PLAINTIFF'S
EXHIBIT
DUP-2402

MANUFACTURING DIVISION
KINGSTON WORKS

1983 July 19

cc: J. Dennis (for communication to O.H. Sub-committee)
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TO: N. J. Morrison STUDY NO. 83-09

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AIR MONITORING STUDY #83-09: ASBESTOS: INSULATORS

During the period 1983 June 13 to June 17, personal air monitoring was conducted on Insulators to assess their daily exposure to asbestos while performing routine maintenance activities.

For control purposes, jobs performed by Insulators have been subdivided into four distinct categories, based on the levels and type of asbestos likely to be encountered. These include:

(i) insulation shop activities - canvassing calcium silicate insulation with 'A' cloth (D.E.E.R. job code 734F)

(ii) fieldwork - major strip-outs involving the removal of permanent asbestos insulation (D.E.E.R. job code 467D)

(iii) fieldwork - major strip-outs involving the removal of preformed calcium silicate and thermobestos insulation covered with 'A' cloth (D.E.E.R. job code 467C)

(iv) fieldwork - routine daily maintenance. (D.E.E.R. job code 467G)

Routine daily maintenance includes such jobs as:

(i) installation and removal of non-asbestos insulation (eg. Trymer, fiberglass, etc.)

(ii) applying and cleaning mud on calcium silicate insulation

(iii) minor fabrication of calcium silicate insulation in the shop.

(iv) minor removal of asbestos bearing insulation on valves, elbows, and short lengths of pipes

DUP 0909175

DU 028996

Maintenance activities have not been considered to pose a significant health hazard with respect to airborne asbestos. Currently these jobs are performed without respirators or the use of special controls (eg. wetting, enclosures, barriers, etc.). In order to fully characterize employee exposure to asbestos, a total of 16 personal samples were collected, each sample covering the full 8 hour work period.

Asbestos Exposure Standards

Since small amounts of amosite asbestos may be encountered when removing thermobestos insulation on valves and elbows, the exposure standard for amosite was used in this study.

The exposure limits for amosite asbestos, as specified under the "Regulation Respecting Asbestos" for Industrial Establishments (Ontario Occupational Health & Safety Act, 1978) are as follows:

* 1. 40 hour time-weighted average (TWA) limit = 0.5 fibres/cc

2. maximum concentration not to be exceeded = 2.5 fibres/cc.

Sample Collection and Analytical Method

(See Appendix I)

Survey Results

In accordance with Eng. Std. 30L12, all personal 8 hour exposure measurements were statistically analyzed using the computer program LOGAN (see Appendix III for LOGAN criteria and results).

Personal sample results were as follows:

(i) employee daily 8 hour average exposure to airborne asbestos: 0.1 fibres/cc (geometric mean of 16 samples)

(ii) range of measurements: undetected (less than 0.1 fibres/cc) to 0.7 fibres/cc.

Summary

1. Employee 8 hour TWA exposure to asbestos was in compliance with the MOL exposure standard.

2. Fifteen out of the sixteen 8 hr. TWA exposures measured, resulted in airborne asbestos concentrations less than or equal to 0.2 f/cc.

Based on this evidence, it was concluded that employee 40 hour TWA exposure was also in compliance with the 0.5 fibres/cc limit.

* Note DUP 0909176

The Environmental Affairs Group (EAG) will continue to take the conservative approach and time-weight exposures over an 8 hour period.

Comments & Recommendations

1. As required under section 11(a) of the regulation, the results of this study must be posted in the Insulation Shop for a period of at least 14 days.

   The EAG also recommends that verbal communication of the study results be undertaken with all insulators.

2. Johns Manville Ltd. stopped putting asbestos fiber in their mud a few years ago. However, there still exists on site, significant amounts of old insulation packed with asbestos mud. As the personal results show, cleaning asbestos mud can result in significant exposure to airborne asbestos (see Sample #1, Appendix II).

   Based on the results of personal monitoring, the following recommendations are made:

   i) When insulators are required to clean old insulation, suspected of containing asbestos-bearing mud, respirators are mandatory. Wetting of the insulation should also be considered.

   (ii) For all other routine daily maintenance activities described at the beginning of this study, respirators are not mandatory.

3. The EAG still has to characterize asbestos exposure during major strip-outs involving preformed calcium silicate and thermobestos insulation covered with 'A' cloth. This study will be undertaken when the opportunity arises.

RAMcN/hr
Attach.

APPENDIX I

ASBESTOS IN AIR: INSULATORS: SAMPLE COLLECTION & ANALYTICAL METHOD

Sampling and analysis was conducted in accordance with the procedures set out in the "Code for Measuring Airborne Asbestos Fibres" dated 1982 July 19.

Sample Collection

All samples were collected on millipore cellular ester filters (MAWG 037 Ao pore size 0.8 micrometers) held in 3 piece 37 mm open-faced filter holders.

Air flow was provided by battery-operated P2500 Du Pont pumps calibrated at 2.0 liters/min. ±5%. A soap-film flow meter and electronic stop watch were used to calibrate the pumps.

In general, each sample covered a period of approximately 7 hours. The pump was removed from the employee during lunch period only. It was assumed that no exposure to asbestos occurred during the unsampled period: hence 8 hour exposures were calculated by dividing the measured asbestos concentration by 8 hours.

