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U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE  
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH  
CINCINNATI, OHIO 45202

HEALTH HAZARD EVALUATION DETERMINATION  
REPORT NO. 73-120-139

CUPPLES COMPANY, RUBBER DIVISION  
OVERLAND, MISSOURI  
JULY 1974

I. TOXICITY DETERMINATION

Because of sampling and analytical problems which cannot be resolved in a relatively short period of time and because of the inaccessibility of reliable morbidity and mortality data, it is not possible to state whether a potential health hazard exists during vulcanization of rubber at the Cupples Rubber Company.

Personal communication with Industrial Hygienists familiar with the vulcanization process have indicated that the air contaminants from vulcanization operations have not been defined. Numerous compounds are evolved during the vulcanization of rubber. The rubber manufacturing industries in conjunction with the United Rubber Workers Union have contracted with two Universities to study the complete rubber manufacturing process over a five year period. The results of this study should provide, not only environmental sampling and analytical techniques, but also information on the physiological responses from exposure to the chemicals used.

II. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this Determination Report are available upon request from the Hazard Evaluation Services Branch, NIOSH, U.S. Post Office Building, Room 508, 5th and Walnut Streets, Cincinnati, Ohio 45202. Copies have been sent to:

- a) Cupples Rubber Company, Overland, Missouri
- b) Authorized Representative of Employees
- c) U.S. Department of Labor - Region VII
- d) NIOSH - Region VII

For the purposes of informing the "affected employees" the employer will promptly "post" the Determination Report in a prominent place(s) near where exposed employees work for a period of 30 calendar days.

### III. INTRODUCTION

Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6), authorizes the Secretary of Health, Education, and Welfare, following a written request by any employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

The National Institute for Occupational Safety and Health (NIOSH) received such a request from an authorized representative of employees to evaluate the potential hazards associated with the vulcanization of inner tubes.

### IV. HEALTH HAZARD EVALUATION

#### A. Conditions of Use

One of the products of the Cupples Rubber Company is inner tubes for automobiles and other vehicles. In the vulcanization process the uncured inner tubes are heated to about 350°F by steam under pressure to cure the rubber. The area specified in the Health Hazard Evaluation Request was Department 24, Line G. Essentially the operation consists of inflating the uncured inner tubes, adding a parting compound to the exterior of the tubes, heating the tubes in molds (presses), and removing the tubes for transfer to another area. The potential exposures in this area are to the dust from the parting compound, and to the gaseous and particulate matter evolved as the inner tubes are removed from the vulcanizing molds and transferred by conveyor to another area. Potential exposure to heat was not evaluated since this is not a NIOSH function as defined by the Occupational Safety and Health Act of 1970, Section 20(a)(6).

#### B. Worksite Evaluation

On November 28, 1973, a health hazard evaluation was conducted to evaluate alleged exposures of employees to air contaminants from vulcanization of inner tubes at the Cupples Rubber Company.

#### C. Evaluation Methods

Samples were collected during the survey to evaluate exposure of employees to free silica dust in the parting compound, and to oil mist. Exposure to other environmental air contaminants can not be evaluated because sampling and analytical methods are not presently available.

E. Evaluation Discussion

1. Environmental

a. Exposure to Particulate Matter.

Gross airborne dust concentrations of  $6.7 \text{ mg/M}^3$  and  $6.1 \text{ mg/M}^3$  were obtained from personal samples for two workers working in the vulcanization area. Most of the material evolved during the vulcanization process is reported to be in the respirable range. These values represent a relatively high exposure to respirable material, the toxicity of which has not been determined at the present time.<sup>1</sup>

b. Exposure to Oil Mist

An employees exposure to oil mist should be limited to less than  $5 \text{ mg/M}^3$  according to U.S. Department of Labor Standards. Two high volume air samples collected in the vulcanization area and analyzed for oil mist were well below this standard. The values obtained for oil mist were  $0.4 \text{ mg/M}^3$  and  $0.3 \text{ mg/M}^3$ .

