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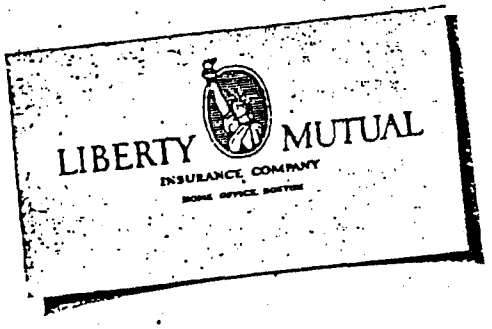
SPECIAL REPORT

WORLD ASBESTOS CORPORATION

NEW CASTLE, INDIANA

INDUSTRIAL HYGIENE STUDY

MAY 19, 1947



from

LOSS PREVENTION DEPARTMENT

WORLD BESTOS CORPORATION

NEW CASTLE, INDIANA

A dust study was made at several operations in the brake lining manufacture to determine the exposure to lead and to asbestos dust. This report gives the results of our tests with a discussion of the hazards studied and recommendations to aid in the control of the exposures.

SUMMARY AND CONCLUSIONS

High concentrations of lead dust in air were found at the batching operations during the weighing of litharge and at the sheet preform press. Control of the lead and dust exposures at these operations was needed.

Concentrations of lead above the maximum allowable concentrations were found during the operation of the mill in the N. E. corner of the compounding room. This was not a continuous operation and it is not thought that a serious lead exposure existed at this operation. However, it would be advisable to consider better control of the dust at this mill.

Dust counts at the asbestos shredding mill were moderately high and improvement in the enclosure of the machine is recommended.

SUMMARY OF RECOMMENDATIONS

Compounding room:

1. Install exhausted partial enclosures at the batching scale and at the supply barrels of litharge, plastic powders and excessively dusty powders. See attached sketch.

2. Install cleanout doors in the duct work of the exhaust system in the compounding room to make a periodic cleanout at the elbows and bends.

Mill in the compounding room:

3. It would be advisable to bring the exhaust hood closer to the rolls of the mill on one side at least, and to increase the amount of air exhausted. The increase in the amount of air might possibly be obtained by cleanout of the present exhaust system.

Asbestos shredding machine:

4. Close up or block off the openings along the seams of the machine enclosure to confine the dust and extend the enclosure to cover the chute at the discharge end. The present exhaust system should be satisfactory but the duct work must be cleaned out periodically.

Sheet preform press:

5. Construct a curtain or shield around the ram to fit like a box cover in order to trap the surge of dust. The shield should extend from the outside of the exhaust slots to a short distance below the bottom of the ram. If necessary construct an offset in the shield to go over the outside of the bed plate.

General:

6. Install clean-out openings near all bends and elbows of exhaust ducts and have the dusts cleaned out periodically.

Standards

Lead A maximum allowable concentration of 1.5 milligrams of lead per 10 cubic meters of air for lead and its compounds has been generally accepted by health authorities. This figure is meant as an average for an eight hour exposure and concentrations may exceed this figure for short periods if there are correspondingly lower figures at other times. It is believed, however, that concentrations of lead in air should not exceed 5 milligrams per 10 cubic meters.

Asbestos A figure of 5 million particles of asbestos dust per cubic foot of air has been widely quoted as a maximum allowable concentration fro this dust. We believe that this figure is too high and would prefer to see the dust levels for asbestos dust kept below 3 million and preferably about 1 million particles per cubic foot.

The dust from the handling of asbestos contained about 5 to 6% of asbestos fibers and a conservative estimate would be about 10%. The dust also contained serpentine which is chemically identical with asbestos (chrysotile) but its physical characteristics are different and this mineral is considered more of a nuisance dust.

Discussion

Batching operations near the Ransome mixers Although the total dust concentrations at the batching operations was high at times, only three of the materials handled were considered to be objectionable from a health standpoint. These materials were:

Lead (litharge)
Asbestos
Plastic powder

The other dusts are ordinarily considered nuisance dusts.

Lead: The exposure to lead dust during the batching and dumping of the litharge was of comparatively short duration but the concentrations were high during this operation. This dust was spread throughout the department and lead was found in the settled dust samples and in the general room air during ordinary operations which did not involve the handling of litharge.

Asbestos: The exposures to asbestos dust were of short duration and occurred in the weighing and dumping of the material. Appreciable amounts of asbestos dust were not present at other times.

