U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
CENTER FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45226

HEALTH HAZARD EVALUATION DETERMINATION
REPORT HE 79-38-624

DOVER MOLDED PRODUCTS, INC.
DOVER, OHIO

October 1979

I. TOXICITY DETERMINATION

A health hazard evaluation was conducted by the National Institute for Occupational Safety and Health (NIOSH) at the Dover Molded Products Company on March 21 and 22, 1979. Environmental samples were taken for airborne particulate, lead, chromium, cadmium, 1,1,1-trichloroethane, Freon 11 and Freon 12.

Results of this evaluation indicate that, on the days of the evaluation, two employees were exposed to concentrations of chromium and cadmium above the recommended maximum levels. Some employees also experienced irritant effects from mold release sprays. Recommendations are made for both short term and long term corrective measures.

II. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this Determination Report are currently available upon request from NIOSH, Division of Technical Services, Information Resources and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be available through the National Technical Information Service, (NTIS), Springfield, Virginia. Information regarding its availability through NTIS can be obtained from NIOSH, Publication Office at the Cincinnati address.

Copies of this report have been sent to:

a) Dover Molded Products Company
b) United Steelworkers, Local 5021
c) United Steelworkers International
d) U.S. Department of Labor, Region V
e) NIOSH, Region V

For the purpose of informing the approximately 80 "affected employees", the employer shall promptly "post" for a period of 30 calendar days the determination report in a prominent place near where exposed employees work.

III. INTRODUCTION

Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 20 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 at the Dover Molded Products Company, Dover, Ohio, to investigate substances used in that plant.

Subsequent to the on-site portion of this investigation, company and employee representatives were informed of the results of environmental samples as they were received. On May 22 and on July 17, 1979, reports were sent to both parties containing results of environmental samples.

IV. HEALTH HAZARD EVALUATION

A. Process Description

Dover Molded Products is a job shop producing small plastic items by injection molding. On the order of 10,000 pounds of plastic per day is supplied to the company's approximately 20 presses to be molded into items of various color, shape and size. To obtain the desired color, white plastic is blended with dry powered colorant by placing both in 55 gallon drums and rotating the drums to assure uniform mixing. Employees mixing the colorants and plastic, as well as those subsequently dumping the mixed material into the presses' supply hoppers, are subjected to dust from the colorants and the plastic.

To promote ease of separation of the plastic from the mold, a silicone mold release spray is sometimes used. The press operator is exposed to this spray, and also to any vapor created by heating the plastic during the injection process.

B. Evaluation Design

Prior to the on-site evaluation, telephone contact was made with the company to obtain information on processes and materials. Material safety data sheets were obtained from the supplier of the colorants listing the composition of several of the colorants used at this plant. These data sheets indicated the presence of lead, cadmium, chromium and other heavy metals of varying toxicity.

The initial visit to this plant was made on March 21, 1979. On this day the NIOSH investigator met with representatives of management and labor. The Hazard Evaluation program and the protocol for the evaluation were discussed. A walk-through survey of the workplace was conducted to gain an understanding of processes and substances involved and to facilitate preperation of sampling strategy.

On March 22, 1979, personel and area environmental samples were obtained during the day shift in all areas of the plant. Samples were taken for lead, chromium, cadmium, airborne particulate, 1,1,1-trichloroethane, Freon 11 and Freon 12. Battery powered personal sampling pumps were used to collect the samples, either on acrylic copolymer filters or by adsorption onto activated charcoal.

Employees in all areas of the plant were informally interviewed regarding working and smoking histories, working conditions and health problems. Current working conditions, as well as any recent process and equipment modifications, were discussed with company and union representative and employees.

C. Evaluation Criteria

Table I lists various criteria used in the evaluation of the toxicity of the substances under study. Listed in this table are OSHA Standards (1), NIOSH Criteria Document and Current Intelligence Bulletin Recommendations (2-7), and the Threshold Limit Values of the American Conference of Governmental Industrial Hygienists (8), along with predominant health effects of each substance.

The evaluation criteria developed for airborne particulate or "nuisance dust" is based on its ability to reduce workshop visibility, create unpleasant deposits in the eyes, ears and nasal passages, or cause injury to the skin or mucous membranes by chemical or mechanical action per se or by the rigorous cleansing procedures necessary for its removal.

Lead exhibits toxic effects on the kidney, the peripheral and central nervous systems, and the hematopoietic system. These effects are felt as weakness, tiredness, irritability, digestive disturbances, high blood pressure, premature aging, nephritis, mental deficiencies, and other changes detected by testing.

1,1,1-Trichloroethane, also called methyl chloroform, produces light-headedness, irritation, anesthetic effects and incoordination at low levels; it can also cause central nervous system responses and cardiovascular and respiratory effects in animals.

Occupational exposure to cadmium can cause both acute and chronic pulmonary effects, renal damage (the most common abnormality found in workers exposed to cadmium is proteinuria), and olfactory, hematopoietic, cardio-vascular, skeletal, liver and gonadal effects. There is also some epidemiologic evidence linking cadmium with teratogenic and carcinogenic effects.

