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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. 74-151-181

WESTERN FORGE CORPORATION  
COLORADO SPRINGS, COLORADO 80907  
APRIL 1975

I. TOXICITY DETERMINATION

It has been determined that a potential health hazard may exist in the assembly and packing area of Plant #2 from vinyl chloride gas at the concentrations measured during normal operating conditions. This determination is based upon environmental measures obtained on January 27, 1975 analyses of work practices, and on available information regarding the toxicity of vinyl chloride. The determination is based on the fact that three of five environmental measurements showed detectable levels above the lower limit of detection (0.2 ppm) for the method used and the fact that NIOSH has rejected the concept of a threshold limit for vinyl chloride gas.

NIOSH recommends that the employer reduce airborne concentrations of vinyl chloride to levels not detectable by the recommended method and that any employee who is exposed to measurable concentrations of vinyl chloride should wear an air-supplied respirator or other appropriate respirator approved by NIOSH for such use.

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) Western Forge Corp., Colorado Springs, Colorado
- b) U.S. Department of Labor - Region VIII
- c) NIOSH - Region VIII

For purposes of informing the approximately two "affected employees" the employer will promptly "post" the Determination Report in a prominent place 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 an employer regarding exposure of employees to vinyl chloride at the Western Forge Corp. in Colorado Springs, Colorado.

### IV. HEALTH HAZARD EVALUATION

#### A. Introduction

The Western Forge Corp. produces hand tools (screwdrivers, pliers, wrenches, etc.) and one of their largest customers is Sears Roebuck. Many of the tools produced for Sears are packaged in containers and then covered with a film of polyvinyl chloride. An evaluation of this packaging operation was requested by a representative of management.

#### B. Plant Process - Conditions of Use

On January 27, 1975, NIOSH investigators, Mr. George J. Butler and Dr. Bobby Gunter conducted a conference with a representative of management as an introduction to the hazard evaluation.

The finished tools are sent to the assembly and packing area where they are manually placed in cardboard display boxes and sent through one of two machines that covers these boxes with a PVC shrink film. This operation is very much similar to that used in meat wrapping. The film used is manufactured by Dayco Corp. and comes in two sizes, 18" wide and 20" wide. The film is cut from a roll by a hot wire. There are two workers involved for each machine. One worker operates the machine and the other removes the finished cartons for final packing.

The operation of wrapping and sealing the display cartons is not carried-on continuously nor are both machines frequently operated at the same time. However, one or the other machine is operated daily as the need arises.

#### C. Evaluation Criteria

Vinyl chloride is now suspected as being an etiological agent in the development of angiosarcoma of the liver. Based on theoretical considerations as stated in NIOSH's Recommended Standard for Occupational Exposure to Vinyl Chloride<sup>1</sup> there is probably no threshold for carcinogenesis although it is possible that with very low concentrations the latency period might be extended beyond the life expectancy. In view of these considerations and NIOSH's inability to describe a safe exposure level as required in section 20(a)(3) of the Occupational Safety and Health Act the concept of a threshold limit for vinyl chloride gas in the atmosphere was rejected".

#### D. Evaluation Methods

On January 27, 1975, Mr. Butler and Dr. Gunter conducted an environmental evaluation for vinyl chloride in the assembly and packing area. Employee exposure to vinyl chloride was measured via personal air sampling equipment. Breathing zone air samples were obtained using Sipin personal sampler pumps and charcoal air sampling tubes. Sampling rates for vinyl chloride were approximately 50cc per minute and sample volumes ranged from 1.7 - 2.7 liters. One general area sample of 20.3 liters of air was also collected. The charcoal tubes were sealed and mailed immediately to the NIOSH Laboratory in Salt Lake City for analyses.

#### E. Evaluation Results

On January 27, 1975, five air samples were collected in the assembly and packing area of the Western Forge Corp. Four of these samples were collected in the breathing zones of the sealer operator and packer. The results are contained in Table 1. Three of the five samples indicated concentrations of vinyl chloride from 0.21 - 0.41 ppm.

<sup>1</sup>/ "NIOSH Recommended Standard for Occupational Exposure to Vinyl Chloride", March 11, 1974 memorandum from Director, NIOSH to Assistant Secretary of Labor, OSHA.

V. CONCLUSIONS

The Federal Standard for vinyl chloride gas promulgated by the U.S. Department of Labor is 1.0 ppm based on an 8-hour time-weighted average. This Standard also calls for specific steps by an employer when the 8-hour time-weighted average exceeds the action level of 0.5 ppm. The average measured concentration of vinyl chloride in the assembly and packing area was approximately 0.25 ppm. Although this average concentration does not exceed the Federal Standard for vinyl chloride, NIOSH has rejected the concept of a threshold limit for this gas and it is therefore concluded that a potential health hazard may exist for the employees using the PVC film sealer machines.

VI. RECOMMENDATIONS

It is recommended that the employer reduce airborne concentrations of vinyl chloride to levels not detectable by the recommended method of sampling. Any employee who is exposed to measurable concentrations of vinyl chloride should wear a respirator approved by NIOSH for protection against vinyl chloride until it is assured that vinyl chloride exposures are controlled.

VII. AUTHORSHIP AND ACKNOWLEDGMENTS

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TABLE 1. Levels of Vinyl Chloride in Parts Per Million (ppm)  
 Collected on January 27, 1975 at the Western Forge Corp.

LOCATION	SAMPLE VOLUME LITERS	SAMPLING PERIOD	CONC. (ppm)*
Packer***	1.8	13:16 - 13:49	N.D.**
Sealer Operator***	1.7	13:14 - 13:47	N.D.
General Area	20.3	13:18 - 14:39	0.21
Sealer Operator***	2.6	13:48 - 14:36	0.37
Packer***	2.7	13:50 - 14:40	0.41

\*ppm - Parts of vapor or gas per million parts of contaminated air by volume.

\*\*N.D. - None detected, limit of detection is 0.20 ppm.

\*\*\*Personal sample in breathing zone of worker.