Plastic powders: The composition of the plastic powder in use was not known but these materials are partially polymerized plastics and certain types are known to be irritants. The types of plastics used have changed from time to time and with the uncertainty of the particular characteristics of the materials in use it is advisable to handle these powders carefully and to control the dust dispersed in handling them.

Respirators were used regularly at the batching operations and these will provide the necessary protection against toxic dusts and against the other

dusts. But respirators should be considered as temporary expedients for they are difficult to wear in warm weather. The effect of the exhaust at the batching was negligible in controlling these dusts and a better type of enclosure and exhaust would be desirable.

If the present procedures were continued it would be advisable to install a hood which would extend partially over and around the barrel on the scale. It would be advisable to install similar partial enclosures around the supply boxes or barrels of the litharge, the plastic powders and other very dusty nuisance dusts such as the carbon. A sketch is attached showing the type of hood suggested.

A similar enclosure and exhaust would be necessary for the circular type of batching table proposed and this would be much more difficult to exhaust for the barrels on the rotating table would have to pass by the enclosure and much of its effectiveness would be lost. A similar type of exhaust would still be necessary for the receiving barrel on the scale.

Dumping batches into the hopper of the Ransome mixers High dust counts were obtained at the hoppers with the exhaust turned off, but the dust concentrations dropped off considerably with the exhaust turned on. It was not possible to quantitate this decrease for part of the dust came from the batching operation in the center of the room. The enclosure and exhaust at these hoppers should satisfactorily control the dust after the completion of the proposed rearrangement of the duct systems and increase in the amount of air exhausted. Clean-out doors should be installed in the duct work of this system in order to make periodic cleanings at the bends and elbows.

Mill operation (NE corner of compounding room) The concentrations of lead in the air during the operation of the mill were higher than the maximum allowable concentration but part of this dust may have spread from the batching operation for there was general room contamination of lead. The operation of the mill was intermittent and an average concentration would be below the maximum allowable concentration. This operation was not considered a serious hazard.

For complete control it would be advisable to extend the hood at this machine to bring at least one side of it closer to the point where the powdered materials are dumped on the rolls. An increase in the amount of air exhausted would be necessary, but this may possibly be done by a check on the present exhaust and clean out of the system. There were indications at this operation of possible blocking in the exhaust ducts.

Asbestos shredding The hand preparation of the asbestos string before shredding dispersed a small amount of dust but this was rapidly dispersed and the large size of the room prevented any appreciable concentrations of dust from building up. Control at this operation was not considered necessary.

The shredding machine was enclosed and exhausted but numerous leaks in the enclosure permitted the dust to escape. Dust counts at this machine varied from 8 to 50 million and this would mean asbestos dust from 0.8 to 5 million. The exposure was not continuous, the high count did not represent a breathing zone sample and it was not considered a serious exposure. However, it is advisable to keep concentrations of this dust at a minimum and the separations

along the joints and seams of the enclosure should be closed or blocked off to confine the dust and permit the exhaust to capture it. The chute at the discharge end should be partially covered and made continuous with the rest of the enclosure.

Sheet preform press The concentration of lead dust in the breathing zone of the operator of the preform press was excessive and above 10 milligrams per ten cubic meters. Dust counts were not taken at this operation but the total amount of dust present was high and an appreciable quantity of this dust was asbestos dust.

The present exhaust system on the press was partially effective but the slots around the edge were narrow, they did not extend around the sides of the ram and were too far away from the source to capture the surges of dust from the bed.

The openings to the hood should be wider, probably at least 3 inches wide for its effectiveness depends more on the quantity of air exhausted than on the velocity through the slot. A metal curtain or shield should be built down from the exhaust slots and enclose the ram so that it would come down as a cover over the bed. This curtain should extend so that the bottom edge will be about 2 inches below the bottom of the ram and it may be necessary to offset the bottom of the shield to permit it to pass the bed plate.

The velocity of air exhausted should be at least 250 linear feet per minute through the opening between the ram and the curtain.

General Asbestos dust will readily accumulate in pipe elbows and bends in exhaust systems and clean-out traps should be installed at convenient spots near the bends. A regular program for periodic cleanout of these points should be made in order to maintain the exhaust systems at their best efficiency.

