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PB89-216071

WALK-THROUGH SURVEY

OF

THE JOHNS-MANVILLE CORPORATION

FIBROUS GLASS PLANT 7

WATERVILLE, OHIO

SURVEY DATE:

March 30, 1973

SURVEY CONDUCTED AND REPORT WRITTEN BY:

John M. Dement

Philip J. Bierbaum

DATE OF REPORT:

April 11, 1973

Environmental Investigations Branch
Division of Field Studies and Clinical Investigations
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
Cincinnati, Ohio

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PLACE VISITED	:	THE JOHNS-MANVILLE CORPORATION Fibrous Glass Plant 7 Waterville, Ohio
DATE OF VISIT	:	March 30, 1973
PERSONS MAKING VISIT	:	Philip J. Bierbaum John M. Dement
PERSONS CONTACTED	:	Mr. Jim Givens, *Employee Relations Supervisor for Waterville, Ohio Complex* Mr. Richard Meyers, *Employee Relations Supervi for Plant 1* Mr. Don Tumblin, *Employee Relations Supervisor for Plant 7* Mr. David Bender, *Manager Plant 7*
PURPOSE OF TRIP	:	To observe the microfiber operations in this facility and to take preliminary air samples in the microfiber operations.

INTRODUCTION AND DESCRIPTION OF THE PLANT

The Division of Field Studies and Clinical Investigations of the National Institute for Occupational Safety and Health, has underway an "industrywide" study of the fibrous glass industry. Of particular interest in this study are small diameter, potentially respirable fibers.

On March 30, 1973, Phil Bierbaum and John Dement conducted a walk through survey of the Johns-Manville Fibrous Glass Plant 7 in Waterville, Ohio. The major purpose for this survey was to observe the Plant's flame attenuation process for making very small diameter fibers, although a tour was made of the entire plant.

The major products of Plant 7 are microfibers for making filtration papers, microfelt insulation, microquartz refractory fibers (leached glass microfibers) and die pads and larger diameter fibers used for making filter tubes, chopped strand mat and bonded mat.

The microfiber operations, which were of major interest during this visit, began as a research venture in 1950. Microfibers were not commercially produced until approximately 1966. Chopped strand mat production was started in the late 1950's. Bonded mat ("Shuler" process) and filter tube production began in 1967 and 1968, respectively.

The entire work force of Plant 7 is presently approximately 177 persons, with approximately 132 of these persons being hourly employees. The unions in this Plant are Local #20 of the International Brotherhood of Teamsters and Local #4 of the Mechanics Educational Society of America (MESA).

There are presently approximately 50 persons involved in the microfiber operations. A breakdown of the age and duration of employment for persons in the microfiber operations is given in Table 1.

MEDICAL, INDUSTRIAL HYGIENE AND SAFETY PROGRAMS

The Johns-Manville Corporation has a Corporate Medical Director located in Denver, Colorado. A local general practitioner is retained as a consultant to the Plant and performs all physical examinations. A registered nurse is on duty at the Plant during the day shift.

Both pre-employment and voluntary periodic (every two years) physicals are given each employee. These examinations include a physical examination, chest x-ray (14" x 17"), and extensive blood work. No pulmonary function tests are given.

According to Mr. Meyers and Mr. Givens, no acute or chronic effects of fibrous glass exposure have been noted. Initial dermatitis does occur with some employees but is not considered a serious problem. Use of protective creams and ointments appears to alleviate this problem.

Industrial hygiene matters in this Plant are taken care of on a corporate basis. Mr. William Reitze serves as Director of Industrial Health and Safety. Industrial hygiene surveys are made in this Plant on an annual basis. In addition, during January and February of 1973, Mr. Sansone of the University of Pittsburgh conducted surveys of the microfiber operations as a part of the fibrous glass study supported by the National Insulation Manufacturers Association.

Industrial safety is also the responsibility of Mr. Reitze, on a corporate basis, with the Employee Relations Supervisor at each plant being in charge of safety. Mr. Jim Givens is Employee Relations Supervisor for the entire Waterville, Ohio complex and Mr. Don Tumblin is the Employee Relations Supervisor for Plant 7. The Plant has a Safety Committee composed of hourly and salaried employees and union representatives.

Personal protection programs presently in force at this Plant include hearing protection (ear muffs) in high noise areas and safety glasses in selected areas ("Shuler" mat forming area). Respiratory protection is not presently used in any production operations at Plant 7.