2. Medical

a. Interviews

Ten workers on G Line, Department 24, of the Cupples Rubber Company were interviewed. They averaged six years experience on G Line. Three out of ten workers complained of nasal irritation and one worker complained of "burning in the chest" while working. No workers had seen their local physician or the plant physician. All workers said they were in good health.

b. Projected Protocol and Feasibility

During the above interviews it was learned that several workers were concerned about two foremen, one an inspector and one working in the packing plant, who recently developed lung cancer after working several years at Cupples. Both workers who developed lung cancer were in their early 50's; carcinoma of the bronchus occurs most commonly between ages 50 and 59.<sup>4</sup> Also, both of these workers spend most of their time as supervisors and foremen, physically removed from the actual vulcanization process.



For the years 1959-1962, skilled and semi-skilled workers in the rubber industry had a slightly increased incidence of malignant neoplasm of the respiratory system (1.44 times normal). Also, an increase in osteoarthritis, rheumatoid arthritis, emphysema, chronic rheumatic heart disease, and cerebral embolism and thrombosis was found among workers at this trade.<sup>2</sup> However, rubber workers have a distinctly lower incidence of hypertensive heart disease and mental illness.

Because of the small number of workers available for study, the long latency period for development of any type of malignancy, and the low ratio of cancer of the lung (21 per one hundred thousand of normal population),<sup>3</sup> it was decided to study plant employment records to determine the morbidity and mortality of all workers, past and present, at G Line, Department 24.

The Cupples Rubber Company moved from downtown St. Louis in 1966. No employee records were kept at the old plant during its operation (1920 to 1965). Local #688 of the Teamsters Union in St. Louis was also unable to provide mortality or morbidity data on workers at Cupples. Starting in 1966, reliable records have been kept by the Cupples Rubber Company. However, this newer data is currently insufficient in quantity to permit meaningful analysis.

#### Conclusion

Because of the inaccessibility of reliable morbidity and mortality data, it is impossible to state now whether or not a health hazard exists at G Line, Department 24 of the Cupples Rubber Company. However, we cannot exclude the occupational environment as a cause for lung cancer in rubber workers. Two workers, both foremen, who spent little of their time at G Line have developed lung cancer in their early 50's a typical age for developing this disease. Social Security records do indicate there is a slight increase in respiratory tract neoplasms in skilled and semi-skilled rubber workers.

F. Recommendations

1. In the opinion of the NIOSH investigators better control measures including the use of enclosures, ventilation, and respirators should be provided for the vulcanization area for the following reasons: (1) the parting compound used in this area contains free silica\*, (2) the relatively high levels of airborne particulate matter determined, and (3) because of the unknown potential hazard of the materials evolved during the vulcanization process. Respiratory protection of the workers during use of the parting compound would also help reduce exposure to free silica until a parting compound which does not contain free silica is obtained.
2. A non-silica parting compound should be substituted for parting compounds containing free silica.

V. REFERENCES

1. Personal communication - Niel Hill, University of North Carolina.
2. Occupational Characteristics of Disabled Workers by Disabling Conditions, published by the U.S. Department of Health, Education, and Welfare.
3. Ackerman & Regato: Cancer, p. 440, St. Louis, Missouri, 1954.
4. Ibid

\*Seven percent free silica was found in a bulk sample of the parting compound by the Western Area Occupational Health Laboratory at Salt Lake City, Utah. (The Company was not aware the parting compound contained free silica.)

The free silica exposure was not extensively evaluated. NIOSH investigators conducted a preliminary survey with the intent of returning at a later date (after the analysis of a bulk sample of the parting compound for free silica) for additional sampling.

Since sampling methods are not available for other air contaminants, the industrial hygienist conducting the survey decided a return visit could not be justified for evaluation of free silica exposure. Potential free silica exposure can be eliminated by substitution of a parting compound that does not contain free silica. Also only 1.0 mg/M<sup>3</sup> of respirable free silica was determined for the worker using the parting compound which is below the present Federal Standard for free silica.

VI. AUTHORSHIP AND ACKNOWLEDGMENTS

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