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

HEALTH HAZARD EVALUATION DETERMINATION
REPORT NO. 74-29-161

ETHYL VISQUEEN DIVISION OF ETHYL CORP.
TERRE HAUTE, INDIANA

NOVEMBER 1974

I. TOXICITY DETERMINATION

It is determined on the basis of environmental evaluation, data obtained from medical questionnaires, and professional judgment, that a health hazard from exposure to vinyl chloride monomer does not exist at the time of this evaluation. However, in light of the recent NIOSH recommended standard implicating vinyl chloride as a cancer-suspect agent, there may exist a potential hazard to vinyl chloride in the blending room and therefore, efforts should be made to reduce exposure to zero at this operation. Although a limited medical evaluation was made that corroborated the determination, future more definitive medical studies in industries involved in the use of vinyl chloride monomer may need to be undertaken. The investigation was conducted in May 1974 and samples of air that were collected indicated that the concentration of vinyl chloride in air ranged fron none detected to 4 ppm. This is below the emergency Federal Standard of 50 ppm for vinyl chloride in air, but higher than the none detectable concentration recommended by NIOSH.

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) Visqueen Division of Ethyl Corp., Terre Haute, Indiana
b) Authorized Representative of Employees
c) U.S. Department of Labor - Region V
d) NIOSH - Region V

For the purposes of informing approximately 60 exposed employees this report shall be "posted" in a prominent place(s) readily accessible to workers for a period of at least 30 calendar days.

III. INTRODUCTION

Section 29(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 the United Steel Workers of America, Local 7441, Terre Haute, Indiana, to evaluate the potential hazards associated with the alleged exposures to polyvinyl chloride in the Pipe Plant of the Visqueen Division of Ethyl Corporation, Terre Haute, Indiana.

IV. HEALTH HAZARD EVALUATION

A. Conditions of Use

The Visqueen Division of Ethyl Corporation in Terre Haute, Indiana, manufactures polyvinyl chloride pipe used for the transport of water. This pipe is manufactured from crystals of polyvinyl chloride resin which are mixed with other materials (see Table 1) and then extruded into pipe. The polyvinyl chloride resin is received at the Pipe Plant in enclosed railroad cars and transported pneumatically to storage bins. The entire operation is totally enclosed except in the blender room where additional raw materials are added to the resin. There are approximately 60 workers operating on three 8-hour shifts, 7-days per week.

B. Evaluation Design

The environmental evaluation was conducted by collecting air samples in charcoal tubes in the breathing zone of the exposed workers and in various areas where it was thought the highest concentrations of vinyl chloride would be generated, e.g., around the extruder barrels and in the blending room. The samples were collected using a low flow (50cc per minute) air pump and analyzed in the Salt Lake City laboratory according to the standard methods for determining vinyl chloride in air. A total of 37 samples for vinyl chloride were collected which represented a full shift.

Because of the dusty conditions observed in the blending room, 2 samples were collected to evaluate the nuisance dust exposure during this operation. The dust samples were collected in such a way as to represent the dust concentration in the respirable size range.

A brief medical evaluation was made by interviewing the workers and filling out a short questionnaire involving smoking history, working history, and a general medical history including questions about liver, gastrointestinal, pulmonary, and cardiovascular symptomotology. The questions were asked in a directed manner.

Blood samples were also collected from these workers to determine the Serum Glutamic Oxaloacetic Transaminase (SGOT) levels. The levels of this serum enzyme were used to measure hepatic cellular damage. Although SGOT occurs in all body tissues, especially heart, liver, and skeletal muscle, many studies have shown that the height and duration of serum enzyme elevations parallel the extent of liver cell damage.

C. Evaluation Criteria

The Occupational Health Standards relative to the substance of this evaluation as promulgated by the U.S. Department of Labor (Federal Register, May 10, 1974 for vinyl chloride and June 27, 1974 for nuisance dust) are as follows:

Substance	ppm	mg/m^3 (respirable fraction)
Vinyl chloride	50	
Nuisance dust		5

Occupational Health Standards are established at levels designed to protect individuals occupationally exposed to individual toxic substances on an 8-hour day, 40-hour per week basis over a normal working life time.

The NIOSH Recommended Standard for Occupational Exposure to Vinyl Chloride states that exposure to vinyl chloride monomer should not exceed levels that are detectable by the recommended methods of analysis.

D. Evaluation Results and Discussions

The concentration of vinyl chloride monomer determined from the collected samples in the Pipe Plant are found in Table 2. The concentrations range from none detected to a high of 4 ppm. The highest concentration of 4 ppm was found in the breathing zone of the blender operator. It is believed that this exposure occurs as a result of the addition of the other raw materials to the resin

requiring a brief opening of the closed system. In order to completely insure the health of the blender operator, engineering controls should be installed to remove all escaping vinyl chloride from the blending area. The concentrations of inert dust in the respiratory fraction are found in Table 3 and again this was caused by the addition of raw materials to the resins.