DESCRIPTION OF THE PROCESSES

Microfibers and Microquartz

Microfibers are made with varying diameters, ranging from "C" to "AAAAA" fibers (see Table 2 for diameters), in this Plant using a flame attenuation process. In the process glass marbles are melted in a small gas fired furnace. The molten glass flows by gravity through platinum bushings in the bottom of the furnace thus forming coarse primary fibers. These primary fibers are next introduced into a very high velocity glass flame where attenuation into the very small diameter "microfibers" takes place. These fibers are collected on a rotating screen forming a thin fiber mat which is rolled onto small mandrels. No binders are applied to these fibers for purity purposes. The rolls of fiber are cut from the mandrel, compressed and boxed for external shipment or further processing in the Plant. Microfibers are sold in bulk to manufacturers of filtration papers and as high efficiency thermal insulation. One principal use of these fibers is in surgical masks. This Plant has one department for making surgical mask material which involves simply applying muslin to both sides of the microfiber mat. There are no sewing operations in this Plant.

"Microquartz" felts and compressed microquartz board (Dyna-Quartz) are made by leaching microfibers until the fibers contain 99+ percent SiO_2. In this process, microfibers are first placed in a leach tank. The leached fibers are next removed from the tank, compressed and dried in an oven. The fibers are next put back into a slightly acidic aqueous suspension and pumped into a vat with a screen in the bottom. The water is pumped out through the screen while a worker spreads the fibers by hand, thus a felt of uniform thickness is formed. The "microquartz" is next fired at temperatures of approximately 1500-1800°F, cooled and packaged. Die pads, used for extruding stainless steel, are made with basically the same method, the only difference being the final shape.

In the same area where microquartz felts are made, a product known as "microfelt" is also made. This process is essentially the same as that used for microquartz felt except that no leaching takes place.

Bonded Mat

Bonded mat, which is used to make roofing material and pipe insulation, is manufactured in Plant 7 by the "Shuler" process. In this process, glass marbles are melted in glass furnaces which then flows through sieve-like bushings to form primary fibers. These fibers are then collected on a rotating drum where the pulling action of the drum on the fibers causes fiber attenuation. Fibers from several of these forming drums are then thrown onto a moving conveyor to form a crossed mat of fiber. The fiber mat is next treated with a binder (urea-formaldehyde or neoprene) and cured in ovens. The edges are next trimmed and the mat rolled onto mandrels.

Chopped Strand Mat and Filter Tubes

Chopped strand mat, which is used for both a "built-up" roofing material and as reinforcement for plastics is manufactured in this plant. In this process, fibrous glass rovings are fed from a series of creels into a chopper. The chopped fibers (approximately two inches in length) are blown onto a screen thus forming a mat with fibers of random orientation. The mat is next treated with a latex binder, cured and packaged for shipment.

Filter tubes are also manufactured in this facility; however, these operations were not in operation during the visit.

INSPECTION OF THE PLANT

Potential Health Hazards

The major potential health hazards observed during this survey were as follows:

1. Respiratory exposure to small diameter fibrous glass
2. Dermatitis (mechanical) due to exposure to large diameter fibrous glass
3. High noise exposures in fibrous glass forming areas
4. Respiratory exposure to binder materials (urea-formaldehyde, phenol-formaldehyde, and neoprene) liberated during curing.

Ventilation

In the microfiber operations, exhaust ventilation is provided at each forming station. The system consists of a hood over the fiber forming station with air flow provided by a centrifugal fan. The exhaust is discharged to a large roof plenum and a collection system. This collection system was installed in 1971.

Curing ovens in the "Shuler" mat process are vented to the roof without a collection system. There does appear to be a leakage problem at these ovens as considerable amounts of dense smoke were noted in the building in the area of the ovens.

SURVEY PROCEDURES

The major portion of this visit was devoted to observing the microfiber operations with respect to potential for exposure to airborne microfibers. Bulk samples of each of the types of fiber being made on the day of the survey (Types A, AAA, AAAAA microfibers and microquartz) were obtained and four air samples were taken for evaluation by optical microscopy. These samples were collected on Millipore Type AA membrane filters at a sampling rate of 2.0 liters/min. Two of the samples were personal samples on fiber spooler operators. The other two samples were stationary samples collected in the general area of the spooling operations.

Analysis of the collected samples was done by an optical count method similar to that used for asbestos.[1] Due to the presence of very small diameter fibers, these counts were done with an oil immersion objective at 1000X magnification (see Table 3 for complete microscope specifications). Concentrations are reported as fibers/ml.

RESULTS AND DISCUSSION

Results of the air samples for fiber count are shown in Table 3. The average of the four samples was 15.6 fibers/ml. Almost all the fibers observed in these samples were well below 0.5μ in diameter. Although most of the fibers were relatively long, a few fibers as small as 5μ in length were observed.

Although the respirability of airborne fibers is not clearly understood, it is speculated that this characteristic is chiefly diameter dependent. Trimbrell[2] suggests that fibers with densities of less than 3.5 g/cm^3 and large length to diameter ratios could be respirable if the fiber diameters were less than 3.5 micrometers. Fibrous glass (borosilicate glass) satisfies the density requirement and the results of the optical examination show that almost all the airborne fibers in the microfiber operations have very large length to diameter ratios and are well below 0.5 micrometers in diameter. Based on these observations, it can be concluded from Trimbrell's observations that rather large exposures to respirable fibers possibly occur in the microfiber operations.