Freon 11 (fluorotrichloromethane) and Freon 12 (dichlorodifluoromethane) can create narcosis in high concentrations, and has been shown in animals to affect the central nervous system in very high concentrations.

Chromium, especially in the hexavalent state, has been shown to cause effects such as contact dermatitus, skin ulcers, irritation and ulceration of the nasal mucosa, and perforation of the nasal septum. Some chromium (VI) compounds, including lead chromate, have been associated with an increased incidence of lung cancer. NIOSH recommends that chromium of this type be controlled in the workplace so that time weighted average breathing zone concentrations are not greater than 0.001 mg/M^3.

D. Evaluation Results

The attached Tables II and III show workplace concentrations of airborne particulate, lead, chromium, cadmium, 1,1,1-trichloroethane, Freon 11 and Freon 12 on the day of the evaluation. These concentrations indicate that the color blender was exposed to cadmium and the man filling the supply hoppers on the presses was exposed to cadmium and chromium at concentrations above the recommended maxima.

Visual observations indicated the presence of dust during the adding of colorant to the plastic in barrels, and also during the dumping of the blended plastic into the press supply hoppers. This dust did not quickly dissipate, indicating a lack of general air movement in these locations, although smoke tubes did show better air movement in the aisles and near the press operators' stations.

Discussions with employees indicated no specific health problems, but there was a general consensus that the use of silicone spray and/or the molding of certain vinyl plastics created emissions which caused transient irritation lasting up to several hours.

Personal respiratory protection was available to and used by the color blender in the form of a NIOSH approved half-mask respirator with organic vapor cartridges and dust prefilters. The hopper filler did not wear a respirator.

Since this company may use any of several hundred different powdered colorants, it was not practical to obtain information on each colorant. It was decided, therefore, to obtain the composition of the most frequently used colors and a representative sample of various reds and yellows since these types of pigments commonly contain the most toxic substances. This information was also obtained for all colorants used on the day of the on-site evaluation. Of the colorants investigated, all reds and yellows were reported to contain one or more of the following toxic heavy metals: lead, cadmium, chromium, mercury and selenium.

E. Summary and Conclusions

Results of this evaluation indicate that the color blender and the hopper filler were exposed to concentrations of heavy metals at levels above the recommended maximum levels. Other employees, while not shown to have toxic exposures, were periodically exposed to irritant substances. Material safety data sheets indicated the presence of toxic and potentially carcinogenic components in varying concentrations in some colorants used in this plant.

V. RECOMMENDATIONS

1. Due to the high toxicity of lead and potential carcinogenicity of chromium, and cadmium, it is recommended that the use of colorants containing these metals be phased out. Discussions with company and supplier representatives indicate that it is technically and economically feasible to replace these colorants with substitutes which do not contain toxic substances.

2. Until such time as colorants containing these metals can be phased out, the color blender and the man filling hoppers should be supplied with and should wear respirators. The type currently in use is sufficient. These respirators should be wiped at the end of each day with a clean, damp cloth, and visually inspected frequently for signs of wear (i.e., cracks, missing valves, etc.). They should be worn during blending and dumping, and placed in a clean location, preferably in a sealed plastic bag, when not in use.

3. Since most claims of irritation arose from operations which used vinyl plastic and silicone mold release spray, it is recommended that the job rotation be arranged in such a way that an individual is not working on this type of operation two weeks consecutively.

4. Smoking, drinking, and eating should be prohibited in the manufacturing portion of the plant. Employees should wash before breaks. Transfer of contaminant from hand to cigarette or food is a major cause of exposure.

5. In as far as possible, press hoppers should be refilled during breaks, lunch, or between shifts in order to reduce the operators exposure to dust.

VI. REFERENCES

1. U.S. Department of Labor, Occupational Safety and Health Administration, OSHA Safety and Health Standards, 29 CFR 1910, Revised January, 1978.

2. Criteria for a Recommended Standard . . . Occupational Exposure to Lead, DHEW (NIOSH) Publication No. 78-158, Cincinnati, Ohio 1978.

3. Criteria for a Recommended Standard . . . Occupational Exposure to Cadmium, DHEW (NIOSH) Publication No. 76-192, Cincinnati, Ohio 1976.

4. Criteria for a Recommended Standard . . . Occupational Exposure to 1,1,1-Trichloroethane, DHEW (NIOSH) Publication No. 76-184, Cincinnati, Ohio 1976.

5. Current Intellegence Bulletine 27, Chloroethanes, U.S. Department of Health, Education and Welfare, NIOSH, August 21, 1978.

6. Criteria for a Recommended Standard . . . Occupational Exposure to Chromium, DHEW (NIOSH) Publication No. 76-129, Cincinnati, Ohio 1975.

7. Current Intellegence Bulletin 4, Chrome Pigments, U.S. Department of Health, Education and Welfare, NIOSH, October 8, 1976.

8. American Conference of Governmental Industrial Hygienists, Documentation of the Threshold Limit Values for Substances in Workroom Air, 1977.

