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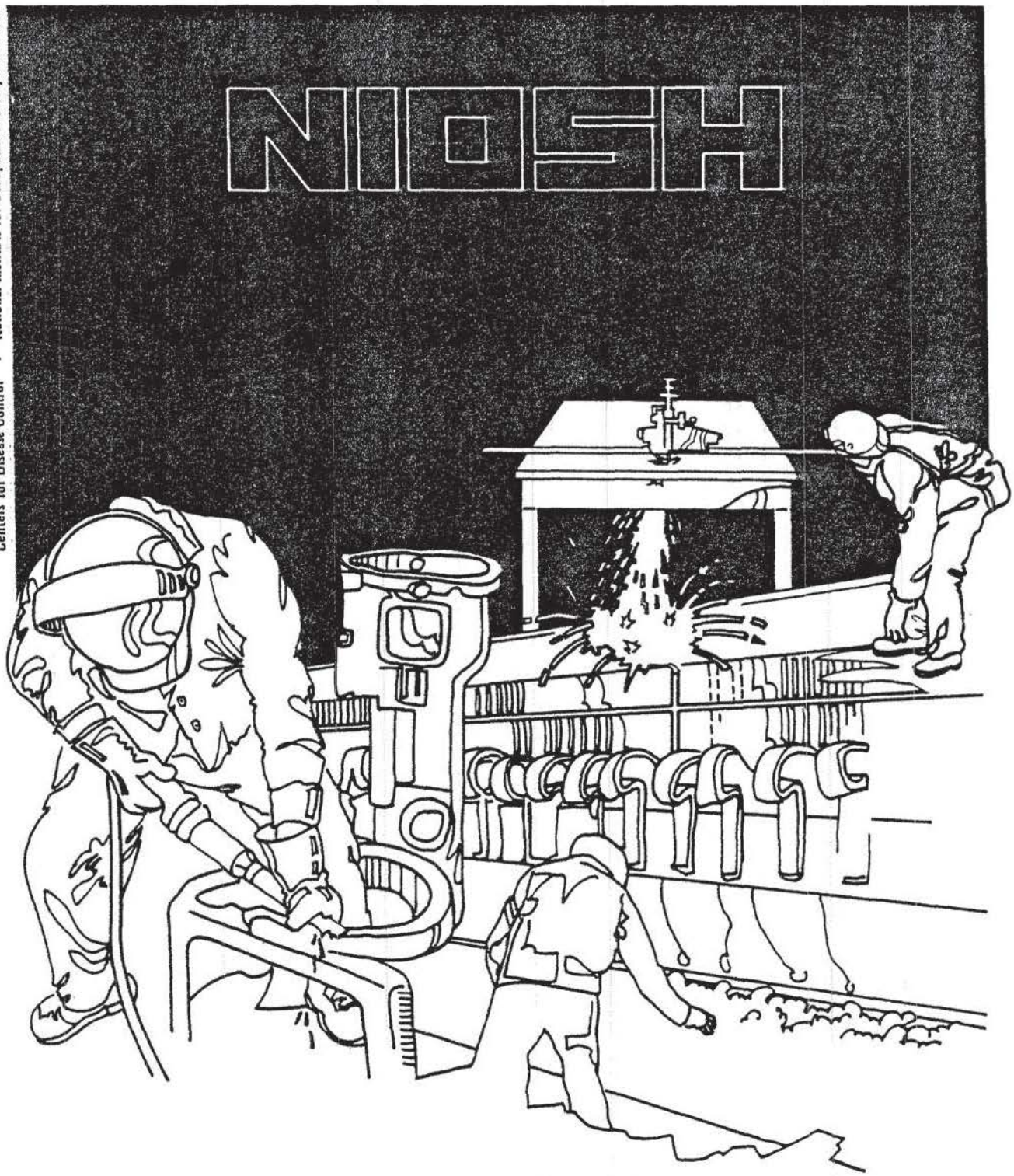

Health Hazard Evaluation Report

80-152-774

PREFACE

The Hazard Evaluations and Technical Assistance Branch of NIOSH conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 699(a)(6), which authorizes the Secretary of Health and Human Services, following a written request from 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.

