Our annual budget is \$360,000 or approximately 18 cents per capita.

Although additional research in this field would be helpful in shedding further light on the health and economic effects of polluted air, we already have sufficient information which indicates that something must be done to combat this problem. Likewise, the technology for controlling pollution emissions is sufficiently well-advanced. There is an urgent need for additional legislation at all governmental levels and the provision of adequate enforcement agencies for dealing with the air pollution problem by local, regional or state governments.

CDC SHORT COURSE ON EPIDEMIOLOGY AND CONTROL OF SALMONELLOSIS

The Communicable Disease Center in Atlanta, Georgia, will present a course, "Epidemiology and control of Salmonellosis," June 6-10, 1966. Control of salmonellosis will be emphasized. Current information and immediately useful techniques related to control will be delineated.

This course is designed especially for sanitarians, engineers, and veterinarians; however, it is also of interest to other members of the public health team involved in the epidemiology and control of salmonellosis. Course content will include the status and surveillance of salmonellosis in

the United States; a review of the bacteriology of salmonella; sources and reservoirs of salmonellae; epidemiology of salmonellosis; and controls related to animal feeds, the farm environment, rood processing, and food service.

There is no charge for this course or the training materials which will be distributed. Travel and living costs are the responsibility of the applicant. For application forms and information, write: Chief, Training Branch, Communicable Disease Center, Atlanta, Georgia 30333.