Analytical Method

All filters including 2 blanks were sent to Ontario Research Foundation to be analyzed by phase contrast microscopy. In this method, the number of fibres on the filter are determined. Only those fibres having a length greater than 5 micrometers and a length to width ratio of 3 to 1 or greater are included in the count. This method does not identify the type of fibre present, all fibres counted were, therefore, assumed to be asbestos.

The lowest detectable concentration of asbestos fibres was 0.1 f/cc per sample.

Both blank filters had undetectable amounts of fibres present.

ASBESTOS IN AIR; INSULATORS: SAMPLE RESULTS

Sample #	Employee	Asbestos Concentration Measured in Sample (fibres/cc)	8 Hr. TWA Exposure (fibres/cc)	Summary of Daily Activities
1	N. Donaldson	0.9	0.7	CP Area: cleaning mud from preformed calcium silicate insulation covered with 'A' cloth (mud suspected of containing asbestos).
2	N. Donaldson	0.2	0.2	CP Area: applying non asbestos mud to insulation on finisher.
3	B. Pitcher	0.1	0.1	T-29 Spinning: installing preformed calcium silicate insulation covered with 'A' cloth & metal jacketing removed and installed preformed thermobestos insulation on one valve.
4	B. Pitcher	0.2	0.2	T-29 Spinning: - cleaning mud off preformed calcium silicate insulation covered with 'A' cloth - applying non-asbestos mud to insulation - installing some preformed calcium silicate insulation covered with 'A' cloth.

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ASBESTOS IN AIR; INSULATORS: SAMPLE RESULTS (cont'd)

Sample #	Employee	Asbestos Concentration Measured in Sample (fibres/cc)	8 hr. TWA Exposure (fibres/cc)	Summary of Daily Activities
5	B. Asselstine	less than 0.1	less than 0.1	Fan Room #17: - installing Trymer insulation (non-asbestos) - wrapping pipes with cold water tape.
6	J. Dier	0.2	0.2	Batch Polymer: cleaning non-asbestos mud off preformed calcium silicate insulation covered with 'A' cloth.
7	B. Asselstine	less than 0.1	less than 0.1	Insulation Shop: - fabricating Trymer insulation Fan Rm. #19 - installing preformed calcium silicate insulation covered with 'A' cloth.
8	J. Dier	0.1	0.1	Insulation Shop: - fabricating and canvassing calcium silicate insulation Field: - routine checks
9	J. Dier	less than 0.1	less than 0.1	Insulation Shop: - fabricating and canvassing calcium silicate insulation
10	B. Asselstine	0.1	0.1	- fabricating Trymer insulation

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ASBESTOS IN AIR; INSULATORS: SAMPLE RESULTS (cont'd)

Sample #	Employee	Asbestos Concentration Measured in Sample (fibres/cc)	8 hr. TWA Exposure (fibres/cc)	Summary of Daily Activities
11	M. Donaldson	0.1	0.1	T-13 CP: - applying non asbestos mud to preformed calcium silicate insulation covered with 'A' cloth
12	B. Asselstine	less than 0.1	less than 0.1	Fan Room #17: installing Trymer insulation
13	B. Hartling	0.1	0.1	fabricating and installing Trymer insulation - worked on piping in T-13 CP 5th floor (residual dust on piping probable source of asbestos in sample)
14	B. Pitcher	0.2	0.2	- stripped a small line covered with grey thermobestos - fabricating and canvassing calcium silicate in shop.
15	B. Asselstine	0.1	0.1	Fan Rm. #17: - applying metal jacketing to Trymer insulation (pipes covered with residual dust; possibly asbestos)
16	B. Pitcher	0.1	0.1	Shop: canvassing calcium silicate insulation - installing fiberglass and Nortab inside T-29 spinning machines

DUP 0090181

DU 029002

APPENDIX III

ASBESTOS IN AIR; INSULATORS: LOGAN CRITERIA AND RESULTS

Logan Criteria

As outlined in Engineering Standard 30L12, an appropriate objective is to control the contaminant level so that the maximum probability of employee exposure exceeding the exposure limit is 5%. To determine if this objective has been met, statistical analysis of the sampling data is required.

The computer program LOGAN provides a complete statistical analysis of air monitoring data. It tests the fit of the data to a log-normal distribution and then provides important parameters of the distribution.

The most important parameter is the acceptance concentration (A value), which is used in the decision process for determining compliance with an exposure limit. The A value is dependent on the number of samples collected and the magnitude of the results. If the A value is less than the exposure limit then the control objective has been met.

Other parameters provided by LOGAN are the geometric mean (GM) and geometric standard deviation (GSD) of the distribution. The geometric mean which is the median value, is a good estimate of the employee's average daily exposure to the contaminant being measured. The geometric standard deviation is a measure of the variability in the data; the higher the GSD, the greater the variability.

Logan Results

(i) data followed a log-normal distribution

(ii) geometric mean of distribution = 0.1 fibres/cc

(iii) geometric standard deviation of distribution = 1.9

(iv) A value = 0.4 fibres/cc

Since A value was less than 0.5 fibres/cc, compliance was demonstrated.