

April 8, 1974

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Technical Task Group on
Vinyl Chloride Research
Manufacturing Chemists Association
1825 Connecticut Avenue, N. W.
Washington, D. C. 20009

SUBJECT: Proposed Occupational Safety and Health
Work Practice Standard for the Manufacture of
Synthetic Polymer Containing Vinyl Chloride

Gentlemen:

The attached Occupational Safety and Health Work Practice Standard for the Manufacture of Synthetic Polymer Containing Vinyl Chloride is submitted for your consideration and approval.

In preparing this Work Practice, the Subcommittee set the following objectives for itself:

1. Workers in the industry must be protected from hazards related to vinyl chloride exposure.
2. The Work Practice Standard should be practical and clearly understandable. Performance standards were not to be rigid routines.
3. The hazards related to vinyl chloride exposure should be controlled within the monomer and polymer industry. Resin converters and compounders should be protected.
4. The Work Practice should not impose impossible or uneconomic limits on the monomer or resin industry, but should eliminate many of the past practices which may have caused or contributed to the health hazards attributed to vinyl chloride inhalation.

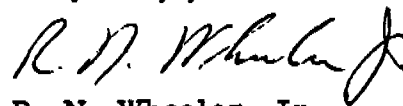
In light of the foregoing objectives, the Subcommittee chose a working level concentration of 50 ppm TWA based upon work reported by Torkelson, Oyen, and Rowe (Am. Ind. Hyg. Assoc. Journal, Volume 22, page 354, 1961) and the work currently underway by Dr. Cesare Maltoni. Since there is no data indicating that polyvinyl chloride resin is harmful, the Subcommittee does not feel that protection from this material is required other than that needed for nuisance dusts. Similarly, no identified hazard exists for absorption of vinyl chloride through the skin from low concentrations in air, thus, no impervious clothing and other protective devices are required.

Based upon the Work Practice Standards already established for human carcinogens, a concentration limit of 0.1% by weight or less was set on process and product streams to be exempt from the standard. The Subcommittee believed that with proper ventilation no hazard would exist for workers in waste treatment plants, in transportation operations, and in subsequent compounding and fabrication of the resin.

The desire of everyone in government, labor, and industry to minimize the hazards to workers in the resin and monomer industry has led to requests for goals such as no detectable level of vinyl chloride monomer in the air or levels of 5 or 10 ppm ceiling. The Subcommittee believes that these limits are uneconomic and all but impossible to meet, based upon present technology. The chosen limit of 50 ppm TWA in this standard represents a serious constraint on the industry but it is one that industry is prepared to accept in the interest of worker safety. An arbitrary reduction in the acceptable ceiling concentration to 0, 5, or 10 ppm at this time is simply a requirement for liquidation of a major industry.

The Subcommittee on Work Practices recommends approval of the attached Work Practice Standard for the Manufacture of Synthetic Polymer Containing Vinyl Chloride and that it be transmitted to the Department of Labor as an industry proposal.

Very truly yours,



R. N. Wheeler, Jr.

Chairman

Subcommittee on Work Practices

RNWJr/ra

Attachment

Support of the Subcommittee on Work Practices, of human

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PROPOSED OCCUPATIONAL SAFETY AND HEALTH
WORK PRACTICE STANDARD
FOR THE MANUFACTURE OF
SYNTHETIC POLYMER CONTAINING VINYL CHLORIDE

WORK PRACTICE SUBCOMMITTEE
TECHNICAL TASK GROUP VINYL CHLORIDE RESEARCH
MANUFACTURING CHEMISTS ASSOCIATION

MARCH 7, 1974

from: R. N. Wheeler, Jr.
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March 7, 1974

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OCCUPATIONAL SAFETY AND HEALTH WORK PRACTICE STANDARD
FOR THE
MANUFACTURE OF SYNTHETIC POLYMER CONTAINING VINYL CHLORIDE

I. SCOPE AND APPLICATION

This standard applies to any area in which the process of manufacturing synthetic polymer containing vinyl chloride (chloroethene, Chemical Abstracts Registry No. 75015) is conducted. This work practice shall not apply to solid or liquid mixtures containing 0.1% or less.

II. PURPOSE

The purpose of this work practice standard is to limit exposure of workers to vinyl chloride monomer in synthetic polymer manufacturing.