HE 80-152-774
NOVEMBER 1980
TECHNOLOGY PRODUCTS, INC.
LONGMONT, COLORADO

NIOSH INVESTIGATORS:
Paul Pryor, IH

I. SUMMARY

In May 1980 the National Institute for Occupational Safety and Health (NIOSH) received a request to evaluate the potential exposure to vinyl chloride, azodecarbonamide (Celogen), dioctyl phthalate, dimethyl phthalate, carbon monoxide, carbon dioxide, hydrogen chloride, and ammonia at Technology Products, Inc. The request originated out of the employer's concern regarding the potential by-products of thermal degradation of polyvinyl chloride (PVC) which is used in an extrusion molding process at the company. The extrusion process is normally operated by two employees and the concern was that these workers, as well as other employees in the immediate area, were being exposed to these agents.

In July, personal time-weighted average (TWA) samples, area samples, and detector tube samples were used to evaluate the chemicals listed above. Bulk samples were also obtained of the various raw materials used in the extrusion process. All of the sample results showed levels less than 10 percent of the NIOSH and Occupational Safety and Health Administration (OSHA) evaluation criteria of 0.001 mg/M^3 for vinyl chloride, 5 mg/M^3 for dioctyl and dimethyl phthalates, 35 parts per million (ppm) for carbon monoxide, 5000 ppm for carbon dioxide, 50 ppm for ammonia, and 5 ppm for hydrogen chloride. There is no standard or recommended criteria for azodicarbonamide.

On the basis of the data obtained in this investigation, NIOSH determined that exposures to extrusion operators at Technology Products, Inc., are below applicable exposure criteria for those chemicals evaluated. Therefore, based on the results of this investigation, no health hazard is believed to have existed at the time of this survey from the chemicals in question. However, during the evaluation it was noted that a potential noise problem may exist to operators and/or employees who are in the vicinity of the plastic materials grinding machine. The employer subsequently submitted a health hazard request for a noise evaluation.

KEYWORDS: SIC 3070 (Miscellaneous Plastics Products), extrusion process, vinyl chloride, polyvinyl chloride, azodicarbonamide, Celogen, dioctyl phthalate, dimethyl phthalate, carbon monoxide, hydrogen chloride, ammonia, noise, thermal degradation.

II. INTRODUCTION

In May 1980 NIOSH received a request pursuant to Section 20(a)(6) of the Occupational Safety and Health Act of 1970 from a representative of Technology Products, Inc., Longmont, Colorado. The request was to determine if there was a health hazard from exposures to vinyl chloride, azodicarbonamide (Celogen), dioctyl phthalate, dimethyl phthalate, carbon monoxide, hydrogen chloride, and ammonia during extrusion processing. An environmental survey was conducted on July 29, 1980, to evaluate potential exposures to the above contaminants.

III. BACKGROUND

Technology Products, Inc., has been in operation for approximately five years and produces various products made from extrusion operations (injection molding machines). There are approximately 40 employees who normally work during one of three shifts: 6:00 a.m. - 3:00 p.m.; 2:30 p.m. - 11:00 p.m.; and 10:30 p.m. to 7:00 a.m. Recently, Technology Products changed ingredients in one of their products, baby stroller tires, and the employer and employees were concerned whether the new ingredient (Celogen-azodicarbonamide) could produce health problems. Azodicarbonamide is added to the process as a foaming/blowing agent in order to give the tires a more shock absorbing quality. This particular type of tire is produced approximately 50 percent of the time and normally requires two operators to perform the operation. The various stages of the operation include the following:

1. Pellets (ingredients) are loaded into the extrusion reservoir.

2. The various type of pellets are blended together and forced through the extrusion barrel. Temperatures range from 325-350 degrees Fahrenheit (F) at different stages in the barrel prior to extruding into the various molds. Temperatures of the extruded material once in the molds are about 300 degress F and release temperatures, i.e., once injected, then cooled, and released from the mold are about 150 degrees F.

3. The interface of the operator is minimal in terms of the potential health exposure, i.e., the operator begins by loading the rims into the extrusion molds, then closing the side door. The machine then injects the material into mold; the operator waits 4-6 minutes prior to opening the side door of the extrusion machine, and finally, removes the completed tires. Once the tires are removed this cycle is repeated. The total time the operator spends actually loading and unloading the tires is about 2-3 minutes per cycle.

4. Once the finished wheels are removed from the molds they are dropped into a receiving bin directly below the access door to the molds. These are left in the bin to accumulate until the box is about half full and then the operator places these onto a table top where they then finish their cooling phase.

