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Industrial Pneumoconiosis Prevention and Control

by
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Joint Session on Chest Diseases, Clinical Pathology,
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INDUSTRIAL PNEUMOCONIOSIS PREVENTION AND CONTROL

By Edmund M. Fenner
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When I was asked to appear before this distinguished medical society and speak on the subject of the prevention and control of industrial pneumoconiosis, the first thought that occurred to me was how interesting and how encouraging it was that I, an engineer and a representative of industry, had been invited to address such a meeting.

I think that one of the main reasons for this positive development is that medical science and industry have found that they can, indeed must, work together toward the prevention of occupational disease.

This is partly due to the fact that the majority of American business leaders have become increasingly aware of and concerned about the various occupational health hazards associated with their industries.

The cooperation between science and industry has already achieved some striking results, and there is no doubt in my mind that this trend will continue.

The very fact that I am here this morning is evidence of what I say. I am here because my job within my own company is to coordinate an environmental control program designed to eliminate industrial health hazards, and to insure that we do not misuse the air and water we share with our community neighbors.

So, let me take this moment to thank you for this opportunity to speak to you today.

From an engineering point of view, the prevention of industrial pneumoconiosis depends largely upon the control of respirable dusts. The achievement of proper control has two basic requirements:

First . . . processes and production equipment should be designed to be free of hazardous dust emissions. This frequently will require the incorporation in the design of properly engineered dust collection systems.

Second . . . a formal program of industrial hygiene surveys measuring dust concentrations should be instituted to assure that safe levels are being maintained.

Of course, in those instances where dust concentrations are above safe levels and dust collection systems cannot be provided, then exposed workers should wear dust respirators of a type approved by the United States Bureau of Mines. The wearing of respirators, I should emphasize, is to be relied upon only when control cannot be achieved otherwise.

I can best illustrate how a prevention and control program works by discussing the efforts in this area of the company with which I am associated—Johns-Manville.

However, before going into details on where J-M is today, I would like to go back in time and review briefly the past history of Johns-Manville's industrial hygiene programs, especially with regard

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to chrysotile asbestos fiber—my company's most important raw material.

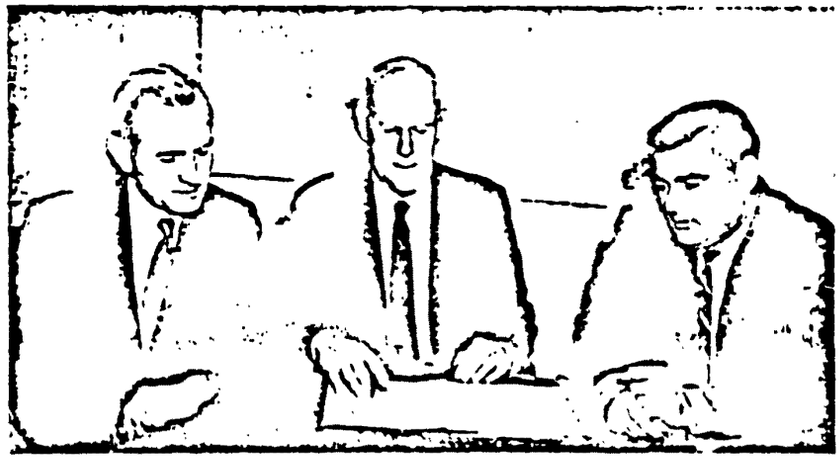
Although J-M started in the asbestos business some 110 years ago, it was not until the late 1920's that scientists first became concerned about a connection between occupational exposure to large quantities of asbestos fiber dust over a period of many years and a non-malignant lung disease called asbestosis. Johns-Manville's reaction was to sponsor, in the 1930's, both animal and human research on the biological effects of asbestos at the Saranac Laboratory of the Trudeau Foundation in up-state New York. This research continued providing valuable information to assist in planning J-M dust control activities for more than 20 years. It established that prolonged and heavy exposure did indeed produce a unique and identifiable pulmonary fibrosis.

It was the opinion of the scientists that conducted this research that it was the so-called long fibers of from 10 to 50 microns in length that were responsible for the production of fibrosis. These doctors therefore suggested that a threshold limit of 1.0 million fibers, 10 microns or longer, per cubic foot of air would be sufficient to eliminate the disease. Johns-Manville adopted this threshold limit value.