III. DEFINITIONS

- a) "Regulated area" means an area to which entry and exit are restricted and controlled as provided for in this standard.
- b) "Waste material" means any resin or other reaction products which contain freely emanating vinyl chloride monomer and which have been removed from vessels and are to be discarded.
- c) "Closed container" is any container which is used to prevent waste material containing freely emanating vinyl chloride monomer from contact with the individual.

III. DEFINITIONS (cont'd.)

2.

- d) "Contaminated" refers to the presence of freely emanating vinyl chloride monomer where it would not normally be found or expected and where it could contribute to employee exposure.
- e) "Saturated" refers to clothing contaminated with materials containing freely emanating vinyl chloride monomer so that the clothing may become a source of exposure.
- f) "Immediate" means without delay; at once.
- g) "Prompt" means within a reasonable time. This refers to situations less urgent than those requiring immediate action.
- h) "Working level" refers to the atmospheric concentration of a contaminant or material which, in the light of current knowledge and technology, may be achieved.

IV. ENVIRONMENTAL (Workplace Air)

a) Concentrations

Vinyl chloride monomer concentrations in the breathing zone of employees shall not exceed a working level of 50 ppm determined as a time-weighted average (TWA) exposure for an eight-hour work day.

permissible exposure limit (PEL) should be 75 ppm. This is the same as the PEL for vinyl chloride.

b) Sampling, Calibration, and Analysis

Procedures for the collection of environmental samples shall be as provided for in Appendix I* of this work practice standard or by an equivalent method. Analysis of samples shall be as provided in Appendix II* or by any method shown to be equivalent in precision, sensitivity, and accuracy to the specified method.

V. MEDICAL

a) Medical surveillance as specified in this section of the work practices standard for manufacturing of polyvinyl chloride resins shall apply to all employees engaged within the scope of this standard.

b) Medical surveillance shall be provided or made available to workers covered by this work practice standard no less frequently than every twelve (12) months. This medical program shall be reviewed every three (3) years for revisions where indicated.

c) The preplacement and annual examinations shall consist of:

1) History

- A. Medical history
- B. Comprehensive work history
- C. Specific past exposures to VCM
- D. Cancer background history

V. MEDICAL (cont'd.)

4.

2) Physical Examination

Complete physical examination by a physician.

3) Radiological Examination

A. 14x17 Chest X-ray

B. Hands

4) Pulmonary Function

A. FVC

B. FEV₁

5) Blood Work

A. Complete Blood count

(1) Red blood count

(2) White blood count and differential

(3) Hemoglobin

(4) Hematocrit

B. Platelet count

V. MEDICAL
5)

Blood Work (cont'd.)

5.

C. Blood Chemistry

- (1) Bilirubin
- (2) SGO-T
- (3) SGP-T
- (4) Alkaline phosphatase
- (5) LDH
- (6) BUN
- (7) Total protein
- (8) Albumin

6) Urinalysi

A. Routine urine chemistries.

B. Microscopic.

7) Other

Other tests as may be indicated based on medical findings, history, or state of the art.

- d) If an employee shows an abnormal test or finding, more fr quent examinations shall be performed.

V. MEDICAL
7) Other (cont'd.)

6.

- e) Initial annual examination for presently employed workers shall be completed within six (6) months of the promulgation of this standard.
- f) The medical representatives of the Secretary of Health, Education, and Welfare, of the Secretary of Labor, and of the employer shall have access to these medical records. Physicians designated and authorized by any employee or former employee shall have access to the results of these examinations for that employee.
- g) These medical records shall be maintained 20 years.

VI. LABELING AND POSTING

a) Signs

- 1) Entrances to the regulated areas shall be prominently posted with legible signs bearing the following:

DANGER!
HAZARDOUS CHEMICAL AREA
AUTHORIZED PERSONNEL ONLY

b) Labels for Monomer Containers

Vinyl chloride monomer in containers or vessels located outside the regulated area shall be labeled as follows:

VI. LABELING AND POSTING

b) Labels for Monomer Containers (cont'd.)

7.

V I N Y L C H L O R I D E

DANGER! EXTREMELY FLAMMABLE LIQUID AND GAS
UNDER PRESSURE

HARMFUL IF INHALED

MAY POLYMERIZE VIOLENTLY UNDER FIRE

CONDITIONS OR LOSS OR REMOVAL
OF INHIBITOR

Keep away from heat, sparks, and open flame.

