Industrial Ventilation Survey

of the

United States Asbestos Division

of Raybestos-Manhattan, Inc.

Manheim, Pennsylvania

March 14,15,16 and 17, 1944.

SUMMARY

This is a report of a study undertaken to locate the most important sources of dust and to develop additional dust control measures at the Manheim plant of U. S. Asbestos Division of Raybestos-Manhattan, Inc. Sixteen dust counts were made in various departments. These samples indicate that conditions in the Picker House are not satisfactory but dustiness in the Carding, Spinning and Twisting Departments is less than 5 million particles per cubic foot. Recommendations are made that can lead to a reduction of dustiness in the Picker House as well as in the Carding Department. It is believed that while the card room is under considerable negative pressure the consequent starvation of the exhaust equipment is probably not in itself sufficient to account for any marked reduction in control of dust.

The results of dust counts are given in Table I.

Industrial ventilation survey of the U.S. Asbestos Div. of Raybestos-Manhattan, Inc., Manheim, Pa., March 14, 15, 16, 17,1944.

TABLE I

Dust Counts

Sample No.	Date	Time	Location and Operation	Particle per cu. f
			Picker House	
24	3/14/44	1:50-2:01 P	At Pan Crushers, to nearly simulate operator's exposure	8.7 mill
27	3/14/44	1:35-1:45 P	Floor Batching - Exposures of 2 workers outside booth - Finished about 1:42	1.7 mill
21	3/14/44	2:16-2:27 P	Operation of Pan Crushers for Amosite-Time represented complete cycle of operation. (1/2 hour daily)	38.0 mill
19	3/14/44	4:22-4:33 P	Batch feeding vertical opener. Exposure of operator within booth	9.9 mill
ESP 10	3/17/44	9:50-10:42A	52 minute sample at central point of room for "general air." near vertical opener	5.6 mill
			Carding	
23	3/14/44	2:59-3:10 P	General air walking about various carding machines in Breaker Card Room	4.0 mill
26	3/14/44	3:17-3:27 P	Beside point of discharge from condenser to box in Breaker Card Room	3.8 mill
1	3/15/44	10:54-11:09A	At roving end of 4 finish cards, #1, 2,7,8. General air - Exposure of 2 attendants	4.3 mill
2	3/15/44	11:15-11:25A	Along central aisle-way, at camel-back ends of cards	4.8 mill
ESP 11	3/17/44	10:49-11:49A	Between finisher cards, #15,16,21,22. All windows of carding and spinning room open wide to simulate summer conditions	2.8 mill
			Spinning and Winding	
3	3/15/44	11:48-11:58A	At mule spinner, while following operator, to simulate his exposure	4.8 mill
4	3/15/44	1:10-1:20 P	At Universal winders, 2nd floor, adjoining cards - following operator (no exhaust)	3.0 mill
5	3/15/44	1:36-1:46 P	At Foster Winders. Average of all aisle-ways	3.6 mill
6	3/15/44	1:50-2:00 P	At Twisters. Average of all aisle-ways	4.0 mil
7	3/15/44	2:19-2:29 P	At L-frames on 2nd floor. Average along aisle-ways	3.6 mil
8	3/15/44	2:45-2:55 P	At L-frames on 1st floor. Average along aisle-ways	2.0 mil

Note: All samples with Midget Impinger except those marked ESP (Electrostatic

"ASBESTOS AND INDUSTRIAL HYGIENE"

The problems of occupational and environmental hazards are now under public scrutiny as never before. Manufacturers in many industries are working harder than ever before to achieve safer working conditions for their employees and to improve control of the environment both inside and outside their plants. Today the concern is not only to have a healthier environment, but to have a healthier worker as well. As industrial hygienists, this problem has special importance for you, and I speak to you today, as a spokesman for the asbestos industry, both as a member of the business community and as a concerned citizen.

Industry has made many mistakes in the past. Some of the illustrations which I will show you later during my talk will contrast working conditions of many asbestos workers before and after preventive measures were implemented. In an increasingly technological society, the road to progress often is a difficult one, and there are many who suffer because of the lack of knowledge that existed in the past on the part of industry, workers, Federal, State and Local governments and the general public.

