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MIDLAND MICHIGAN	Chemical Biology Research	January 16, 197
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EVALUATION OF ASBESTOS DUST EXPOSURES DURING THE MORAFING OF TEFLON LINED PIPE, LINED PIPE PLANT, BAY CITY, MICHIGAN

INFORMATIVE SUMMARY WITH CONCLUSIONS

Results of eight breathing zone samples taken at the Bay City Lined Pipe Plant indicate that exposures to asbestos dust during gasket application and MORAFing of Teflon lined pipe are well within the current inhalation standard for asbestos. No further control measures are needed.

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Hoyle Exh 1/13/89

PROBLEM

Gaskets containing asbestos are used in the Bay City Lined Pipe Plant on pipe lined with poly-tetra fluoroethylene (Teflon). These gaskets are placed between the face of the end flange and the lining which is heated and molded (MORAFed) over the face of the flange. Since chronic inhalation of asbestos dust is known to have deleterious effects on the lungs, supervision of the Lined Pipe Plant requested that the Industrial Hygiene Section of Chemical Biology Research evaluate the exposure of personnel to asbestos dust while the gaskets were being placed over Teflon pipe linings and MORAFed into place.

CONCLUSIONS

The results of eight samples taken show that the exposures of personnel to asbestos dust are well within the current occupational health standards. No additional dust control measures are necessary.

DISCUSSION

As seen in Figure 1, the MORAFing process consists of placing an asbestos-containing gasket over the Teflon liner. The protruding end of the linar is then heated with a gas-fueled torch until it becomes clear (water white) and moldable. A die is subsequently clamped over the end to mold/extrude the liner over the gasket into a plane parallel to the flange face. The fire retardant properties of asbestos are desirable because relatively high temperatures are obtained during heating of the liner, yet the gasket suffers little or no damage.

On December 5, 1972, eight asbestos dust-in-air samples were collected at the Bay City Lined Pipe Plant during the MORAFing of Teflon lined pipe. The samples were collected by placing two membrane filters (in holders) on the lapel of the operator performing the work. The filters were coupled in parallel with rubber tubing which was attached to a vacuum pump. Using a mercury-filled manometer, the pressure drop across the filters was measured, in addition to the total sample time. Four sets of duplicate breathing zone samples were collected in total.

The filter samples were taken to the Microscopy Lab at 574 Building where the filter papers were sectioned and mounted on 1"x 2" microscope slides. A clarification medium was applied to the papers to change the opaque, white paper into a clear, transparent gel. The samples were subsequently observed

under the phase contrast microscope. In accordance with the current criteria for counting asbestos dust fibers established by NIOSH (The National Institute of Occupational Safety and Health), all particles greater than five microns in length with an aspect (length to width) ratio ≥3.0 were counted over 20 fields. It should be noted that approximately 10% of the fibers counted actually appeared as asbestos. Total area of the 20 fields was 0.692 sq. mm. (The microscopic analysis of the samples was completed by the author.) The results of the analyses are shown in Table 1 which also includes other pertinent data. The data listed for samples 1L and 1R are predicated on the assumption that the vacuum pump was operating for a five-minute interval. The actual sample period is known only to be less than 45 minutes at which time the pump was observed to be inoperative from an overloaded circuit. Basing conclusions on the remaining six samples, the mean concentration is 0.073 fibers per ml of air, and the standard deviation is 0.048. Within a 97.5% confidence limit, it is concluded that the breathing zone dust concentrations are less than 0.17 fibers per ml of air. These are fibers ≥5 microns in length with an aspect ratio ≥3, as asbestos.