Keep container closed.

Use with adequate ventilation.

Avoid breathing vapor.

Avoid contact with skin.

Keep cylinder out of sun and away from heat.

Container should be grounded when being emptied.

Never drop cylinder.

FIRST AID: If inhaled, remove to fresh air. If not breathing
give artificial respiration, preferably mouth-to-
mouth. If breathing is difficult, give oxygen. Call a physician.

In case of:

Fire— Use water spray, dry chemical, or CO₂.

Spill or Leak— For small spills, evacuate area and
permit to evaporate. For large spills or
leaks, evacuate area. Dike or flush to ground and let
evaporate. Do not flush to sewer because of explosion
hazard.

VI. LABELING AND POSTING

(cont'd.)

8.

- c) These materials shall be removed from the regulated area for disposal and shall be placed in closed containers having the following label:

WASTE VINYL CHLORIDE MATERIAL
DANGER! MAY CONTAIN VINYL CHLORIDE MONOMER
EXTREMELY FLAMMABLE
VINYL CHLORIDE IS A HAZARDOUS CHEMICAL

- d) Equipment

Equipment, material, and clothing contaminated with vinyl chloride monomer shall not be removed from the regulated area unless it has been decontaminated or placed in closed containers bearing the following legend:

DANGER! CONTAMINATED WITH VINYL CHLORIDE MONOMER
HAZARDOUS CHEMICAL AGENT

VII. PERSONAL PROTECTIVE EQUIPMENT AND CLOTHING

- a) Clothing

Protective gloves, footwear or foot coverings, and protective head covering shall be worn as appropriate. This provision shall also apply to reactor cleaning operations where levels of vinyl chloride monomer are below 50 ppm within the reactor environment.

VII. PERSONAL PROTECTIVE EQUIPMENT AND CLOTHING

9.

a) Clothing (cont'd.)

For reactor cleaning operations where levels within the reactor environment are in excess of 50 ppm, protective clothing shall be worn to prevent skin contact of vinyl chloride monomer or other materials containing vinyl chloride monomer.

b) Respiratory Protection

1) General

When the limits of exposure prescribed in Section IV (a) cannot be met by limiting the concentration of vinyl chloride monomer in the work environment through feasible engineering means, an employer must establish and enforce a program of respiratory protection detailing the required protection of each worker exposed. The type of respiratory protection to be used shall be of an air-supplied type, self-contained, or by air lines. Sources of air for respiratory protection shall be ^{free of} ~~for~~ contaminants.

Respiratory protection, as defined above, shall be provided and used when a variance which allows the use of respirators as a means of controlling exposure for routine operations has been granted or while action on an application for a variance is pending.

VII. PERSONAL PROTECTIVE EQUIPMENT AND CLOTHING

10.

b) Respiratory Protection (cont'd.)

2) Non-Routine Operations

The requirements set forth in this section shall apply for non-routine operations such as a brief exposure to concentrations in excess of the working level as a result of maintenance or repair activities, emergency situations, or other short-time non-standard work routines. A respiratory protection program meeting the general requirements outlined in American National Standard Practices for Respiratory Protection Z88.2 - 1969 shall be established and enforced by the employer. This program shall include instructions on the selection, fitting, use, testing for leakage, cleaning, and maintenance of the respiratory protective devices.

3) Vessel Cleaning and Maintenance

Where employees are engaged in cleaning and maintenance operations inside vessels at a concentration maintained below 50 ppm, respiratory protection shall be made available in the case of excursion above this limit or as may be needed for escape from the vessel. Where employees are engaged in cleaning and maintenance operations inside vessels at concentrations in excess of 50 ppm, they shall be provided with and wear an air-supplied respirator.

VIII. APPRIAL OF EMPLOYEES

11.

Each employee exposed to vinyl chloride monomer shall be apprised of its hazards, appropriate emergency procedures, proper conditions for safe use, and precautions to minimize exposure.