Research has been largely responsible for the many improvements which have been achieved in mining, milling and manufacturing methods over the last 30 years. It has brought about greater efficiency and safer working conditions in factories and on job locations throughout industry, and certain industry has contributed a sizeable share of its dollars to research. It will have to contribute even more in the future, and everyone will benefit as the results of this research are disseminated more widely.

Before discussing asbestos products and manufacturing processes and some of the preventive measures taken to limit dust levels in the asbestos industry, I should like to add a realistic note into this discussion. Business must be operated profitably <u>and</u> humanely. This fact sometimes escapes the attention of those who would like to focus public interest on the more sensational aspects of industrial hygiene and environmental control problems. A prominent Canadian member of the asbestos industry recently pointed out that it is a well established characteristic of communication, by whatever medium, that normality and virtue are not newsworthy. Accordingly, the mistakes and troubles of the asbestos industry have received much more publicity than ~~has~~ its very extensive and determined efforts to minimize and, wherever possible, eliminate its objectionable features.

In order to make decisions which will benefit both employee and employer alike, management must have the right inputs on which to base its actions. This, unfortunately, has not been the case in too many instances. Instead of seeking ways to bring all parties together - industry, government and labor - to solve asbestos-related health problems via more effective communication, instances have occurred that tended to fix blame on a single group rather than to effect a cure. This point of view has been stated most succinctly by Dr. Irving Selikoff in a paper called "Partnership for Prevention", a description of an industrial hygiene research program carried out in the asbestos insulation industry. This program, begun in 1968, was a joint undertaking supported by industry, labor, the federal government and medical researchers. To quote Dr. Selikoff:

> "It is too easy to indulge in what might be called the demonological theory of industry hygiene history. One version would place the responsibility for early identification of risk and its correction upon industry

> and then indict it for trading human health for profits. Similarly, the other side of this counterfeit coin puts the blame on organized labor for having been more interested in premium pay for hazardous work than in eliminating known hazards. Both conclusions are too convenient and are essentially erroneous. It is much nearer the truth to say that both industry and labor shared in ignorance and neglect of the problem. Science and medicine are also at fault here for inadequate attention to environmental and occupational health".[1]

In short, we are all to blame for not having done more sooner. But from the standpoint of business, should this state of affairs be interpreted to mean that safety and profits are at odds? We in the asbestos industry join our colleagues in other environmentally sensitive industries by saying <u>no</u>, and saying it emphatically. During the past decade, the asbestos industry spent approximately $100 million to implement controls in its plants. The industry probably will spend at least another $100 million within the next three or four years to meet the standards decided upon by OSHA and the Department of Labor. But the money must be spent responsibly to have maximum effect.

To give you - who are professional hygienists - a better idea of what the asbestos industry is like and what you may expect to see in a mining, milling or manufacturing facility, I would now like to give a brief outline of asbestos products and how they are used.

Manufacturers of asbestos-containing products had gross sales amounting to approximately $1 billion in 1971. Together, they employ nearly 50,000 workers. In terms of tonnage, the total amount of asbestos consumed in the United States in 1971 amounted to nearly 750,000 tons. Approximately 145,000 tons went into floor tiles, 140,000 tons into asbestos-cement pipe, 110,000 tons into felt and paper products, 80,000 tons into friction materials such as brake linings and clutch facings, 50,000 tons into asbestos-cement building materials, 25,000 tons into packing materials, 22,000 tons into textiles, 16,000 tons into insulation, and 15,000 tons into spray-on asbestos materials.

Asbestos is a unique material. It is used because it saves lives. No substitute material has as yet been found or developed which can provide the protective qualities offered by asbestos in most applications. Several characteristics are responsible for the value of asbestos. It has a unique fibrous structure, extreme flexibility and strength, and it offers great heat resistance. Asbestos fibers can be spun or woven into fabrics which provide thermal insulation and resist combustion. Asbestos mixed with cement is used to make pipe, roofing, siding, and flooring. Asbestos mixed with various other binding materials is used to make brake linings, floor tiles, gaskets and insulation. Space-vehicle heat shields are made of asbestos. So are the shingles on many of your homes.