The industrial hygiene standards that we strove to attain, during this period were considered sufficient—in light of the medical knowledge that was then available. By the mid-1950's, doctors in Great Britain had become concerned about a possible link between prolonged exposure to large quantities of asbestos dust and lung cancer. Johns-Manville therefore undertook independently and in concert with others in the industry, the sponsorship of a wide number of scientific projects designed to investigate this reported relationship. This type of J-M sponsored research continues to this very day.

Three of the typical research projects currently underway, in which Johns-Manville is participating are:

1. A fibrous dust study being undertaken by the Industrial Hygiene Foundation of America. The purpose of this program is to investigate the factors in-



Edmund M. Fenner (center), Director of J-M Environmental Control Department, and his two assistants, George L. Swallow (left) and James N. Siegfried (right), check a plant environmental control report.

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volved in the pathogenicity of asbestos fiber dust.

2. A seven to ten year environmental, clinical, and epidemiological study of workers exposed to asbestos. This study was initiated several years ago. It is being conducted by the Bureau of Occupational Safety and Health of the Department of Health, Education and Welfare, with the cooperation of the asbestos industry. The purpose is to obtain information on the health effects of exposure to the major types of asbestos used in the United States.

3. An epidemiological study of the Canadian general population, including several thousand workers in the asbestos-producing regions of Quebec. This study is sponsored by the Institute of Occupational and Environmental Health in Montreal. Its purpose is to examine possible relationships between asbestos exposure and disease.

We are also concerned with other research work, including a number of studies with fiber glass and other fibrous materials, but I believe these three give a good idea of J-M's involvement in this area.

These and other studies, including those by Dr. Doll and associates in Great Britain, indicated to those of us concerned with industrial pneumoconiosis that their prevention—whether from asbestos, or talc, or silica, or diatomaceous earth—depends largely on the control of respirable dusts.

Now, what are the actual mechanics of prevention and control in Johns-Manville. In the first place, our dust control activities are not new. We have had processes with integral dust control systems in our plants and mines for many years. And we have kept watch on their effectiveness. At first, our plants were checked by the Metropolitan Insurance Company and then later by our own industrial hygienists—I might add that J-M hired its first industrial hygienist in 1937.



J-M employee Ralph Hindmarch adjusts a personal air sampling device for testing on-the-job dust concentrations.

A few years ago, we critically examined the effectiveness of our control programs.

We asked ourselves what kind of a system could we set up that would include surveys to check the levels of dust, noise and fumes in all plants and mines; an engineering program that would provide solutions to the problems found; and a monitoring procedure that would keep close tabs on our overall progress.

Our solution was to set up a Department of Environmental Control. This department coordinates long-standing Johns-Manville efforts to improve working and community environments; to provide added health and safety protection for employees and customers; and to control the quality of the air and water around our plants.

The unique element in this set-up is that all of these varied efforts are co-

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ordinated by a single, central agency. Of course, in today's discussion, we are most concerned with that portion of the department's activities which centers on occupational environment—which we define as the working conditions inside our plants and mines that could affect the health, safety and welfare of our 22,000 employees.

One of the first jobs undertaken by the new department was to take a critical look at the Threshold Limit Values we were using to evaluate dust exposures, including asbestos fiber exposure.

The Threshold Limit Value for asbestos fiber dusts had long been 5 million particles per cubic foot. The value had been established by the American Conference of Governmental Industrial Hygienists in the 1930's. Johns-Manville used this standard, and in addition, the standard of 1 million fibers per cubic foot that I mentioned previously as being recommended to us by the doctors at Saranac Lake.

It might be helpful at this point if I explained the difference between a particle and a fiber. Simply speaking, a fiber is an object with a length to diameter ratio of not less than three to one, and for these standards, a length of at least 10 microns. A particle is defined as any material that cannot be classified as a fiber. The Johns-Manville standard measured fibers; the ACGIH standard measured particulate—in our surveys we used both standards as a yardstick.

The measurement of asbestos fiber dust concentrations against either of these Threshold Limit Values required the same sampling and analysis technique. Samples were collected by an impinger, then particle and fiber counting was done under a light microscope at 100 magnification. This same method of collection and analysis would also be used to determine concentrations of silica and other dusts. Last year, the American Conference of Governmental Industrial Hygienists announced a new intended Threshold Limit Value for asbestos. I calls for limits of either 2 million particle per cubic foot of air or 12 asbestos fibers over 5 microns in length, per cubi centimeter of air.