There is presently no data available relating human experience with respirable fiber exposures of the magnitude found in the microfiber operations. All human experience to date has been with fibers of much larger size and at much lower concentrations;[3 4 5] therefore, no estimate of the effects of such exposures can be made at this time.

CONCLUSIONS AND RECOMMENDATIONS

From the observations made during this survey and the sample results, the following conclusions and recommendations are made:

1. Although only four air samples were taken, it does appear that relatively large exposures to possibly respirable fibers occur in the microfiber operations sampled. While no data presently exist to indicate respiratory problems due to such exposures, it must be emphasized that human experience with such fibers is limited. This population should be closely observed for signs of respiratory involvement. Medical recommendations will be differed until more complete environmental studies have been made.

2. Further environmental investigations in the microfiber operations are indicated. As was discussed with plant personnel, NIOSH (DFSCI) will make arrangements in the near future to conduct these studies.

REFERENCES

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2 Trimbrell, V., "The Inhalation of Fibrous Dusts", Annals of the New York Academy of Sciences, Vol. 12, December, 1965, pp. 255-273.

3 Wright, George W., "Airborne Fibrous Glass Particles: Chest Roentgenograms of Persons With Prolonged Exposure" Arch. Environ. Health, Vol 16, February, 1968.

4 Murphy, George B., "Fiber Glass Pneumoconiosis", Arch. Env. Health, Vol. III, December, 1961.

5. Gross, Paul, "Lungs of Workers Exposed to Fiber Glass: A Study of Their Pathologic Changes and Their Dust Content", Arch. Env. Health, Vol. 23, July, 1971.

TABLE 1

EMPLOYEE AGE
&
DURATION OF EMPLOYMENT

MICRO FIBERS - PLANT 07
8/25/72

	LENGTH OF SERVICE	Less 5		5 - 15		15 - 25		Over 25	
	AGE	M	F	M	F	M	F	M	F
PERATIONS	Under 25	25		1					
	25-35	6							
	35-45	3		6					
	45-55	2		1		1			
	55-65			2					
OFFICE	Under 25								
	25-35								
	35-45								
	45-55								
	55-65								

TABLE 2

FIBER DIAMETERS

MADE IN THE MICROFIBER FLAME ATTENUATION PROCESS

JOHNS-MANVILLE

PLANT 7

WATERVILLE, OHIO

FIBER DESIGNATION	*FIBER DIAMETER, MICRONS*	
	MIN.	*MAX.*
AAAAA	0.05	0.20
AAAA	0.20	0.50
AAA	0.50	0.75
AA	0.75	1.50
A	1.50	2.50
B	2.51	3.81
C	3.81	5.08

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TABLE 3

RESULTS OF AIR SAMPLES

FOR

FIBER COUNT IN MICROFIBER OPERATIONS

JOHNS-MANVILLE

PLANT 7

WATERVILLE, OHIO

March 30, 1973

SAMPLE #	*JOB OR LOCATION SAMPLED*	*AVERAGE* FIBERS/FIELD*	*AIR VOLUME LITERS*	*CONCENTRATI FIBERS/ml*
1	Microfiber Spooler	5.8	172	18.2
2	Microfiber Spooler	4.1	120	18.7
3	At Side Wall Approximately 10' From Spooling Operation	3.0	160	10.9
4	At Package Labeling Desk 15' From Spooling Operation	4.5	166	14.6

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* Microscope Data

TYPE	:	"Olympus"Positive Phase Contrast
OBJECTIVE	:	100X Acromat Oil Immersion N.A. = 1.30
CONDENSER	:	Abbe Type Oil Immersion, N.A. = 1.25
EYEPIECES	:	10X Huygenian with "Porton" Recticle
COUNTING FIELD AREA	:	0.0072MM^2

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A walk-through survey was conducted at the Johns-Manville Corporation, Fibrous Glass Plant 7, Waterville, Ohio, on March 30, 1973, to observe the microfiber operations in this facility and to take preliminary air samples in the microfiber operations. The major products of the plant are microfibers for making filtration papers, microfelt insulation, microquartz refractory fibers, and die pads and larger diameter fibers. The processes are described in detail. Potential health hazards observed include: respiratory exposure to small diameter fibrous glass, fibrous glass mechanical dermatitis, high noise exposures in fibrous glass forming areas, and respiratory exposure to binder materials liberated during curing. Relatively large exposures to possibly respirable fibers occur in the microfiber operations, and human experience with such fibers is limited. Therefore, this population should be closely observed for signs of respiratory involvement.

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