5. The cooled tires are eventually placed into a large box for shipping.

The only other tasks performed by these operators is preparing the work area for production, i.e., arranging the materials (pellets, rims, etc.) in such a manner as to facilitate the process during operation; packaging the finished tires in large boxes for shipping to the customer, and finally, cleaning up the area once the shift is over.

There were no medical complaints by any of the operators nor by the employees who were working in the immediate area.

IV. ENVIRONMENTAL DESIGN AND METHODS

Vinyl chloride breathing zone and general room air samples were collected on organic vapor charcoal tubes using vacuum pumps which operated at 200 cc per minute and was analyzed by NIOSH Physical and Chemical Analysis Method No. 178. Dimethylphthalate and dioctylphthalate breathing zone and general room air samples were collected on AA filters using vacuum pumps operated at 1.5 liters per minute and analyzed by NIOSH Method S-40.

Celogen-azodicarbonamide was not sampled for specifically because NIOSH's laboratory advised that the decomposition products of this material easily hydrolyzes to form nitrogen, carbon dioxide, and ammonia, and this reaction will not take place below 356 degrees F. However, some employees have smelled ammonia in the past; therefore, ammonia was evaluated.

Ammonia, carbon dioxide, carbon monoxide, and hydrogen chloride were evaluated using colorimetric gas detection devices. Each has an accuracy of ± 35 percent at one-half the exposure limit and an accuracy of ± 25 percent at one to five times the exposure limit.

V. EVALUATION CRITERIA

A. Environmental

Two sources of criteria were used to assess the workroom concentration of air contaminants: (1) NIOSH criteria for recommended standards; (2) Occupational Safety and Health Administration (OSHA) standards (29 CFR 1910), January, 1979.

	Permissible Exposure Limits 8-Hour Time-Weighted Exposure Basis		
Vinyl chloride	0.001	mg/M^3	(OSHA)
Dioctyl phthalate	5.0	mg/M^3	(OSHA)
Dimethyl phthalate	5.0	mg/M^3	(OSHA)
Carbon dioxide	5000.0	ppm	(NIOSH/OSHA)
Carbon monoxide	35.0	ppm	(NIOSH)
Ammonia	50.0	ppm	(NIOSH/OSHA)
Hydrogen chloride	(C) 5.0	ppm	(NIOSH/OSHA)

mg/M^3 = milligrams of substance per cubic meter of air
ppm = parts per million
(C) = ceiling value not to be exceeded at any time.

Occupational health standards are established at levels designed to protect individuals occupationally exposed to toxic substances on an 8-hour per day, 40-hour per week basis over a normal working lifetime.

B. Toxicology

The various chemicals evaluated at Technology Products, Inc., and the health effects expected are listed in Table I.

VI. ENVIRONMENTAL RESULTS

A total of two personal and four area samples for vinyl chloride, dioctyl and dimethyl phthalates were taken during the sampling period. Each of the personal samples for dimethyl phthalate and vinyl chloride had non-detectable levels and the dioctyl phthalate levels were less than 10 percent of the criteria established for this investigation (refer to Table II). All of the area samples taken found levels similar to those found for the personal samples, i.e., non-detectable for both vinyl chloride and dimethyl phthalate and levels were less than 10 percent of the criteria for dioctyl phthalate. Each of the remaining chemicals (carbon monoxide, hydrogen chloride, carbon dioxide, and ammonia) were evaluated using colorimetric techniques and the results for each of the areas tested are listed in Table III. Again, the results for each of the eight areas surveyed for these chemicals showed non-detectable levels.

VII. DISCUSSIONS AND CONCLUSIONS

During this evaluation it was determined that no health hazard existed for those employees who performed the extrusion operation or for those employees who work around this operation. This conclusion is based on the various air samples taken, evaluation of the work processes, and review of the toxicological information evaluated for all of the chemicals in question. However, during the evaluation two other processes, two different types of plastic grinding machines, were inspected and determined to be a potential noise problem. This determination was a subjective evaluation, i.e., based on the NIOSH investigator's opinion and, therefore, Technology Products decided to submit a Health Hazard Evaluation request to fully evaluate this potential problem. Health Hazard Evaluation number HE 80-231 will address the concerns of this future investigation.

VIII. RECOMMENDATIONS

In view of the findings of NIOSH's environmental study, as well as personal communications with individuals at Technology Products, Inc., the following recommendations are made to provide a better work environment for the concerned employees:

1. Each operator who performs grinding of the plastic materials should wear safety goggles and ear protection while performing this task.