Asbestos is used wherever fire and excessive heat are a threat to safety. It is a mainstay in the construction industry where it is used to insulate and fireproof factories, commercial buildings and houses. It is used in automobiles, trucks, buses, aircraft, ships, locomotives and railroad cars. Asbestos also serves the oil and chemical industries, as well as agriculture, mining and manufacturing.

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1 Industrial Medicine and Surgery, Volume 38, No. 3

In its original state, asbestos is hard and compact, and almost as dense as the rock that encases it. One form of asbestos - chrysotile - accounts for approximately 95 percent of all asbestos used in the United States. Other common forms of asbestos include amosite, which is relatively brittle and easily pulverized, and crocidolite, which is acid resistant and has a harsher composition than chrysotile. Most of the asbestos used commercially in the United States, the chrysotile variety, comes from mines located in Canada. Asbestos deposits also are mined in the United States, Africa, Brazil, India and Russia.

When asbestos is mined, milled or processed its minute fibers tend to float in the air like dust particles. This is especially true of asbestos in the dry state. Long exposure to heavy concentrations of asbestos dust has been shown by researchers to be linked directly to increased incidence of such diseases as lung cancer, asbestosis and mesothelioma among long-time workers in the asbestos industry. Thus, asbestos is one of a number of harmful pollutants released by industrial processes. Others which come to mind include carbon monoxide gas, as well as fumes which contain sulfur and nitrogen compounds; beryllium, lead, cadmium, mercury, silica, and even cotton dust.

As I stated before, the asbestos industry is working hard to protect our environment and the health of its employees. What the industry did not know before, it knows now. Years ago the asbestos industry recognized the incidence of asbestos is among some of its employees and took steps to prevent the disease. These limited measures now have been improved and expanded upon, with the ultimate goal being the reduction of exposure to the point where all workmen will be protected from any kind of disease caused by inhalation of asbestos dust.

Since my background is in manufacturing, I will discuss some of the basic techniques used to limit dust inhalation in industrial plants, and then will go on to illustrate just how these measures actually work on the job. In a few instances you'll see the employee's environment both before and after protective measures were taken.

Please keep in mind that the asbestos industry does not present a uniform profile. Certain product lines and asbestos-related activities pose special problems. For instance, the OSHA Standard of five fibers per cubic centimeter will be achieved most readily in the manufacturing industry, where most asbestos is converted from raw fiber to a finished product. However, when it comes to the use or installation of certain so-called non-locked-in asbestos products, the problem of limiting dust levels becomes exceptionally difficult. In many manufacturing processes, asbestos is locked into the product with a binder, saturant, coating or bonding agent, so that normal handling, application and use does not release dust. On the other hand, in certain types of construction work such as ship renovation or repair, pipe insulation, etc., airborne dust is a major problem and more drastic corrective measures are required.

The textile industry faces special problems because the carding, spinning, twisting and weaving processes basic to it are inherently dust producing. Innovative measures which wet the asbestos fibers during processing have been developed and now are being applied in many asbestos textile plants. The problem, of course, is finding the right combination of available technologies to do the job efficiently.

Fortunately, textiles, which account for a high percent of the dust problems, account for only two or three percent of the demand for asbestos.

A manufacturing process using asbestos can be broken down into a number of steps. Usually, once the asbestos is unloaded and stored, and after the fiber has been introduced into the process, dust is not a problem until the finishing operation. Textiles are an exception to this rule. Here, a continuous attempt must be made to keep the asbestos fibers moist at all times, or carefully controlled exhaust ventilation, or a combination of these control methods, must be applied.

Over the years, the asbestos industry has devloped numerous methods to control pollutants. Among these are highly organized programs of preventive maintenance to control the accumulation of dust; advanced monitoring methods which allow us to continuously monitor dust levels; complex dust collection systems with highly efficient filters to remove asbestos dust from the air; and wetting and dampening methods which minimize dust generation. This is an especially important factor for the textile industry where abrasive processes produce large amounts of dust. Dust respirators approved by the U. S. Bureau of Mines are used in environments where asbestos workers may be exposed to dust levels in excess of the permitted TLV. And new dust-control components such as improved dust collectors, high-velocity/low-volume exhaust systems, more efficient portable and central vacuum cleaners, etc. are being developed which may substantially improve methods now in use.

