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What to Do About Dust?

Industrial Dust Hazards . . . Little Known of Them...Foundation to Study Ways, Means of Combating . . . Medical, Legal, Engineering Aspects

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DUST might be roughly described as the "airy particles" arising from a world that is wearing away under the ceaseless erosion of nature and the onrush of restless man.

The physical world is, of course, composed of matter in many forms. Dust, in a broad sense, is simply the tiny remnants resulting from the breaking up of this matter. It is the product of that tireless process of wearing out which walks hand-in-hand with time and affects life, mountain tops, and all material things. Dust is one of the common denominators of the world and exists, potentially, in every solid object. Even man is made of dust, according to the Scriptures, and unto dust he ultimately returns.

Thus certain fine, powdery particles are a part of the natural order and might be called natural dusts, since they are independent of man. Examples of such forms of air pollution include withering dust storms searing the country side or miniature particles of plant and animal life afloat in the air.

Far more dangerous than these, however, are the man-made dusts generated in the industrial processes of our highly industrial era. Besides the "chimney-sweeps" of incomplete combustion—smoke, ash, tar, and so on—there are the numberless industrial dusts. The use of abrasives to clean and polish metal, abrasive powder and abrasive soap making, foundry work, sand blasting, quarrying, tunnelling, mining, glass making, and pottery making are among the "dusty trades."

The stone cutter of old, hacking at hard rock with a pick or with hammer and chisel, had little to fear from dust. The modern stone cutter, thundering through brittle rock with power drills, stirs up smoke-like waves of dust. Unless properly protected, he may inhale harmful quantities of dangerous silica particles. Some of these drills are known among miners as "widow makers."

THE United States Public Health Service estimates that approximately 1,000,000 workmen are exposed to silica dust in America's mines and mills—a dust which, breathed in sufficient quantities and over a sufficient period of time, may cause silicosis and other disorders of the respiratory organs. The inhalation of dust may, under certain conditions, weaken man's resistance to tuberculosis, colds, bronchitis, pneumonia, and sinus troubles. Men working in dusty trades suffer more from such ailments than men working elsewhere. "The evidence that excessive dustiness of any kind is harmful is beyond argument," according to Prof. Philip Drinker of the Harvard School of Public Health.

Of the estimated 1,000,000 workmen exposed to silica dust, approximately one half of this number is exposed to harmful concentrations. In addition to silica, there are numerous other dangerous dusts, such as lead dust or asbestos dust.

It was not until about two years ago that the general public in this country became acutely conscious of dust as an enemy to health and a cause of occupational disease. This realization followed the wide publicity given to silicosis cases in connection with a tunnelling project at Gauley Bridge, West Virginia.

But prior to this general awakening, with its accompanying panic and hysteria, a number of industrial leaders representing the steel, foundry, glass, ceramic, pottery, refractory, aluminum, coal, and metal mining industries began meeting and discussing ways and means of combating occupational diseases. An epidemic of ruinous lawsuits was sweeping the country. Many firms were forced out of business entirely. The industrial areas about St. Louis and Rochester, New York, suffered severely. Insurance rates were mounting as a result of the many claims.

IN the face of these developments, industry, perplexed and often bewildered, knew not where to turn for help or guidance. Even noted physicians frequently disagreed as to the medical aspects of the problem. Engineers, attempting to devise equipment to dispose of dust, were hampered by this inability of medical men to say just what concentration of a given dust constituted a hazard to health, and just how low the concentration should be cut to make a reasonably safe working place.

Consequently a score of firms and trade organizations banded together and established the Air Hygiene Foundation of America, a non-profit, scientific organization created to conduct research on silicosis and kindred industrial diseases. The Foundation, in its search for the vital knowledge needed to combat these ills, is not only engaging in research itself but is attempting to collect into one central reservoir the fruits of experience and research which have accrued heterogeneously everywhere.

After getting underway early in 1936,

A dangerous concentration of silica dust at left, thrown off in a cloud by a pneumatic drill. On the right a new suction collector carries away all dust

the Foundation immediately launched a program of fact-finding searches in the three fields bearing upon the problem—medicine, engineering, and law.