The results of the medical questionnaires issued to 13 workers produced the following statistical information. All were white males, between the ages of 26-59. Their work experience ranged from 3 months to 13 years (average = 4.6 years); 7 were smokers, 4 were non-smokers, 2 were ex-smokers. According to the medical history, 3 workers had histories of duodenal or gastric ulcers, and 2 had hypertension. No workers had had any skin, liver or pulmonary problems. Analysis of the blood samples for SGOT levels were carried out at a local hospital (Union Hospital, 1505 North 7th Street, Terre Haute, Indiana 47808). Results ranged from 18 to 38 International Units (average = 24.4). Normal values ranged from 5 to 40 International Units. At the present time with the limited questionnaire used and the single blood test taken, no abnormalities attributable to the work environment were identified.

V. REFERENCES

1. British Medical Journal, pp. 590-591, March 30, 1974.

2. Harrison's Principles of Internal Medicine, 6th Edition, p. 1527, 1970.

3. Cecil-Loeb Text Book of Medicine, 11th Edition, p. 1829, 1963.

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TABLE 1

LIST OF RAW MATERIALS

Polyvinylchloride resin

Calcium carbonate

Calcium stearate

Titanium dioxide

Hydrocarbon wax

Acrylic modifier

Liquid organotin-sulfur stabilizer

Polyethylene wax

TABLE 2

CHARCOAL TUBE DETERMINATION
FOR VINYL CHLORIDE

VISQUEEN DIVISION OF ETHYL CORP.
TERRE HAUTE, INDIANA

Sample No.	Sample Location	Sample Time on/off	Vinyl Chloride (parts per million)
1	Extruder No. 9 west side of barrel	11:05-11:29a.m.	ND*
2	Extruder No. 10 west side	11:10-11:30a.m.	ND
3	Automatic Beller	11:12-11:31a.m.	ND
4	Extruder No. 4 at rear	11:15-11:36a.m.	ND
5	Extruder No. 6 by barrel control	11:16-11:37a.m.	ND
6	Automatic Beller	1:02 -1:40p.m.	ND
7	Blender Operator - A.N.	11:40-12:03p.m.	2 ppm
8	Extruder No. 10 west side	1:04 -1:34p.m.	ND
9	Extruder No. 9 west side of barrel	1:06- 1:33p.m.	ND
10	Extruder No. 4 at rear	1:08- 1:36p.m.	ND
11	Extruder No. 6 by barrel control	1:10- 1:38p.m.	ND
12	Blender Operator - A.N.	1:15- 1:44p.m.	4 ppm
13	Extruder Operator - J.W.	1:28- 2:11p.m.	ND
14	Extruder Operator - K.T.	4:21- 4:45p.m.	ND
15	Beller - R.B.	1:42- 2:05p.m.	ND
16	Extruder Operator - J.C.	1:30- 2:08p.m.	ND
17	Blender Operator - A.N.	1:45- 2:15p.m.	1 ppm
18	Extruder No. 9 west side of barrel	1:33- 2:20p.m.	ND
20	Extruder No. 10 west side	1:35- 2:21p.m.	ND
21	Extruder No. 6 by barrel control	1:39- 2:18p.m.	ND
22	Extruder No. 4 at rear	1:37- 2:19p.m.	<1 ppm
23	Automatic Beller	1:40- 2:22p.m.	ND
24	Beller - R.B.	2:06- 2:27p.m.	<1 ppm
25	Extruder Operator - J.C.	2:09- 2:30p.m.	ND
26	Extruder Operator - J.W.	2:12- 2:28p.m.	ND
27	Extruder Operator - D.N.	4:42- 5:12p.m.	ND
28	Extruder Operator - J.W.	4:45- 5:12p.m.	<1 ppm
29	Extruder Operator - D.N.	4:17- 4:41p.m.	ND
30	Extruder Operator - K.T.	4:46- 5:14p.m.	ND
31	Blender Operator - M.H.	4:19- 4:57p.m.	<1 ppm
32	Extruder Operator - H.A.	4:20- 4:46p.m.	ND
33	Extruder Operator - J.W.	4:18- 4:44p.m.	ND
34	Beller - D.L.	4:22- 4:49p.m.	ND
35	Beller - D.B.	4:22- 4:58p.m.	ND
37	Extruder Area	4:24- 4:52p.m.	ND
38	Beller - D.B.	4:59- 5:20p.m.	ND
41	Extruder Operator - H.A.	4:59- 5:20p.m.	ND

*None Detected (Limit of sensitivity is 1 ppm)

TABLE 3

RESPIRABLE NUISANCE DUST

VISQUEEN DIVISION OF ETHYL CORP.
TERRE HAUTE, INDIANA

Sample No.	Sample Location	Dust Concentration (milligrams/cubic meter)
E14	Blender Operator - A.N.	0.77 mg/M^3
E16	Blender Operator - M.H.	1.30 mg/M^3