At about this same time, as a result c the cooperative study with the asbesto industry I mentioned earlier, the Unite States Public Health Service recom mended another evaluation technique a the most accurate method for deter mining asbestos fiber dust concentration This new technique counted fibers and re quired completely different sampling an analysis procedures and equipment. I called for the use of a personal a sampler—an air sampling device worn b the employee on his job—that collecte dust on a membrane filter. The fibers co lected were to be counted by phase cor trast light microscopy at 430 magnifica tion. Since this membrane filter metho had been recommended as the mos accurate, Johns-Manville adopted it—eve though it meant we also had to chang our procedures for measurement of othe dusts—and even though it meant consider able cost in additional personnel an equipment.

How do we go about attaining this ne ACGIH standard of 12 fibers per cc. I lik to think that the methods we use are r clinical in nature as those employed b the medical profession. A problem at plant or mine location is diagnosed b means of an industrial hygiene surve performed by a team of industrial h genists from one of our laboratorie Guided by the survey results and app cable Threshold Limit Values, we pr scribe the necessary corrective actio Periodic spot checks by our hygienis determine the effectiveness of our co rective measures.

Our instruments are dust, fume an vapor directors, and noise level meter our cures are, first; process and equip ment changes to reduce dust, noise an fume generation and second, the install tion or improvement of existing contr devices.

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Each Johns-Manville plant has a complete industrial hygiene survey at least once a year. Plants or operations with potentially high exposures are surveyed more frequently—semi-annually, or quarterly, or even monthly. Our surveys monitor dusts such as asbestos, diatomaceous earth, crystaline silica, talc and mica, and check for vapors, fumes and noise. Each production operation with a potential exposure to an employee is checked.

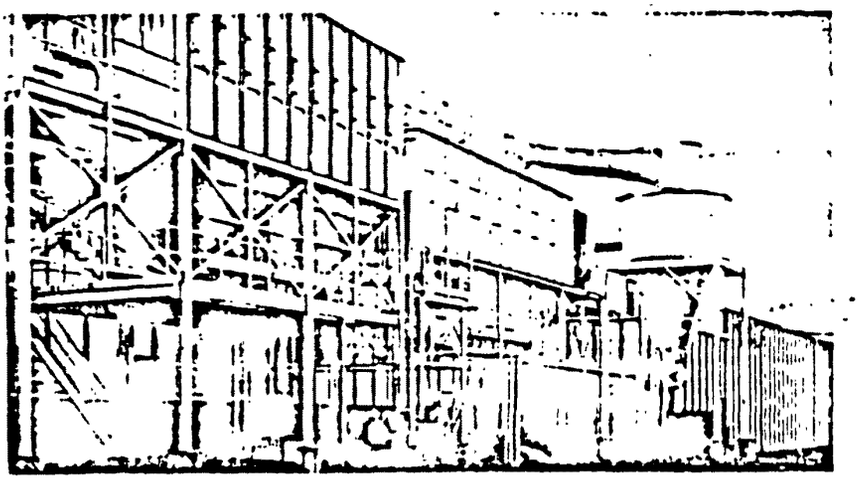
Survey results are carefully studied. This study enables us to determine if conditions are under control, or if corrections are needed.

If corrective measures are required, we work closely with plant management and our engineering department in implementing them. After solutions have been accomplished, we return to the plant and audit to determine if our goals have been met.

To give you a better idea of how this system works, let me describe one recent example. It deals with the asbestos-cement shingle making operation at our Manville Plant in New Jersey.

The operation was set up in the mid-1930's, with dust control as an integral part of the system. Our own industrial hygiene records show that our initial dust control efforts were successful. In 1966, however, the shingle-making operation was drastically revised to increase production and to permit the manufacture of two new products. When the new line went into operation, our initial hygiene survey determined that the existing dust control system required revision. Engineering studies were immediately initiated. A completely new control system was recommended and installed—at an approximate cost of $125,000. Subsequent re-surveys showed that the new system had reduced dust levels below both the ACGIH and Johns-Manville Threshold Limit Values. We are now surveying the plant again to determine if the fiber counts are below the proposed TLV of 12 fibers per cubic centimeter.

That is how we operate—it is coordinated, it is scientific, it is thorough, and most important of all, it gets the job done. I'm not going to try and tell you that we've got every single situation under control at this time—because we don't. What *is* important is that we are working on the problem, and that we've



Part of the dust collection system at the company's Manville, New Jersey, Plant.

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got an efficient approach that will in time eliminate industrial pneumoconiosis in all our plants and mines.

In summary, I would like to repeat what I consider to be the basic requirements for the prevention and control of industrial pneumoconiosis:

First . . . processes and production equipment should be designed to be free of hazardous dust emissions. This frequently will require the incorporation in the design of properly engineered dust collection systems.