Some of the accomplishments of the industry in the area of dust control are truly dramatic. At Johns-Manville's main asbestos mill located at Asbestos, Quebec, Canada, 5 million cubic feet of air per minute are cleansed by a fabric-bag dust collector which occupies the entire 12th floor of the mill. The dust house was designed by J-M's General Plant Engineering Department. The collector bags and exhaust fans are located in an air-tight chamber that measures 112 x 432 feet. Entrance to the area is gained through air locks. By today's standards, the cost of this dust house control system would exceed $8 million.

The asbestos industry is currently working on development of a completely automatic fiber bag opening station to permit workers to open the bags, remove the fiber, dispose of the bags and introduce the fiber into the manufacturing process without exposing the operators to any dust.

Finishing operations can often be cleaned up considerably. If products are molded to size in a molding press, machining can be limited to non-standard parts. Here is an area where design engineering, purchasing and management can play an important role. By Agreeing on standard sizes and shapes for asbestos products, and by using them in uniform applications, many dust-producing stages in the fabrication process might be eliminated. Again, better communication of the needs of the asbestos worker, the industry and the end user will benefit the whole pollution control effort, as well as the cause for asbestos.

It is quite impressive to see what the application of dust control has accomplished in the way of improving working conditions and reducing emissions of dust from asbestos mining, manufacturing, and construction operations.

SLIDES - WITH COMMENTS - IN THE FOLLOWING AREAS:

MINING, MILLING, ASBESTOS-CEMENT PRODUCTS, FRICTION

MATERIALS, PACKING AND GASKETS, INSULATION, TEXTILES,

PLASTICS, TRANSPORTATION, PAPER, AEROSPACE.

The effectiveness of all these techniques, of course, depends on the implementation of a properly planned maintenance program. Industrial hygiene surveys are an absolute necessity to insure the proper functioning of dust control operations. In many instances, these programs now are being scheduled daily, weekly, or monthly, at whatever frequency is necessary to insure proper control equipment operation and reliable monitoring of airborne fiber levels.

Improved monitoring methods will aid in achieving better control of airborne asbestos dust in the future. Regularly scheduled equipment inspections and adequate preventive maintenance must go hand in hand with innovative control measures if the OSHA standards are to be met and the safety of all individuals is to be insured on a continuous basis.

Not that any of this is new. The asbestos industry has been working with a number of government agencies and leading researchers in the field of occupational health for many years to find ways of solving asbestos-related health problems and to find out exactly what the medical facts are and to act on them responsibly. The fact that action is being taken is proof that the working relationship which exists between the asbestos industry, the federal government and medical researchers has been a successful one.

It should be remembered that the first major epidemiological study linking asbestos dust to lung cancer was not published until 1955. In fact, the greatest part of all mdeical information about asbestos-related disease is less than a decade old. Dr. Premysl Pelnar of the Institute of Occupational Safety and Health has pointed out that at least 90 percent of all information and data now available is the result of medical studies undertaken during the past 10 years.

To put it bluntly, all parties concerned are still studying and combating asbestos-related diseases relatively early on the learning curve. The time gaps established for the various diseases, those existing between the onset of exposure to concentrations of asbestos dust and the first signs of actual disease, are really quite startling - from 10 to 20 years for asbestosis, from 15 to 25 years for bronchogenic cancer, and from 30 to 45 years for mesothelioma. Thus, diseases that are being reported among asbestos workers at this moment are often a consequence of dust levels that existed decades ago - when industrial hygiene experiments were just getting started and dust control equipment was neither as efficient nor as reliable as it is today.

The asbestos industry, like many other essential business enterprises, is and ever will be associated with some environmentally undesirable side effects. The industry has long recognized the need to control the environment in and outside of its mines, mills, and manufacturing plants and has been very extensively involved in and committed to the solution of its environmental problems. With the continuing cooperation of all parties involved - management, production, engineering, and maintenance in industry - and labor, medical researchers, and various governmental agencies - I have confidence that the industry will continue to provide its products and service for the benefit of the general public in the future, and will be able to do it without endangering the welfare or health of the public or of the asbestos worker.