2. Each of the employees who work in or around the plastic grinding machines should also wear ear protection while these machines are in operation.

3. Until a thorough noise evaluation can be performed at Technology Products each of the recommendations listed above should be followed as deemed necessary. However, if the results of the noise survey show levels exceeding the OSHA noise standard of 90 dBA (8-hour, time-weighted average), a more effective means must be instituted to resolve the noise problem beyond personal protection. That is to say, engineering controls are the preferred method to control high noise levels if they exist in the work environment.

IX. REFERENCES

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XI. DISTRIBUTION AND AVAILABILITY

Copies of this 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, Publications Office, at the Cincinnati address.

Copies of this report have been sent to:

1. Technology Products, Inc.
2. U.S. Department of Labor/OSHA - Region VIII.
3. NIOSH - Region VIII.
4. Colorado Department of Health.
5. State Designated Agency.

For the purpose of informing effected employees, a copy of this report shall be posted in a prominent place accessible to the employees for a period of 30 calendar days.

TABLE I

Toxicology

Technology Products, Inc.
Longmont, Colorado

1.	Vinyl chloride	Skin irritant, eye irritation, central nervous system (CNS) depressant, lightheadedness, nausea, and hepatic (liver) damage. Vinyl chloride is considered a human carcinogen.
2.	Dioctyl and dimethyl phthlate	Potential allergic sensitization and bronchial asthma may occur. However, patch tests with undiluted material in humans have not shown irritation nor sensitization.
3.	Carbon dioxide	Headaches, dizziness, paralysis, excessive sweating, and malaise. Also, increased heart rate, elevated blood pressure can occur.
4.	Carbon monoxide	Headache, rapid breathing, nausea, weakness, dizziness, and confusion. Also, halucination, cyanosis, and depression.
5.	Ammonia	Eye, nose, throat irritation; dyspnea, bronchospasm, chest pain, pulmonary edema, and skin burns.
6.	Hydrogen chloride	Inflammation, ulceration of nose, throat irritation. Cough and choking, as well as burning eyes and skin irritation producing dermatitis can occur.

TABLE II

Breathing Zone and General Room Area Sampling for
Vinyl Chloride, Dioctyl and Dimethyl Phthalates

Technology Products, Inc.
Longmont, Colorado

Job/Description	Sample Number	Sampling Time (minutes)	mg/M^3		
			Vinyl Chloride	Dioctyl Phthalate	Dimethyl Phthalate
Injection Molding Operator	1	360	ND	0.09	ND
Receiving Bin-Right Side	2	360	ND	0.13	ND
Receiving Bin-Left Side	3	360	ND	0.37	ND
Inside Door-Injection Molder	4	300	ND	0.44	ND
Crushing Operator	5	300	ND	ND	ND
General Room	6	115	ND	ND	ND
	LIMIT OF DETECTION (NIOSH)		0.001 mg	0.02 mg	0.02 mg
	EVALUATION CRITERIA		0.001 mg/M^3	5.0 mg/M^3	5.0 mg/M^3

mg/M^3 = milligrams of substance per cubic meter of air
ND = nondetectable/below laboratory limit of detection

TABLE III

Atmospheric Concentrations of Carbon Monoxide, Hydrogen Chloride, and Ammonia

Technology Products, Inc.
Longmont, Colorado

Sample Number	Location	Type of Sample	ppm			
			Carbon Monoxide	Hydrogen Chloride	Ammonia	Carbon Dioxide
1	Rim Loading	DT/BZ	ND	ND	ND	ND
2	Rim Unloading	DT/BZ	ND	ND	ND	ND
3	Door Open	Area	ND	ND	ND	ND
4	Door Closed	Area	ND	ND	ND	ND
5	Receiving Bench	Area	ND	ND	ND	ND
6	Injector Barrel	Area	ND	ND	ND	ND
7	Injector Barrel	Area	ND	ND	ND	ND
8	Receiving Bench	DT/BZ	ND	ND	ND	ND
	EVALUATION CRITERIA (NIOSH)		35	(C) 5	50	5000

ppm = parts of substance per million parts air
ND = nondetectable concentration
DT/BZ = detector tube/breathing zone sample
(C) = ceiling level which must not be exceeded at any time

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