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

HEALTH HAZARD EVALUATION DETERMINATION REPORT
HE 77-122-695

GOULD's PUMPS, INC.
SENECA FALLS, N.Y.

JUNE 1980

I. SUMMARY

The National Institute for Occupational Safety and Health (NIOSH) received a request to evaluate complaints of exposure to vapors given off while using resins in the #800 building (non-metallic shop) of Gould's Pumps, Inc., Falls Street, Seneca Falls, N.Y. 13204. An industrial hygiene survey of the process during August 1979 revealed exposure to methyl chloroform and styrene at levels within currently acceptable limits. Exposure to methyl chloroform was less than 2 milligrams per cubic meter of air (mg/M^3). Both the OSHA Permissible Exposure Limit and NIOSH Recommended Limit is 1900 mg/M^3. Personal breathing zone exposures to styrene ranged from 5 to 130 mg/M^3. The OSHA standard is a timed weighted average daily exposure limit of 420 mg/M^3 for an 8 hour day, 40 hour week.

Exposure to methyl chloroform and to styrene were within acceptable limits. Under conditions existing at the time of the survey, no recommendations are considered necessary. However, if production increases to the point where the lay-up operation becomes a full-time activity, the lay-up man's exposures should be reevaluated to determine the need for respiratory protection or an exhaust ventilated booth.

II. INTRODUCTION

Under the Occupational Safety and Health Act of 1970*, NIOSH investigates the toxic effects of substances found in the workplace. The United Steelworkers of America, Local #3298, requested an investigation from NIOSH to evaluate possible hazards from exposure to chemicals used when working with liquid resins in the non-metallic shop. NIOSH met with management, union representatives and workers in the non-metallic shop, made a walk-through evaluation of the shop, performed a preliminary survey to identify the vapors generated during the winding and lay-up operations, and then a more detailed survey to determine the extent of exposure to the chemicals. Discussions with employees in this area

*Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669 (2)(6), authorizes the Secretary of Health and Human Services following a written request by an employer or authorized representative of employees, to determine whether any substance in the place of employment might have potenitally toxic effects as it is used or may be found.

indicated no occupational illnesses or symptoms, but a definite concern over working with unidentified chemicals.

III. BACKGROUND

Gould's Pumps produces centrifugal pumps. Most of the plant consist of normal foundry operations. Less than 2% of the product output requires non-metallic pump cores. The non-metallic shop (Building 800) is approximately 120 feet long, 35 feet wide and 17 feet high. Most of the area is used for storage. The front 1/3 of the building contains a machine shop (lathes, drills, etc.). Ten employees work in the building. Production of the resin cores is intermittent, requiring a few hours per week or day, depending on need. The operations are as follows:

1) Lay up - the viscous resin is ladled into a form and leveled-off manually with a brush. Exposure times to methyl chloroform and styrene depend on the size and number of forms, but generally require 45 to 50 minutes per batch of resin (5-10 gallons).

2) Winding - fibrous glass cord is fed through a resin bath, onto spools where it is wound to form a core. Winding time is about one hour; however, exposure persists for several hours longer while excess resin drips from the forms while the cores set.

All personnel who work with the resin wear heavy rubber gloves to prevent hand and forearm contact. Dermatitis has not been a problem in this shop.

Following lay-up or winding, the pieces are placed in a curing oven. After curing they are machined (lathed, drilled, etc.) into the finished product. The lay-up and winding operations take place in the center of the building. The building is ventilated at the rate of 20,000 cfm, a theoretical air change every three minutes, with air flow across the width of the building.

The resins used are "Ashland Hetron 901" (Shell). These acylic resins are used interchangeably. Epocryl Resin 322 was used at the times of both surveys. A small laboratory (20" x 15") is used for storage and mixing of the resins with a few ounces of methyl ethyl ketone peroxide activator per batch (about 5 gallons). The laboratory technician wears protective goggles, as do production employees who work with the resins. The resin is then carried in a pail to the winding machine or lay-up area. Production has been slack and difficulty was encountered in scheduling operations to obtain a meaningful survey.

IV. SURVEY METHODS

Exposure occurs primarily to the laboratory technician who prepares the resin, to the winding machine operator and to the lay-up man. Breathing zones air samples were collected on these employees and general air samples were collected in nearby areas. The sampling

medium was activated charcoal, which would adsorb organic gases and vapors. Samples were later desorbed with carbon disulfide and analyzed using NIOSH's method #127 - gas chromatography with a flame ionization detector. During the preliminary survey (3-27-78), a sampling rate of two liters per minute was used, but break-through into the back-up sections of several charcoal tubes occurred, prompting the selection of a lower sampling rate (200 cubic centimeters per minute) for the follow-up survey (8-2-79). Fibrous glass is used in a non-friable cord and exposure to fibrous glass particles in minimal.

V. EVALUATION CRITERIA

Samples were collected during lay-up and winding operations. The only organic chemicals identified by gas chromatographic analysis were methyl chloroform, styrene and xylene. These chemicals produce similar physiologic responses and have similar odors. (See Table 3) Their characteristic, sweet, aromatic odor was prevalent at the time of both surveys. Directly above the resin, the odor was quite sharp and unpleasant in both the lay-up and winding operations.

All three of these solvents are defatting agents and can cause dermatitis. Contact with the resin also can cause dermatitis. The obvious care taken during preparation and while working with the resin compound, the use of protective gloves and the use of near-by washing facilities undoubtedly contribute to the control of dermatitis in the non-metallic shop.