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Table I

Evaluation Criteria

Dover Molded Products Company
Dover, Ohio

HE 79-38

SUBSTANCE	OSHA STANDARD	NIOSH RECOMMENDATION	THRESHOLD LIMIT VALUE	HEALTH EFFECTS (a)
Particulate	5 mg/M^3 Respirable (b) 15 mg/M^3 Total	N.A. (c)	5 mg/M^3 Respirable 10 mg/M^3 Total	Irritation of eyes and upper respiratory tract, reduced visibility, skin damage
Lead	0.05 mg/M^3	0.1 mg/M^3	0.15 mg/M^3	Kidney, blood and nervous system effects
Cadmium	0.2 mg/M^3 0.6 mg/M^3 ceiling	0.04 mg/M^3 (10 hr TWA) 0.2 mg/M^3 ceiling	0.05 mg/M^3	Lung and kidney effects
1,1,1-Trichloroethane	350 ppm	350 ppm ceiling	350 ppm	CNS, narcosis, light-headedness, irritation
Freon 11	1000 ppm	N.A.	1000 ppm	Narcosis
Freon 12	1000 ppm	N.A.	1000 ppm	Narcosis
Chromium (VI)	0.5 mg/M^3	0.001 mg/M^3	0.05 mg/M^3	Lung Cancer

(a) Primary effects considered in establishing NIOSH criteria document when available, otherwise effects described by ACGIH.

(b) Criteria are 8 hour time weighted averages except as noted.

(c) Evaluation criteria not available for these substances.

Table II

AIRBORNE PARTICULATE AND METAL CONCENTRATIONS

March 22, 1978

Dover Molded Products Company
Dover, Ohio

HE 79-38

Sample Location	Duration	Type*	Concentration, mg/M^3 Lead	Chromium	Cadmium	Particulate
Sampler Placed on Wall of Mixing Cage, Near Door	7:15 am - 2:45 pm	T	ND**	ND	0.003	0.3
Personal Sample on Color Blender	7:20 am - 11:00 am	T	ND	ND	0.08	3.9
Personal Sample on Color Blender	11:00 am - 2:45 pm	T	ND	ND	ND	0.1
Personal Sample on Man Filling Hoppers	7:20 am - 11:05 am	T	0.02	ND	0.04	2.4
Personal Sample on Man Filling Hoppers	11:05 am - 2:20 pm	T	ND	0.01	ND	0.6
Sampler Placed on Post, at Breathing Zone Level, Near Automatic Capping Operation	7:50 am - 3:00 pm	T	ND	ND	ND	0.1
Sampler Placed on Post, at Breathing Zone Level, Near Automatic Capping Operation	8:10 am - 3:00 pm	R	ND	ND	ND	ND
Sampler Placed at Breathing Zone Level Between Machines 1, 2 and 3	7:55 am - 1:50 pm	T	ND	ND	0.004	0.1
Personal Sample on Employee on Machines 3 and 26	8:05 am - 3:00 pm	T	ND	ND	ND	0.08
Recommended Maximum Concentration			0.05	0.001	.04	10 T 5 R

*"T" Indicates Total Particles of All Sizes Were Collected
"R" Indicates Only Particles in Respirable Size Range Were Collected
**Indicates This Substance Was Not Detected in This Sample

Table III
TRICHLOROETHANE AND FREON CONCENTRATIONS
March 22, 1979
Dover Molded Products Co.
Dover, Ohio
HE 79-38

Sample Location	Duration	Type*	Concentration, ppm 1,1,1 - Trichloroethane	Freon 11	Freon 12
On Table, Breathing Zone Level, Near Molder Operator Using Silicone Spray	8:20 am - 12:15 pm	A	ND**	.3	--
On Table, Breathing Zone Level, Near Molder Operator Using Silicone Spray	12:15 am - 3:00 pm	A	--	--	.5
On Table, Breathing Zone Level, Near Molder Operator Using Silicone Spray	12:07 pm - 12:25 pm	A	ND	.2	--
On Table, Breathing Zone Level, Near Molder Operator Using Silicone Spray	1:45 pm - 2:00 pm	A	--	--	37
On Table, Approx. 6 Ft. From Silicone Spray	7:40 am - 12:10 pm	A	ND	1	--
On Table, Approx. 6 Ft. From Silicone Spray	12:10 pm - 3:00 pm	A	ND	1	--
On Molder Operator Using Silicone Spray	7:35 am - 12:10 pm	P	ND	10	--
On Molder Operator Using Silicone Spray	12:10 pm - 3:00 pm	P	ND	15	--
On Molder Operator Using Silicone Spray	12:09 pm - 12:24 pm	P	ND	11	--
On Molder Operator Using Silicone Spray	1:46 pm - 2:01 pm	P	--	--	44
Recommended Maximum Concentration (ACGIH)			350	1000	1000

*"A" Indicates General Work Area Sample
"P" Indicates Personal Breathing Zone Sample
**Indicates this substance was not detected in this sample