FILE NAME: Goodyear (GY)

DATE: 1937 Apr

DOC#: GY100

DOCUMENT DESCRIPTION: Trade Journal Article - Talc Dust in the Rubber Industry

TALC DUST IN THE RUBBER INDUSTRY

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COMMERCIAL talcs are highly variable in composition since they generally contain not only the mineral talc (hydrous magnesium silicate), but, in addition, natural mineral impurities such as dolomite (lime-magnesium carbonate) and serpentine (hydrous magnesium silicate). These variations in composition are relatively unimportant to manufacturers because of the fact that the uses of talc depend more on physical characteristics than on chemical composition. In the rubber industry the chief use of powdered talc is as a dusting agent to prevent pieces of unvulcanized rubber from sticking together.

Possible Health Injury

When so used, talc is disseminated into the air in large quantities and the question has often been raised as to the possibility of permanent lung damage resulting from the continued inhalation of such dust. There has been very little work done in connection with this problem. In two published studies of the effects of exposure to dust in talc mines and mills in Georgia and Vermont (one by Dreessen,[1] the other by Dreessen and DallaValle[2] of the U. S. Public Health Service) the writers concluded that talc does not produce disabling pneumoconiosis, although Dreessen found some evidence in his Vermont study (1,p.98) that the dust (70% talc) produces a "fine diffuse bilateral fibrosis of the lungs which is definitely demonstrable in the x ray."

In order to determine the possible dust exposure involved in the use of talc, the writer undertook a survey of plants engaged in the manufacture of rubber tubing, insulated wire, rubber thread, and other rubber goods. It is the purpose of this report to outline the findings of this survey.

Method

The data on which this paper is based were gathered in a representative group of plants in the rubber industry, which use talc as a dusting agent. Table 1 shows the products manufactured at each of these plants.

TABLE 1

Plant	Product
A	Insulated Wire
B	Rubber Goods (all kinds)
C	Rubber Hose & Tubing
D	Automotive Cable
E	Insulated Wire
F	Insulated Wire
G	Webbing
H	Rubber Thread
I	Rubber Thread

In each plant data were gathered as to sources of dust; number and types of machines; nature of ventilation, if any; number of employees; length of service in dusty operations and nature of work. Air samples were taken with a Greenburg-Smith impinger and counted standard light field technique within a few hours of the time they were taken. There was probably some solution of carbonate particles, but a comparison of tables 3 and 4 will show that the bulk of the carbonates were not dissolved. Samples of the raw materials and the air samples were analyzed by the petrographic method for mineral content.

In every possible case data are put into tabular form to facilitate comparisons between conditions at various plants.

1 Dreessen, W. C.—"Effects of Certain Silicate Dusts on the Lungs," Jour. Industrial Hygiene, Vol. XV, No. 2, Mar. 1933 pp. 66-78.
2 Dreessen, W. C. and DallaValle, J. M.—"The Effects of Exposure to Dust in Two Georgia Talc Mills and Mines." U. S. Public Health Report. Vol. 50, No. 5, pp. 131-143.

Dust Concentration

Table 2 gives a summary of the number of machines generating dust, ventilation, men exposed and dust concentrations in the various departments of these plants.

Plant	Machines	Department	Ventilation	Concentration millions cu. ft.	Employees exposed
A	12	Insulating	W	64.2	26
	3	Depanning (large wire)	WF	169.0	14
	3	Depanning (small wire)	W	71.5	..
	4	Depanning	W	14.3	26
B	7	Tubing	W	46.0 22.6*	7
	4	Vulcanizing (depanning)	W	194.0 ..	9
C	3	Mill Room	W	5.3	92
	6	Tubing & Vulcanizing	W	11.7	11
	3	Mill Room (cellar)	..	28.0	3
	1	Molded Hose	W	13.3	4
D	1	Depanning	W	81.0	9
E	9	Insulating	W	13.8	41
	1	Depanning	W	144.0	4
F	1	Panning	..	7.8	8
	1	Depanning	..	23.8	4
G	2	Spool Winding	..	10.6	2
H	1	Mill Room	..	7.1	5
	.	Thread Department	W	10.7	11
I	.	Thread Department	W	26 4	18
	1	Mill Room	W	7.9	4
	.	Spool Winding	W	49.4	2
					300

W—Windows. F—Fan in Wall.
*At plant B samples were taken under two groups of conditions. With both tubing and vulcanizing departments, which are not physically separated, operating, the dust concentration in the vulcanizing department was 194 million and in the tubing department 46 million When the vulcanizing department was not operating the concentration in the tubing department dropped to 22.6 million. This is an excellent example of contamination of workroom air which could be avoided by segregating dusty from non-dusty operations.

It may be seen from this table that in three of the seven depanning operations (removal of vulcanized rubber from its bed of talc) dust concentrations are over 140 million and only one below 20 million. The concentrations in the extrusion (insulating, panning) departments ranged from 8 to 64 million—the two highest 46(B) and 64(A) being in the same plants having the most dust in their depanning departments. In both of these cases there was no physical separation of the extrusion and depanning departments and much of the dust in the extrusion departments originated in depanning operations.

