FILE NAME: Caterpillar (CAT)

DATE: 1943 Feb 28

DOC#: CAT062

DOCUMENT DESCRIPTION: Illinois Labor Bulletin - Wartime Operations Emphasize Industrial Hygiene Problems of Asbestos Industry

THE ILLINOIS LABOR BULLETIN

STATE OF ILLINOIS . . . . . DWIGHT H. GREEN, *Governor*

Monthly Publication of the

ILLINOIS DEPARTMENT OF LABOR

FRANCIS B. MURPHY, *Director*

Volume 3 — FEBRUARY 28, 1943 — Number 8

WARTIME OPERATIONS EMPHASIZE INDUSTRIAL HYGIENE PROBLEMS OF ASBESTOS INDUSTRY

Control Measures Have Not Kept Pace with Step-Up in Production

Increased demands for war materials and for men to use those materials on the fighting fronts make it imperative that workers on the production front be protected from industrial hazards. Although the number of workers exposed to asbestos dust is not very great, the potential harm ranks it with the most hazardous industries, because "asbestosis" is one of the most insidious and disabling industrial diseases. It is unfortunate that little attention was paid to this disease until tweny-five years ago when a number of deaths occurred. However, as a result of those deaths several extensive studies were made, and from these we have gained some knowledge of potential harm in this industry and how it may be avoided. Today, when we speak of asbestos, and other industrial health hazards, we are interested not in observing classical symptoms of disease, but in preventing the harm by means of engineering control. This article will show what progress has been made in controlling the hazards in the asbestos industry in Illinois and what remains to be done.

In order to appreciate the importance of preventive measures in this industry we will consider briefly the disease—asbestosis. Silicosis has been known as a serious lung disease for many years, but few people have thought of asbestosis as an even worse disease. What makes it worse is its insidious character, the fact that so much harm can be done before X-ray or other evidence can be found, and that the disease is progressive—the lung condition continues to grow worse even when the worker has left the offending environment. Therefore, medical examinations cannot be relied upon to protect workers in the asbestos industry. Not only is this method useless, but the amount of harm possible without visible evidence makes it a dangerous substitute for control of the dust. In one of the studies mentioned above[1] the conclusion was drawn that workers exposed to less than 5,000,000 particles of asbestos per cubic foot of air would be unlikely to develop asbestosis. This value has been used to measure the potential harm in industrial environments, as well as the success of control measures.

Asbestos Industry in Illinois

A large percentage of the thousands of workers engaged in the asbestos industry in the United States are employed in Illinois. Most of this work is on asbestos textiles and on pipe covering and other insulating materials. The Industrial Hygiene Division of the Division of Factory Inspection has made extensive studies of the atmosphere in several of these plants over a period of years. Until 1941, when war production caused a sharp rise in activities, there was evidence of gradual improvement in this industry. However, since that time it is apparent that control measures did not have the flexibility or capacity to take care of increased production, and the result has been high concentrations of asbestos dust and fibers in the factory air. Nor is this experience limited to the asbestos industry; in many other industries engaged in war production we have found that poorly designed exhaust systems and other control measures are ineffective in taking care of stepped-up production schedules. The workers employed in those industries would have been properly protected if necessary improvements and expansion of exhaust equipment had been anticipated when new production schedules were considered.

Because of the danger and insidious effects of exposure to high concentrations of asbestos dust, effective control measures must be adopted by this industry now in order that accelerated operations will not be accompanied by a corresponding increase in cases of asbestosis.

Asbestos has been incorporated into a number of products such as protective clothing, brake linings, cements, roofing shingles, plastics, pipe covering and other forms of insulation, etc. This results in a variety of hazards starting with the breakdown of the native mineral. On the basis of the plant studies made by this Division, the discussion of hazards can best be done by dividing the plants into two groups—rigid products and textiles.

Manufacture of Rigid Asbestos Products

Most of these products are used for heat insulation in the form of blocks, sheets, or molded pipe covering. The first job is to break up the crude asbestos in a pan-mill, under rollers, or in an "opener"—a series of revolving cylinders on which hooks tear apart the asbestos fibers.

Table 1—Dust Counts in Manufacture of Rigid Asbestos Products

(Most samples chiefly asbestos, others largely asbestos with silica, silicates and other dust.)