VI. RESULTS OF SAMPLING AND DISCUSSION

Exposure levels to methyl chloroform, styrene and xylene were less than the permissible levels established by OSHA and recommended by NIOSH (See Tables I and II). No build-up of concentrations occurred over time in the general air samples, indicating that the ventilation system effectively removes the vapors generated during the operations. The greatest exposure occurred to the lay-up men, who work directly with and over the resin as it is ladled into forms. During the survey, total exposure time for the lay-up men was 2½ hours for 3 batches of resin (approximately 5 gallons each). As previously stated, production of non-metallic cores has been limited for several years. Should production increase to the point where lay-up becomes a full-time activity, this operation should be re-evaluated to determine the need for proper engineering controls and ventilation.

VII. DISTRIBUTION - 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 22161. Information regarding its availability from NTIS can be obtained from NIOSH's Publication Office at the Cincinnati address. Copies of this report have been sent to:

1. Gould's Pumps
2. Local Union #3298, United Steelworkers of America
3. U.S. Dept. of Labor, OSHA, Region II
4. U.S. Dept. of H.H.S., NIOSH, Region II
5. N.Y. Commissioner of Health

VIII. AUTHORSHIP - ACKNOWLEDGEMENTS

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TABLE I

AIR SAMPLING DATA
PRELIMINARY SURVEY (3-27-78)

GOULD'S PUMPS, INC.
SENECA FALLS, N.Y.

PRELIMINARY SURVEY

Location	Air Volume (liters)	Methyl Chloroform (mg/M^3)	Xylene (mg/M^3)	Styrene (mg/M^3)
Lay-up man	161	ND	ND	23
(Breathing zone)	95	6.6	ND	15
General air between lay-up area & winding machine	103	2.4	ND	12
Winding machine operator (Breathing zone)	138	ND	ND	94
Winding machine general air	162	ND	0.4	50*
Lab. technician (Breathing zone)	164	ND	0.2	46*

OSHA Permissible Limits - Methyl Chloroform	1900 mg/M^3	time weighted average
Xylene	435 mg/M^3	" " "
Styrene	420 mg/M^3	" " "
	840 mg/M^3	ceiling
	2500 mg/M^3	5 min./3 hr. peak
NIOSH Recommended Limits - Methyl Chloroform	1900 mg/M^3	ceiling for 15 minutes
Xylene	435 mg/M^3	time weighted average
	870 mg/M^3	ceiling for 10 minutes

*Break through of styrene into back-up sections of sampling tubes.

TABLE II

AIR SAMPLING DATA
FOLLOW-UP SURVEY (8-2-79)

GOULD'S PUMPS, INC.
SENECA FALLS, N.Y.

Sampling Location	Time of Sample	Styrene (mg/M^3)	Methyl Chloroform (mg/M^3)
Winding Machine Operator Breathing Zone	9:03 - 10:52	12	0.5
	9:55 - 10:52	23	ND
Winding Machine Controls	9:43 - 11:03	9	ND
"Upwind" from Winding Machine General Air	9:45 - 10:19	6	ND
"Downwind" from Winding Machine General Air	9:43 - 11:05	220	ND
	11:30 - 12:36	12	1.8
	12:45 - 2:02	11	ND
Lab. Technician	8:50 - 10:24	8.6	1.4
	10:25 - 11:26	27	ND
	11:26 - 12:00, 1:01 - 1:49 (lunch break)	14	ND
Laboratory General Air	9:05 - 10:09	5	ND
	10:12 - 12:00	5	ND
Lay-up Man Breathing Zone	10:20 - 10:36	110	ND
	11:02 - 11:57	77	ND
	12:35 - 1:33	54	ND
	12:41 - 1:33	128	ND
	1:40 - 2:15	130	ND
	1:40 - 2:15	63	ND
Tool Table "downwind" from Lay-up Bench, General Air	11:41 - 12:47	4	ND
	12:05 - 1:38	8	ND
	12:49 - 2:21	15	ND
	1:41 - 2:21	13	ND

TABLE II (Continued)

AIR SAMPLING DATE
FOLLOW-UP SURVEY (8-2-79)

GOULD'S PUMPS, INC.
SENECA FALLS, N.Y.

Sampling Location	Time of Sample	Styrene	Methyl Chloroform
		Concentrations in milligrams per cubic meter of air	
Industrial Hygienist Breathing Zone	9:46 - 10:44	16	ND
	10:46 - 12:00	5	1.3
	12:43 - 2:06	11	ND
Lathe Area General Air	1:30 - 2:31	ND	ND

ND = none detected; limit of detection = 0.01 milligram

TABLE III

GOULD'S PUMPS
SENECA, N.Y.

SOLVENT CRITERIA

Solvent	Physical Characteristics	Symptoms of Exposure	OSHA Permissible Exposure Limit	NIOSH Recommended Standard (if different from OSHA)
Styrene	Colorless liquid with sweet, aromatic odor at low concentrations; sharp, disagreeable odor at high concentrations.	Irritation of eyes and nose, drowsiness, weakness, dermatitis of exposed skin. Central nervous system depression	425mg/M^3 (average daily exposure) 850mg/M^3 (ceiling) 2550mg/M^3 (peak) 5 minutes/3 hours	
Methyl Chloroform	Colorless liquid with a mild, chloroform odor.	Irrit. of eyes, headache, central nervous system depression, dermatitis possible cardiac arrhythmias.	1900mg/M^3 (average daily exposure)	1900mg/M^3 (ceiling for 15 minutes)
Xylene	Colorless liquid with aromatic odor.	Dizziness, drowsiness, irritation of eyes, nose and throat, dermatitis.	435mg/M^3 (average daily exposure)	435mg/M^3 (average daily exposure) 870mg/M^3 (ceiling) 10 minutes.