J. A. Houghton

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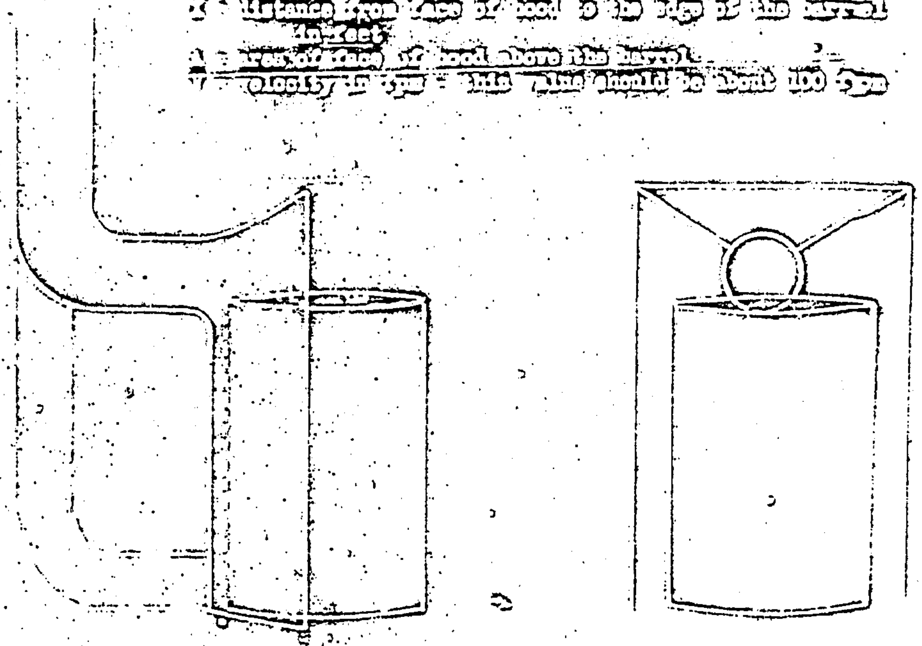
Division of Industrial Hygiene

Suggested Type of Partial Enclosure for Barrels Containing Dusty Materials

The quantity of air exhausted will depend on the distance from the face of the hood to the outside edge of the barrel. It may be estimated from the formula:

$$Q = (10X^2 + A)V$$

Q = quantity of air in cfm
X = distance from face of hood to the edge of the barrel in feet
A = area of face of hood above the barrel
V = velocity in fpm - this value should be about 100 fpm



Alternate design would include additional exhaust to the bottom of the enclosure with a damper in the lower section of the pipe to adjust to the desired control.

Liberty Mutual Insurance Company
Loss Prevention Department

BARREL EXHAUST

RESULTS OF AIR SAMPLES FOR LEAD

Samples were taken for lead dust with a single midget impinger sampling at a rate of 5 liters per minute. The samples were collected in dilute nitric acid and analysed colorimetrically with dithizone.

Location of Samples	Time	Milligrams of lead per 10 cubic meters of air
At batching scale near center of room-sample taken about 5 feet from the operator, no litharge weighed out during the sample.	20 min.	2.1
General room air compounding room near Ransome mixer.	20 min.	1.0
At batching scale at side of room-litharge included in batch weighed out.	5 min.	12.2
Operators breathing area at mill in NE corner of compounding room.	16 min.	3.5
At mill in NE corner of compounding room about 5 feet from mill.	16 min.	2.6
At scale of sheet preforming press-general area near operator weighing out mix.	30 min.	1.7
At preforming press-general breathing area of operator spreading mix and operating the machine.	30 min.	13.4

RESULTS OF DUST COUNTS

Grab samples were taken with the Bausch and Lomb dust counter and counted with darle field illumination.

Location of Sample	Millions of particles per cubic foot of air
Feeding the asbestos shredding machine - operators breathing zone.	7.5 12.7
Over center of asbestos shredding machine - visible cloud of dust rising from machine.	47.1 19.8
At discharge chute of asbestos shredding machine - about 3 feet from the floor.	14.9 8.6
Dumping asbestos from bag into hopper of Ransome mixer - exhaust not operating.	over 50 million over 50 million
General room air of compounding room about 10 feet from batching operation.	20.8 20.5

PETROGRAPHIC ANALYSIS OF AIR SAMPLES

Air samples taken with the Bausch and Lomb sampler were examined petrographically and a determination of the asbestos was made by particle count.

#1 Taken at asbestos shredding machine.

Composed of particles of serpentine, dolomite, magnetite, etc., below 5 microns and 6% asbestos fibers (maximum length 60 microns) by count.

#2 Taken at dumping material into hopper of Ransome mixer.

Sample is similar to #1 - contains 5% asbestos fibers by count.

(C. R. Williams)