Second . . . a formal program of industrial hygiene surveys measuring dust concentrations should be instituted to assure that safe levels are being maintained. Adoption of corrective measures should be incorporated if the surveys show levels above TLV.

And again, in those instances where dust concentrations are above safe levels and dust collection systems cannot be provided, exposed workers should wear dust respirators of a type approved by the U.S. Bureau of Mines.

I must mention that our environmental control engineering program is only a part of our overall corporate environmental health and safety activities. The work my department does is closely coordinated with the medical and health aspects of our total effort.

Of extreme importance is the fact that we have the wholehearted support of the management of Johns-Manville in this effort. This is not a half-baked campaign to put on a good show. As a company Johns-Manville is determined to make its plants and mines as safe for its employees as is scientifically possible.

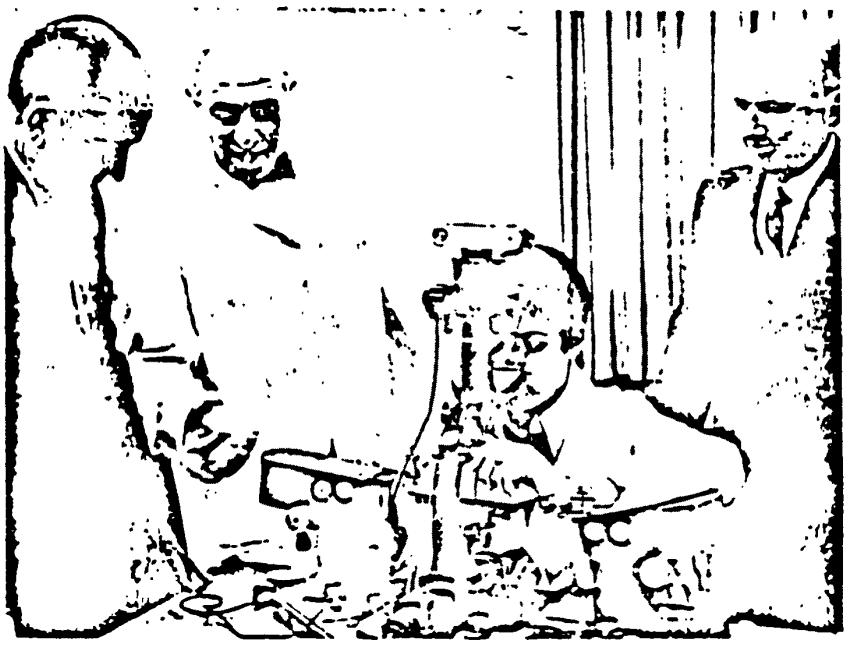
And with the help of scientists such as Dr. Irving J. Selikoff and others, we are extending this concern to the people who fabricate and install our products. One project aimed at this is the Insulation Industry Hygiene Research Program which was inaugurated last October at the Mount Sinai School of Medicine in New York City. My fellow panel member Dr. Selikoff, is director of this unique cooperative effort. The purpose of this program is to develop methods for improving the working conditions of insulation workers. The insulation workers I refer to are *not* men employed in insulation manufacturing plants, such as those operated



An industrial hygienist at the Johns-Manville Waukegan Industrial Hygiene Laboratory performs a dust count.

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Dr. Irving J. Selikoff (center), Director of the Insulation Industry Hygiene Research Program, explains the technique of examining microscopic fibers by means of the micro-manipulator to Albert E. Hutchinson (left) president of the asbestos workers union, and to Johns-Manville Vice President J. B. Jobe (right). Research Assistant Jo Anne Schwartz operates the manipulator.

by Johns-Manville. They are instead the men who apply and remove pipe and equipment insulations in buildings, industrial plants and ships. This program is being jointly financed by Johns-Manville and the International Association of Heat and Frost Insulators and Asbestos Workers, with additional financial support from the Sprayed Mineral Fiber Manufacturers Association. The United States Public Health Service, which is providing consultation and technical assistance for the project, regards this joint voluntary effort as a model program which it hopes to see adopted by other industries.

I thought it might be a fitting close to my remarks to quote to you a statement made by the president of Johns-Manville in regard to environmental control. This statement shows the solid support being given to this effort as a matter of corporate policy. I quote:

"Clean air and water, and employee safety and industrial health are subjects of great national importance, and we consider them to be of the highest priority at Johns-Manville.

"That is why we recently established a new department to coordinate long-standing Johns-Manville activities to improve working and community environments, to provide protection and safety for employees, and to control the quality of air and water used and shared with our neighbors."

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