The medical survey, for example, involved the evaluation of findings gleaned in a number of industries, in hospitals, and in research centers here and abroad. It concludes that on the basis of present knowledge, nine points are definitely known about silicosis. They are:

1. Silicosis results from the inhalation of dust containing free silica.

2. The time required for the development of silicosis varies from a few years to 20 or more, depending upon the concentration of silica particles in the air and the length of exposure.

3. Beginning silicosis is recognizable only by properly taken roentgen films (X rays) of the chest.

4. Associated with silicosis is a marked predisposition to tuberculosis.

5. Silicosis can be prevented by protecting the industrial worker from inhaling silica dust.

6. Concentrations to which dust must be reduced in order to be safe have not been absolutely determined.

7. Industrial dusts, containing silica, are frequently not all silica, being mixed with other materials. Some of these may alter the silica action on the body.

8. Asbestos, a silicate, is the only dust other than free silica which has been shown to cause lung fibrosis.

9. Simple—that is, uncomplicated—silicosis, as seen in the industries in this country, causes relatively little severe disability. It is its combination with other diseases which is serious.

The report of the preventive engineering survey warned engineers to center their attack on the smallest dust particles, pointing out that, in a general sense, the finer the dust the greater the potential danger.

The legal survey examined the statutes and court decisions of each of the 48 states in an effort to establish the exact status of the law in each state as regards occupational disease due to air pollution. This review disclosed sharp conflicts between the laws of the various states respecting compensation for occupational disease. It noted, however, a growing liberal trend toward compensating workmen who contract industrial disease just as workmen injured in industrial accidents are compensated.

THE occupational disease question is so broad, with its social and economic implications, that many of the 44 state legislatures which met last year considered the problem.

Further, as pointed out in the Summary Report of the Economic, Legal, and Insurance Committee of the National Silicosis Conference, "increased costs for preventive or compensatory measures may have marked economic effects upon the relative position of competing industries or units." Obviously a manufacturer in a state with stringent regulations is placed at a disadvantage with a competitor in a state where few such regulations exist. This disadvantage promises to be temporary, however, and may be offset even now by the cost of damage suits.

Aside from the economic consideration is the even more important social or human factor. If a workman contracts an occupational affliction, his wife and his children suffer indirectly, as does the whole community. The United States Public Health Service has shown that the life expectancy of industrial workers is several years less than in the case of other workmen. Pneumonia rates are twice as high and tuberculosis rates are much higher for the industrial group, which roughly comprises some 15,000,000 persons employed in manufacturing and mining.

This situation further emphasizes the need of a coördinating and correlating research center dedicated to the development of sorely-needed information on the cause, cure, and prevention of airborne occupational diseases. Possessed with the findings of its inventory-like surveys, showing, roughly, what is known and what remains to be sought out, the Air Hygiene Foundation was able to lay out a practical program of scientific research into the fundamentals of industrial air pollution.

The research is to be carried on at institutions deemed best fitted for the particular task in mind. Some of these are the Saranac Laboratory, Saranac Lake, New York; University Hospital, University of Pennsylvania, Philadelphia; United States Bureau of Mines, Washington, D. C.; Harvard School of Public Health, Cambridge, Massachusetts; Singer Memorial Laboratory; and Mellon Institute, Pittsburgh.

This program, recently announced, seeks to answer many puzzling questions on the medical and engineering aspects of the subject. Some of these include:

I. What is the mechanism by which silica acts upon the body? Is silica a poison or an irritant? Is the action of silica physical, as in cutting, or is it chemical?

II. What is the relation between silicosis and tuberculosis?

III. What is the effect of other substances upon the action of silica? (It is claimed that some dusts retard the action of silica, apparently diluting its effect, while others are said to speed up the silica action.)

IV. Determination of hood design data for various dust-producing processes involved in the crushing, grinding, and general handling of rock.

Another problem calls for the development of a fool-proof technique of roentgenography (X ray). It appears that pre-employment medical examinations including a chest roentgenogram will be required of workmen to an ever increasing degree in the future. Thus a man may be hired or rejected on the basis of his X-ray film. Therefore, the best possible technique that can be evolved is the least with which employers can be satisfied.

Coal mines constitute another dust hazard and especially at points where machines undercut the coal seam by means of powerful cutting teeth on a flat arm. At the right, this operation is rendered dustless by a spray of water on the cutting arm