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Health & Environmental Research

ACCOUNT NO.

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PROBLEM NUMBER

9082000

TITLE

EVALUATION OF ASBESTOS EXPOSURES TO UTILITY OPERATORS PULLING CHLORINE CELL DIAPHRAGMS AT CHLORINE CELL MAINTENANCE, 853 BUILDING

PLAINTIFF'S EXHIBIT

DOW-1744

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DESCRIPTIVE SUMMARY
WITH CONCLUSIONS:

(Include in this space references to data books, and to earlier related reports, patents and publications.)

Exposures to asbestos fibers by utility men working in 853 building were evaluated while pulling asbestos chlorine cell diaphragms. Measured concentrations were well within OSHA time weighted average (TWA) limits for an 8 hour shift. The estimated TWA exposures for the tank operator and the crane operator for a 12 hour shift were .5 and .2 fibers/ml. The 8 hour standard is 5.0. Peak exposures, dust, other problems and concerns are discussed.

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PROBLEM

The Industrial Hygiene Laboratory of Health and Environmental Research was asked to reevaluate asbestos exposures of workers in 853 building (Chlorine Cell Maintenance) while vacuum drawing chlorine cell diaphragms. Twelve hour shifts were being worked at the time of the study and the results are to be compared to 8 hour standards extrapolated for 12 hour periods of exposure.

CONCLUSIONS

1. Asbestos exposures by the utility men operating the pulling tank job and the crane job were well within acceptable 8 hour time weighted average (TWA) limits. These exposures were within acceptable concentrations even when extrapolated to a full 12 hours of "pulling" diaphragms.
2. The highest concentration occurred when the fiber was dumped into the pulling tank. Although a sample taken during this period was within standards, there is a visible surge of dust just as each bag is dumped and peaks could approach the ceiling limit (10 fibers per ml air). The existing canopy hood is inadequate and was not used.

3. The tank operator wore an approved respirator during the time dry fiber was handled. The crane operator and a third man assisting near the tank did not wear masks.

4. Air agitation of the slurry in the pulling tank created a visible fog over the work area. The fog is a respiratory hazard and should be eliminated. This practice was not an approved procedure and has since been discontinued.

5. Housekeeping, considering the type of work performed, was reasonably good. There was some asbestos and/or dirt on the floors, gratings and equipment near the pulling tank. OSHA rules state that all external surfaces in any place of employment shall be maintained free of accumulations of asbestos fibers if, with their dispersion there would be an excessive concentration.

RECOMMENDATIONS

1. Unless a creative change in method is found to eliminate the dust while getting asbestos into the slurry, the existing canopy hood should be revised or replaced to provide the local exhaust needed to prevent dust accumulations in the building.

2. Until engineering control of airborne asbestos is accomplished, the tank operator should continue to use an approved toxic dust respirator. Other personnel should stay away from the tank when fiber is dumped or wear the masks.
3. Since a respirator is required at the tank when handling dry fiber, then OSHA rules concerning respiratory protection should be reviewed for compliance.
4. Practices that could lead to inadvertent contamination should be reviewed and training in right methods stressed.
 - a. Emphasize the need to avoid carrying asbestos on clothing and shoes to other areas, particularly eating areas.
 - b. Floor cleaning, bag disposal and equipment decontamination should be reviewed with all people concerned.
 - c. The policy of company supplied clean clothes for daily change should be continued.
5. Industrial Hygiene monitoring frequency should be increased to once every six months while there is a possibility of peak concentrations exceeding ceiling limits. After that, a once per year schedule should be maintained to assure adequate monitoring. The supervisor in charge should make certain the survey is made and reported on time and then review the results with the operators.

STANDARDS

The current asbestos exposure limit under OSHA regulations on an 8 hour time weighted average (TWA) basis is five fibers (over 5 microns in length) per ml of air sampled. The maximum peak concentration allowed is 10 fibers per ml air. In 1976 the TWA limit is scheduled to drop to 2 fibers per ml. air.

Extrapolation of 8 hour limits to 12 hour days and over 40 hour weeks is not always a simple averaging because of the lost body recovery time between exposures. However, the intent of the asbestos limit is to control the total amount of fiber inhaled to under a physiologically damaging amount. Therefore, a 12 hour exposure limit can be considered to be two thirds that of the 8 hour limit.

DISCUSSION

The current volume of literature on the subject reminds us again and again of the toxicity and hazard of asbestos inhalation and ingestion. The use of asbestos is the key to our current chlorine cell technology, therefore, it is mandatory that we continue to assure its safe use. This spot survey is a continuation of a

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monitoring program designed to assure the proper control of asbestos exposures. Past Industrial Hygiene reports detail more comprehensive sampling of this process and should be reviewed. Reports written the last five years provide useful background and copies can be obtained from the Industrial Hygiene Laboratory, 1707 building. The file code is NBH34.21-21-3.