Three of the four mill rooms studied had concentrations below 10 million and the fourth, which was located in a basement with little ventilation, had a concentration of 28.0 million.

In the processing of rubber thread, the dust concentrations were found to vary from about 10 million to 50 million.

Composition of the Dust

The wide variation in composition of talcs used in the rubber industry may be seen in Tables 3 and 4.

TABLE 3
Petrographic Analyses of Raw Material
(By count—less than 10 microns)

Plant	% soluble by weight	% less than 10 microns	Talc	Serpentine	Carbonate	Quartz	Others
A	41.73	95	6	5	86	..	3
B	7.95	90	32	49	9	tr.	10
C	35.56	90	12	35	45	tr.	8
D	28.18	95	18	15	62	tr.	3
E	45.53	95	21	33	32	tr.	14
F	25.27	90	6	8	82	..	4
G	22.94	90	16	26	47	tr.	11
H	5.08	80	27	57	9	tr.	7
I	3.56	75	38	50	8	..	4

TABLE 4
Petrographic Analyses of Greenburg-Smith Samples
(By count—less than 10 microns)

Plant	% less than 10 microns	Talc	Serpentine	Carbonate	Quartz	Others
A	80	15	12	42	tr.	29
B	75	50	25	8	2	13
C	90	17	12	62	tr.	9
D	95	45	32	14	tr.	9
E	95	19	12	61	tr.	8
F	90	12	14	64	tr.	10
G	85	16	21	58	tr.	5
H	95	34	49	5	tr.	12
I	60	53	36	6	..	5

Table 3 shows that the mineralogical composition of the talcs being used (raw materials) and Table 4 the composition of talc dust taken from the air. The differences are slight and so it may be assumed for all practical purposes that the dust has essentially the same composition as the raw material used. Little is known as to the toxicity of the silicate minerals present. Some authorities believe the carbonates are practically harmless, so it would seem reasonable to believe that the higher the carbonate content the less harmful the talc.

The important factor to be noted in the above tables is the extremely small amount of quartz present in either raw materials or dusts. The paucity of quartz which may produce silicosis takes these dusts out of the class of dusts considered dangerous such as granite dust or dust from other material with a high free silica content.

Employees

In the nine plants studied there are 300 employees, who have been exposed to various concentrations of dust for different periods of time. Table 5 gives the proportions of employees exposed to

various concentrations of talc dust. Approximately one-fifth of the men involved are exposed to over 50 million particles per cubic foot of air.

TABLE 5

Employees Exposed to Various Dust Concentrations

Concentration (Millions of particles per cubic foot of air)	Employees exposed	%
Over 50	64	21.3
25—50	28	9.3
10—25	103	35.0
Less than 10	105	35.4
	300	100.0

It may be noted from Table 6 that approximately 35% of all employees have been exposed to talc dust for 10 years or more. In the "over 30 year" group one man has been exposed for 44 years, one 45 years and one 55 years. Of those employees exposed to over 50 million particles of dust per cubic foot of air 50% have been working under dusty conditions for 10 years or more.

TABLE 6

Length of Service

	All employees	Employees exposed to over 50 million
Over 30 years	5	
25—30	7	2
20—25	14	1
15—20	19	7
10—15	59	21
5—10	82	16
Less than 5	114	17
	300	64

Summary

Studies including dust counts and petrographic analyses were made in nine plants which use talc as a dusting agent. In these plants, 300 employees are exposed to concentrations of talc dust varying from 7 to 194 million particles (less than 10 microns in size) per cubic foot of air. The highest concentrations were found in the tubing and vulcanizing departments of rubber tubing manufacturers (50 to 200 million) and the depanning departments of insulated wire manufacturers (generally over 100 million). In the mill rooms which, in these plants, were isolated from depanning or other dusty operations, the dust concentrations were generally found to be less than 10 million particles per cubic foot of air. In the manufacture and use of rubber thread, the concentrations ranged from 10 to 50 million. Of all (300) of the employees exposed, 195 or 65% were working in concentrations greater than 10 million and 64 or 21.3% in concentrations greater than 50 million.

The talcs encountered in this study covered a wide range of materials. The contents of silicate minerals ranged from 14 to 92%, while the carbonate contents varied from 8 to 86%, by particle count in the respirable sizes.

Recommendations

1. Handling of materials. It was noted in several plants that considerable unnecessary dust was generated by careless handling of the talc. Control of this factor may minimize some exposures.

2. Isolation of dusty operations. Such operations as depanning which are sources of high concentrations of dust should be located so that other parts of the plant may be kept free from such dust.

3. Raw material. Wherever possible the talc used should have a high carbonate content.

4. Insulated wire depanning. In the cases of smaller sizes of wire it is practical to cover the pan with a cone so that the wire comes out through an opening in the apex. This procedure is effective in minimizing the exposure.

5. Panning operations. Talc should be introduced automatically, obviating the necessity of having a man throw the talc in with a scoop or shovel.

6. Respirators. The use of respirators is recommended for short exposures to high concentrations.