Stage of operations	Date taken (month, year)	Plant	Dust count (Millions of particles per cu. ft.-air)	Actual operation, control
Preparing and handling	5/41	B	4	Bagging cement; good exhaust.
	5/41	B	1	Mixing cement; good exhaust.
	9/42	C	119	Crushing and bagging scrap; overloaded exhaust system and poor housekeeping.
Forming and building	11/37	A	26	Near builder; good enclosure and exhaust.
	4/38	D	15	Feed end of builder; fair enclosure and exhaust.
	4/38	D	11	Output end of builder; fair enclosure and exhaust.
	6/38	A	19	Near builders; fair exhaust, floors wet.
	6/38	A	22	Near builders; fair exhaust, floors wet.
	6/38	A	7	Near builders; fair exhaust, floors wet.
	9/41	A	122	Feeding asbestos to builder; exhaust not properly used.
	9/41	A	104	Output end of builder; most dust from feed end.
	7/42	B	33	Feeding asbestos to shingle machine; exhaust system improperly maintained.
	7/42	B	18	Forming asbestos shingles; exhaust system improperly maintained.
	7/42	B	44	Forming asbestos shingles; exhaust system improperly maintained.
	1/43	A	32	Near builder; dust mainly from leaking opener.
	1/43	A	70	Rear of builder; dust mainly from leaking opener.
Finishing	11/37	A	49	Sawing pipe covering, 2 saws; poor exhaust.
	7/40	A	3	Sawing pipe covering, 2 saws; good exhaust.
	9/42	C	47	Sanding insulation blocks; overloaded exhaust system, poor housekeeping.
	9/42	C	127	Sawing insulation blocks; overloaded exhaust system, poor housekeeping.
	9/42	C	109	Turning pipe covering; overloaded exhaust system, poor housekeeping.

[1] "A Study of Asbestosis in the Asbestos Textile Industry," U. S. Public Health Service, *Public Health Bulletin* No. 241, 1938.

More dust is usually produced by the opener than by the pan-mill.

The prepared fiber is moved to storage either by conveyors or by trucks. Considerable dust is created by shoveling the fiber into bags or trucks, one air sample showing more than 30 million particles per cubic foot of air (see Table 1).

The next step depends upon the product to be made. The fiber may be spread out on mechanical conveyors and sprayed with an adhesive, or it may be mixed with various fillers in batch mixers. In practice, these batch mixers have been found to be well controlled by enclosures which are exhausted to remove the dust before it can get into the air which the workers breathe. The same cannot be said for hand spreading on conveyors; dust concentrations as high as 122 million particles per cubic foot of air have been found at these operations. While our chief concern in this discussion has been exposure to asbestos dust, it should be noted that when the asbestos fiber is mixed with the various fillers and binders, workers may be exposed to the added hazards of free silica dust, as well as a number of silicates.

A binder widely used in this industry is sodium silicate (water glass), which is strongly alkaline and irritating to the skin. In building and moving the wet insulating products to the drying ovens, very little dust is created but the direct hazard from this operation is skin irritation.

Handling of the dried asbestos blocks or pipe covering can create a serious dust condition unless the proper exhaust equipment is provided. Insulating blocks are brought to size by sawing on band saws or table saws and by sanding and turning. Rigid pipe covering and pipe are usually cut to length on band saws. Wherever tubular material is sawed exhaust outlets must be provided both for the dust coming off the outside and inside of the tube. Good housekeeping is very important, in addition to proper exhaust equipment, if real control of the air-borne dust is to be attained at sawing operations. It must be remembered that what we are interested in controlling is the fine particles and filaments which can get down into the lungs. What makes the problem difficult in these operations is that exhaust ducts frequently become clogged with the coarser material and large quantities of waste accumulate on tables and floors where they can be ground into fine dust and find their way into the workroom air. Only a rigid program of maintenance of exhaust equipment, coupled with regular cleaning up, will assure control of the dust hazard.

Before it goes to the shipping department the sawed material is dusted by brushing or by compressed air. The former of these methods can be more easily controlled—provided the brush is equipped with sufficient exhaust. Where pipe lengths are stacked endwise and air blown through the lengths toward an exhausted enclosure, the ventilation requirements are very high for adequate control of the dust.