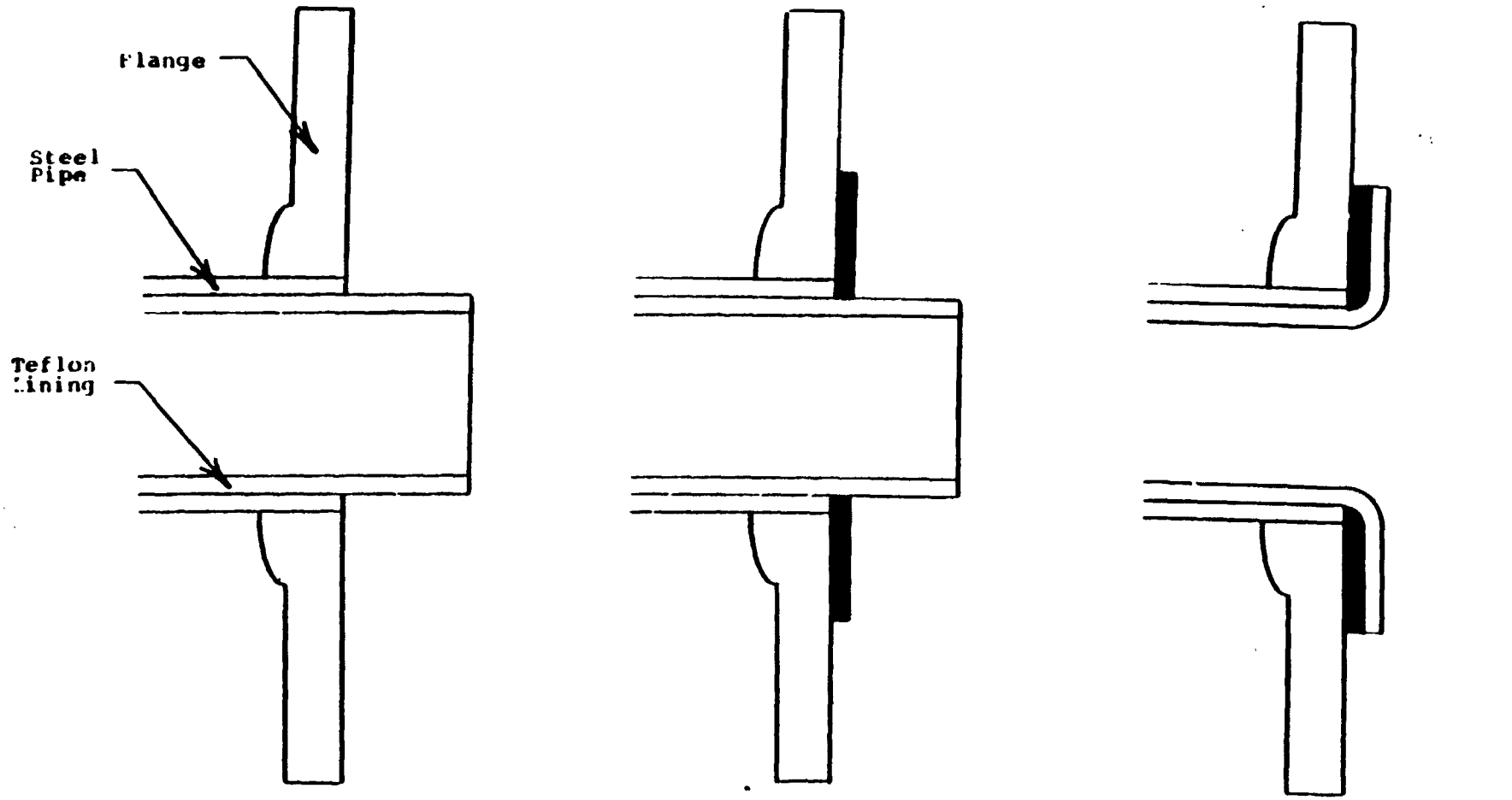
To be meaningful, the observed values should be compared to a standard for asbestos dust inhalation. The standard is the TLV or Threshold Limit Value established by the ACGIH (American Conference of Governmental Industrial Hygienists).

This value is currently five fibers* per ml of air, and represents the maximum time-weighted average exposure that will produce no effect for people exposed. TLV's are based on daily exposures of eight hours with repeated exposures throughout a working lifetime. Because the observed concentrations were well within the TLV, no attempt was made to time weight the exposures, as the exposures are unquestionably within the TLV, and no health hazard from asbestos dust is foreseen with this MORAFing operation.

Present plans call for the lowering of the TLV for asbestos to two fibers per ml air in 1976. Even at this more conservative control level, the asbestos exposures during the MORAFing of Teflon lined pipe are still acceptable.