The process has not changed since the last survey, except the small canopy hood is not being used. Apparently it doesn't do the job intended. Asbestos is received at 853 building in plastic lined burlap bags and stored near the pulling or mix tank. Before drawing a diaphragm the bags are carried one by one to the edge of the tank, opened and dumped into the caustic solution about 2 feet below the edge. The dumping is done with care to control the dust, however, dust was observed rising from the tank before the fiber had a chance to wet and sink into the liquid (after which dust is not a problem). The tank operator did wear an approved dust respirator as protection from possible peak exposures. An exhaust vent located at the dump site should be used in order to prevent the dust from getting up into the air and possibly drifting over to other work areas. The existing canopy hood exhaust should be modified or replaced with a better system. Dust accumulations can later be stirred up into the breathing zone of others. The use of respiratory protection is required

by department rules and therefore the law requires the employer to provide training in its use, assure proper fit, make periodic inspections, assure proper cleaning, storing and repair. These and other OSHA requirements should be reviewed for compliance. We should also remember that the dust mask is not to be used as the primary control of exposure, only as second line of defense against unusual situations or emergencies. In this case a mask is appropriate extra precaution, but revision of the local exhaust should be carried out.

As the asbestos pulp is added, some fiber must be hand handled since the recipe calls for a weighed last increment to the total weight of pulp to the tank. The fiber is normally stirred into the slurry with a hoe, then the whole tank is emptied by vacuum into a mixing tank outdoors. The operator on the day of the survey used air to mix the slurry in the pulling tank. As the air was started into the bottom of the tank, a cloud of mist arose from the top and dispersed into the immediate area. The crane operator nearby did say that the fog seemed to irritate his nose and throat. It is probable the mist is air carrying entrained alkaline water and possibly asbestos from the pulling tank where the caustic and silicates increase the surface tension. In any case this act was not normal procedure and is discontinued. The mixing operation should be reviewed with everyone concerned to avoid getting dust and alkali into the air.

The final part of the cycle is to position a cathode assembly in the pulling tank and then return the slurry where it will completely cover the cathode and its attached vacuum pan. A vacuum is then drawn forming the diaphragm mat with the caustic going back to the mixing tank outside. The caustic is reused to slurry up the next diaphragm. The fresh diaphragm is smoothed by hand and while the asbestos is wet and dust is not a problem, there is some splattering on the workers and the floors. The workers must be careful to avoid contact with the caustic and to avoid carrying away wet asbestos which could later dry and in some way cause exposure problems such as ingesting with food. We can say the same about dust on clothing. The accumulation of asbestos on the floor and gratings must be minimized and controlled. Current procedure calls for a change of Dow supplied clothing every day which keeps problems inside the plant. The disposal of bags and the cleanup procedures later in the shift were not observed. It is advised that these procedures be thoroughly reviewed with building personnel. There has been a gap in time since the last training and there is a lot of plant bumping going on with new people on some jobs.

The last survey was over one year ago. TWA standards have not been exceeded, but the visible dust always means that maximum allowable limits could be approached. By 1976 the TWA limits

set by OSHA will drop to 2 fibers per ml. For these reasons it is recommended that an air sampling frequency every six months be used until we are confident this material is controlled. After that, an evaluation should be made once per year to assure continued control. OSHA requirements call for a frequency and pattern that represent with reasonable accuracy the employees exposure levels. A frequency of 6 months or less is called for employees whose exposures would reasonable be expected to exceed prescribed limits. Operating supervisors are responsible for compliance; therefore, should make sure the work is done by Industrial Hygienists on agreed upon schedules. Review the results of the monitoring to the people involved right away. Don't wait until all the recommendations are acted on.

SAMPLING AND ANALYTICAL

Breathing zone air samples were collected on 37 mm diameter, .8 micron pore size, membrane filters (in cassettes but with open face). Two MSA, 4 hour Monitaire pumps were calibrated with these filters and were operated at about $1.6 \pm .1$ liters/minute on August 27, 1974, one pump, set up with tubing and a filter was worn by the utility man operating the mix and pulling tank. Another pump was attached to the man working as crane operator. These two men (particularly the tank operator) had the greatest

exposure potential. A third man worked with the first two, but mainly after the asbestos was wet and the dust hazard minimized. Samples were taken during the pulling of two diaphragm. The first samples were taken during a period of nearly one hour as the first diaphragm was pulled. During the second pull, the tank operator carried one filter during just the time that he handled and dumped the bags of asbestos. At this point, the filter was changed to get a sampling during the rest of the cycle. Table I summarizes the results. As in past surveys, the period during which the tank operator dumps the fiber is when we measure the highest levels of exposure which confirms the visual observation.

The fibers on the filters were counted by the standard phase-contrast microscopy technique at 450 magnification by the Midland Division Microscopy Laboratory and results reported in analytical report AL NO 86 581.

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TABLE I. Asbestos Exposure Levels at 853 Building During
Diaphragm Pulling

<u>Tank Operator</u>	<u>Average Concentration Fibers Per ml Air</u>
Exposure during 1st diaphragm (53 min.)	.6
Average while dumping fiber 2nd diaphragm (19 min.)	1.1
Average during rest of time 2nd diaphragm (45 min.)	.1
	} Average weighted = .4
Average for 2 diaphragms	.5
(This is probable average for 12 hour shift this day)	
OSHA Standard for 8 Hour Shift	5.0
 <u>Crane Operator</u>	
Exposure during 1st diaphragm (51 min.)	.2
Exposure during 2nd diaphragm (51 min.)	.1
Average for 2 diaphragms	.2
(This would be assumed average for whole 12 hour shift)	

NOTE: The levels found were acceptable even if these men pulled diaphragms all 12 hours of their shift. Other work was performed where past surveys indicated minimal levels. Therefore, a conservative estimate of the TWA exposure levels for 12 hours for

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NOTE: continued.....

the tank operator would be .5 fibers/ml of air. A level of .2
would approximate the crane operator and the third utility man.