Turning and routing of small size pipe coverings from solid blocks of insulating material usually creates very dusty atmospheres. Wherever these operations have been observed the attempts at dust control have been unsuccessful, and it is a difficult ventilation problem. One solution appears to be forming these coverings on the appropriate sized mandrels.

Along with the manufacture of rigid materials some concerns mix and bag asbestos cements. Mixing and bagging create no problems which have not been solved in other industries. Proper enclosures equipped with adequate exhaust will keep the greater part of the dust out of the workroom air.

The results summarized in Table 1 show the hazardous air conditions found in four plants manufacturing rigid asbestos products. Plants A and B both have instituted some control measures but the results indicate that more work must be done to bring the dust concentrations below the tentative safe level of 5 million particles per cubic foot of air. It is also clear that Plant C which has the poorest control equipment has the most serious dust conditions.

Manufacture of Asbestos Textiles

The principal products in this part of the industry are asbestos cloth, twine, tape, woven brake lining, and woven gaskets. In order to make this variety of products it is necessary to follow the original separation or "opening" of fibers with the following operations: carding, spinning, twisting, spooling, winding, and weaving. In general, it may be stated that these added operations in the textile manufacture create more difficult problems in dust control than those in the manufacture of rigid products (see Table 2).

Table 2—Dust Counts in Manufacture of Asbestos Textile Products—Plant A

(Dust in these samples was practically all asbestos)

Stage of operation	Date taken (month, year)	Dust count (millions of particles per cu. ft. air)	Actual operation, control
Preparation	4/40	8	Near Creighton opener; fair enclosure, poor exhaust.
	4/40	35	Between 2 pickers; enclosed but not exhausted.
	4/40	15	Between picker and reclaim; partial enclosure, no exhaust.
	9/41	70	Willowing asbestos-cotton mixture; exhausted, but most dust from shoveling into hopper.
	1/43	32	Shoveling and bagging; no exhaust.
	1/43	27	Near picker; exhaust enclosure leaking.
Carding	7/40	37	Center of carding room; ⅓ of cards enclosed and exhausted.
	7/40	44	Center of carding room; ⅓ of cards enclosed and exhausted.
	9/41	219	Rough carding asbestos-cotton mixture; improper exhaust.
	1/43	32	Rough card; improper exhaust.
	1/43	116	Finishing cards; improper exhaust.
	1/43	77	Finishing cards; improper exhaust.
Spinning	7/40	6	Mule spinning; no exhaust.
	7/40	11	Ring spinning, experimental; no exhaust.
	9/41	20	Twisting; high humidity.
	1/43	39	Twisting; high humidity.
	1/43	25	Mule spinning; no exhaust.
Weaving	7/40	4	Middle weaving room, S. end; high humidity.
	7/40	10	Middle weaving room, N. end; high humidity.
	9/41	4	Weaving blankets, card room; exhaust system poorly maintained.
	9/41	3	Winding bobbins, weaving department; high humidity.
	9/41	11	Weaving tape; high humidity.
	1/43	55	Weaving blankets; preparation room.
	1/43	19	Winding twine, weaving dept.; high humidity.
	1/43	61	Winding broadcloth, weaving dept.; high humidity.

(Continued on page 22)

Prospective Building in Illinois Cities

Table 4—Summary of January 1943 Permits by Type of Proposed Building and Geographical Area