*≥5μ in length, aspect ratio ≥3.0

Figure 1. Sectioned Views of MORAFing Process for Teflon Lined Pipe



Step 1
Lined Pipe Ready For MORAFing

Step 2
Gasket Installed

Step 3
Lining Extruded Over Gasket

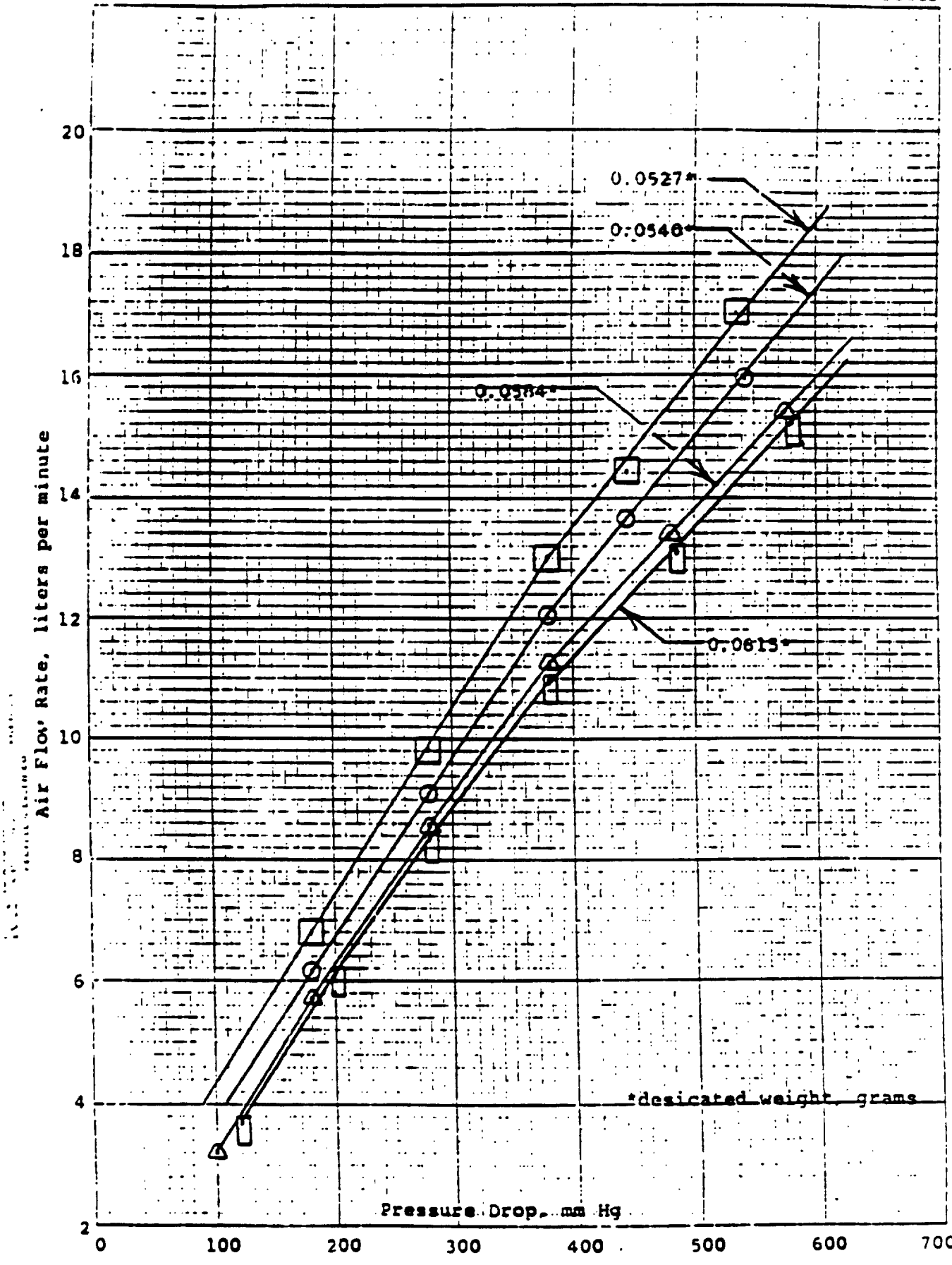
Table 1. Results of Asbestos Dust Samples Taken at the Bay City Lined Pipe Plant During the MORAFing of Teflon Lined Pipe

	Sample Numbers							
	1L	1R	2L	2R	3L	3R	4L	4R
Total fibers counted*	17	14	49	31	87	17	60	26
Total fibers*	23,636	19,464	68,126	43,100	120,959	23,636	83,420	36,149
Pressure drop, mm Hg	550	550	550	550	512	512	521	521
Tare weight, mg.	54.0	57.3	56.4	58.3	54.5	53.2	58.7	55.3
Air flowrate, liters/min. (from Figure 2)	16.2	15.2	15.8	14.9	15.2	16.0	14.2	16.2
Sample time, min.	5**	5**	57.0	57.0	61.5	61.5	43.5	43.5
Total air sampled, liters	81	76	901	849	935	984	618	705
Fibers per ml air	0.29	0.26	0.08	0.05	0.13	0.02	0.13	0.05