IX. WORK PRACTICES

a) Specific emergency procedures shall be prescribed. The procedures shall be readily available, in writing, to the employees. The employees shall be familiarized with these procedures, and trained and rehearsed in their application.

b) Engineering Procedures

Engineering procedures shall be established to reduce exposure of employees to vinyl chloride monomer vapors in polymer manufacturing. Where local exhaust ventilation is used, it shall be designed and maintained to prevent the accumulation of or recirculation of vinyl chloride monomer vapor into the work area.

c) General Housekeeping

1) To prevent airborne contamination and accidental skin contact with vinyl chloride monomer, emphasis shall be placed upon prompt clean-up of spills, periodic inspection, prompt repair of equipment and leaks, and proper handling, storage, and disposal of materials.

IX. WORK PRACTICES

12.

c) General Housekeeping (cont'd.)

2) There shall be periodic tests for emission of vinyl chloride monomer. The frequency of these tests shall be such as to ensure the integrity of equipment and adherence to proper work practices. Tests shall be performed at least daily or more frequently if ambient work atmospheric concentrations of vinyl chloride monomer are in excess of the working level.

3) For waste material and contaminated equipment handling, see Section VI (c) and VI (d) on Labeling and Posting.

d) Special Precautions

Vinyl chloride monomer is a gas at ambient temperatures. Therefore, waste materials, equipment, and other sources of the monomer in closed containers shall not be placed in areas of excessive temperature or sunlight where build-up of internal pressure may result in rupture of the container, fire, or explosion.

e) Reactor and Vessel Entry

A reactor and vessel entry procedure shall be developed. Employees shall be familiarized with the procedure in writing, and shall be trained and rehearsed in the techniques provided for in the procedure.

IX. WORK PRACTICES

13.

e) Reactor and Vessel Entry (cont'd.)

Atmospheres within the vessel shall be purged to where vinyl chloride monomer contained therein is below 50 ppm and the oxygen content contained therein is sufficient for supporting life. Where either the vinyl chloride monomer concentration cannot be reduced below 50 ppm or where there is insufficient oxygen or where other toxic materials may be present in concentrations dangerous to life, an air-supplied respirator system and protective clothing, as stated in Section VII of this work practice standard, shall be provided by the employer and used by the employee.

All piping to and from the vessel shall be blanked or otherwise isolated prior to entry.

X. SANITATION

a) General

Storage or consumption of food, storage or use of containers of beverages, application of cosmetics, or smoking are prohibited in regulated areas.

b) Showers and Hand-Washing Facilities

Showers, hand-washing facilities, and soap and water shall be available to all employees engaged within the scope of this standard. Employees engaged in vessel cleaning or other operations requiring

X. SANITATION

14.

b) Showers and Hand-Washing Facilities (cont'd.)

vessel entry shall shower at the end of the work shift.

c) Clothing

Clothing saturated with vinyl chloride monomer or with other process streams containing vinyl chloride monomer shall be promptly removed and replaced with uncontaminated clothing.

XI. MONITORING AND RECORD-KEEPING REQUIREMENTS

a) Workplace Areas

- 1) Concentrations of vinyl chloride monomer in the work room area shall be monitored at strategic sampling points.

Adequate records of these concentrations shall be maintained and held available for inspection for a period of twenty (20) years.

- 2) Sampling frequency and patterns shall be adequate to represent the work room area environment and to demonstrate the integrity of the equipment and proper work practices.

b) Personnel Monitoring

Sampling shall be of such frequency and pattern as to represent levels of exposure of employees to vinyl chloride. In no case shall the

XI. MONITORING & RECORD-KEEPING REQUIREMENTS
b) Personnel Monitoring (cont'd.)

15.

sampling be done at intervals greater than six (6) months. Records shall be maintained for twenty (20) years for all sample schedules to include the sampling data, analytical methods, type of respiratory protection in use (if applicable), and the concentrations of vinyl chloride monomer. Records shall be maintained so that they may be classified by employee.

Each worker shall have access to the sample results as they pertain to his occupational exposure.

Reactor or other vessel environments shall be periodically monitored at frequent intervals for vinyl chloride monomer concentrations during the times they are occupied by an employee. Summary records of these measurements shall be maintained as hereinbefore provided.

XII. TANK CAR UNLOADING

Each unloading line and each vapor equalizing line shall be equipped with vent connections permitting, at the completion of unloading, pressure to be vented to a point remote from employees' workplace.

4/8/74

(Copies by R. Anderson)

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