Type of building	Total 181 reporting cities		Chicago area (76 cities)						Downstate area (105 cities)	
			Total		Chicago		75 Chicago suburban cities			
	Number projects	Permit valuations	Number projects	Permit valuations	Number projects	Permit valuations	Number projects	Permit valuations	Number projects	Permit valuations
TOTAL—ALL TYPES OF BUILDINGS	**495**	**$1,602,197**	**257**	**$1,223,343**	**132**	**$899,457**	**125**	**$323,886**	**238**	**$378,854**
New residential buildings	**96**	**600,500**	**72**	**523,300**	**21**	**277,800**	**51**	**245,500**	**24**	**77,200**
Housekeeping buildings										
One-family dwellings	87	375,500	63	298,300	12	52,800	51	245,500	24	77,200
Multi-family dwellings	9	225,000	9	225,000	9	225,000	.....	.....	.....	.....
New non-residential buildings	**57**	**288,962**	**43**	**105,008**	**26**	**77,288**	**17**	**27,720**	**14**	**183,954**
Factories, workshops, etc.	4	209,800	2	32,000	2	32,000	.....	.....	2	177,800
Garages, private	37	8,952	27	5,953	13	2,458	14	3,495	10	2,999
Office buildings, banks	3	11,500	3	11,500	3	11,500	.....	.....	.....	.....
Schools	2	27,000	1	24,000	.....	.....	1	24,000	1	3,000
Sheds, poultry houses, etc.	6	2,280	5	2,125	3	1,900	2	225	1	155
Stores and mercantile buildings	4	21,430	4	21,430	4	21,430	.....	.....	.....	.....
All other	1	8,000	1	8,000	1	8,000	.....	.....	.....	.....
Additions, etc.	**342**	**712,735**	**142**	**595,035**	**85**	**544,369**	**57**	**50,666**	**200**	**117,700**
Additions, alterations, and repairs										
Residential buildings	194	94,665	66	59,548	28	33,885	38	25,663	128	35,117
Non-residential buildings	98	580,841	65	507,062	48	482,109	17	24,953	33	73,779
Installation permits	50	37,229	11	28,425	9	28,375	2	50	39	8,804

ber 1942. All three types of construction showed decreases when compared with January 1942.

New residential building increased 30 percent, or from $59,568 in December 1942 to $77,200 in January 1943, new non-residential building increased 344 percent, or from $12,739 to $183,954, but additions, etc., decreased 76 percent, or from $483,972 to $117,700.

One large project, estimated to cost $110,000, was issued for an industrial building to be erected in East Peoria.

Twenty-two of the 105 cities reported higher permit valuations in January 1943 than in December 1942, and nine, higher permit valuations than in January 1942.

Ten cities have been added to the Downstate area, increasing the number of reporting cities in this area from 95 to 105.

Industrial Hygiene Division

(Continued from page 11)

After leaving the openers the asbestos fibers are mixed with cotton; this is done either by hand mixing on the floor or by feeding the two kinds of fiber into a "willow" and the mixture is conveyed to storage. Both methods can create very dusty conditions and require proper enclosures and exhaust to prevent the operation from constituting a serious health hazard.

From storage the mixed fiber goes to the cards, a series of fast moving steel brushes. For the coarser type of product, such as coarse braids, a single card does the whole job, but on finer textiles cards are usually run in pairs with automatic transfer from the primary to the finishing card. This operation usually creates the greatest dust contamination in the entire process and presents a special problem in control because the quality of the product can be changed considerably by too rapid a movement of air across the machine. The high dust counts found at this operation indicate that the attempts at control — large enclosures around the cards with exhaust through the floor or ceiling—did not even approach successful dust control. The amount of air required for adequate exhaust on these enclosures is so great that in practice proper control will more likely be achieved by close housings, using less air.

Spinning is done on ring and mule spinners, the former being smaller and easier to control by enclosure and exhaust. Twisting frames also create asbestos dust by fraying the threads. In twisting operations the dust counts are usually in about the same range as those obtained near the spinners. When asbestos is twisted on wire, as in the manufacture of brake linings, the dust concentrations are higher than when asbestos alone is twisted. For adequate control of twisting, individual exhaust outlets must be provided for each strand.

Weaving is another operation which creates considerable dust and it is obvious from the dust counts in Table 2 that the increased humidity in the weaving department is not sufficient to keep the dust in the air down to safe levels. Winding is done in the same room as weaving but seems to create much less dust. Wet methods have helped to control the dust in weaving operations in other states, but in Illinois reliance on high humidity alone has failed to control the dust. Apparently, where high-humidity-dry-weaving is done the enclosures and exhaust will have to be greatly improved before the dust concentrations can be brought down to safe levels.

The conditions revealed by the studies in the asbestos industry reflect what is happening in so many industries today under wartime schedules. Attempts are made to increase production without taking into account the necessary modifications in the control of health hazards by ventilation and by other means. The result is increased accidents and lost time due to industrial diseases, which means lower, not greater, production. The products manufactured by the asbestos industry are most essential for the war. To get those products made in sufficient volume and to keep asbestos workers on the job at full efficiency will require immediate improvement in control measures throughout this industry, and assurance that these controls will keep pace with the volume of production.

The Industrial Hygiene Division welcomes discussion of the material presented in this article by those interested in the prevention and elimination of asbestosis.