*Total fibers counted in 20 fields having a total area of 0.692 sq. mm. Samples were collected on a filter having an effective area of 962 sq. mm, so total fibers = counted fibers * $\frac{\text{total area}}{\text{area counted}}$

**Assumed value

Fig. 2. Air Flow Rate vs Pressure Drop for 0.2 micron, 47 mm diameter filter



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INDUSTRIAL HYGIENE SAMPLE RECORD

G. Socha

File Number: 25-2-7 — Bay City Lined Pipe Plant — Date: 12-5-72

Material: Asbestos dust — 0.3 μ, 47 mm

Remarks, ventilation, etc.: Local exhaust ventilation used (religiously). Operator on the job is George Southworth

Sample No.	Description of Sample	Start	Concentration
1L+1R	Morafing Teflon lined pipe ends using asbestos gaskets as backing	9:35 am	
	1L Tare = 0.0540 g., 0.0541		0.1 mg.
	1R tare = 0.0573 g, 0.0574		0.1 mg.
	mm Hg ΔP = 550		
	sample time = < 45 min.		
	pump quit (circuit overloaded)		
2L+2R	same job as above		
	mm Hg ΔP = 550		
	2L tare = 0.0564 g, 0.0571		0.7 mg
	2R tare = 0.0583 g, 0.0590		0.7 mg.
	sample time - 57.0 minutes		
3L+3R	same job as #1L+1R		
	mm Hg = 512 (ΔP)		
	3L Tare = 0.0545 g, 0.0549		0.4 mg.
	3R Tare = 0.0532 g, 0.0548		1.6 mg.
	sample time - 61.5 minutes		
4L+4R	same job as #1L+#1R		
	4L tare = 0.0587, 0.0593		0.6 mg.
	4R tare = 0.0553, 0.0560		0.7 mg.
	mm Hg ΔP = 521		
	sample time - 43.5 min.		

Signature: Date:

Form C-1021 Printed 8-1-70

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$\frac{962}{0.692} = 1390$ = conv. factor

× $\frac{\text{fibers} \times 1.39\,E3 \times}{6Y\,l \times}$ $\frac{1\,l}{E3\,ml}$

Y. Rocha
12-27-72

	(0.26) 1R	(0.05) 2R	(0.02) 3R
		2	0
1	0	0	0
2	1	0	0
3	0	1	2
4	0	4	1
5	1	4	2
6	0	1	0
7	2	1	1
8	1	2	1
9	2	1	0
10	0	1	2
11	0	2	0
12	1	3	1
13	0	2	1
14	1	1	3
15	1	2	0
16	0	1	1
17	0	2	0
18	2	0	0
19	2	1	2
20	0		
Σ	14	31	17
ΔP:	550	550	572
tare:	57.3	58.3	53.2
lpm	15.2	14.9	16.0
time, min	(5)	57.0	61.5
	76	849	984

962 mm²

	(0.13) 3L	(0.13) 4L	(0.03) 4R	(0.08) 2L	(0.29) 1L
1	2	0	0	2	0
2	0	0	0	1	0
3	0	1	2	3	0
4	1	0	0	3	0
5	6	0	0	3	0
6	7	0	1	4	1
7	1	8	3	1	0
8	0	2	1	4	1
9	0	2	0	2	0
10	0	8	0	2	2
11	3	3	2	0	2
12	5	1	2	5	1
13	9	8	0	3	1
14	8	4	3	3	1
15	8	6	5	3	2
16	8	3	2	0	1
17	16	5	3	2	0
18	4	2	0	3	0
19	6	3	1	2	2
20	3	4	1	3	3
Σ:	87	60	26	49	17
ΔP:	512	521	521	550	550
tare:	54.5	58.7	55.3	56.4	54.0
lpm:	14.52	14.2	16.2	15.8	16.52
min:	61.5	43.5	42.5	57.0	(5)
Δ#.	8935	618	105	901	81

L. Socha
12-27-72

fibers
mm Hg
mg

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