posed to VC. Also, the eight-hour, time-weighted average standard suggested by several participants at the hearing (see, for instance, TR 178), has been rejected. The March 1974 report of the survey revealed that several kinds of work or operations are of short duration. Loading or unloading of a tank car may require approximately 15 minutes. The cleaning of a reactor may require approximately half an hour. An eight-hour, time-weighted average standard would permit exposure to VC at concentrations of 400 ppm for one hour. Such upward excursions, several times the 50 ppm level, cannot be permitted to occur.

4. *The standard.* The standard set out below contains only the requirements deemed necessary to provide protection before the conclusion of the rulemaking proceeding to be commenced shortly.

Because exposure to VC is hazardous, and because such exposure can occur in the processes of synthesizing or polymerizing of VC or in the handling of VC polymers or copolymers which contain absorbed VC, this standard applies to all such processes and to the handling, reacting, manufacturing, processing, releasing, repackaging, or storage of any of these materials. The monitoring requirements serve two purposes, to trigger into operation a compliance program and to check the effectiveness of the program. Also, engineering controls are favored for compliance, and respirators are intended to provide protection until such controls can be installed or in cases where such controls are not feasible.

Accordingly, by reason of the foregoing and on the basis of the record of the hearing of February 15, 1974, with exhibits, the written submissions received before the hearing pursuant to the notice of the hearing, the post-hearing written submissions by the participants at the hearing, the March 1974 report of a fact-finding survey recommendations received from NIOSH, and the other data referred to herein, it is found (1) that VC at concentrations in excess of 50 ppm is physically harmful and carcinogenic; (2) that exposure to VC at concentrations in excess of a concentration of 50 ppm poses a grave danger to employees; (3) that employees are presently exposed to VC at concentrations in excess of 50 ppm; and (4) that the emergency temporary standard set out below is necessary to provide immediate protection to employees from such danger.

Pursuant to section 6(c) of the Occupational Safety and Health Act of 1970, a proceeding will commence shortly in accordance with section 6(b) of the Act, in which the emergency temporary standard will serve as a proposed rule, together with other subsidiary rules. As soon as possible a draft environmental impact statement will be filed with the President's Council on Environmental Quality, and copies will be provided to other appropriate Federal agencies for their comments.

Pursuant to sections 6(c) and 8(c)(3) of the Williams-Steiger Occupational Safety and Health Act of 1970 (84 Stat. 1596, 1599; (29 U.S.C. 655, 657)), and Secretary of Labor's Order No. 12-71 (36 FR 8754), 29 CFR Part 1910 is amended by adding thereto a new § 1910.93q to read as set forth below. In addition, pursuant to section 4(b)(2) of the Act (84 Stat. 1592; (29 U.S.C. 653)), the standard in the new § 1910.93q is determined to be more effective than the corresponding standards now in Subpart B of Part 1910, in Parts 1915, 1916, 1917, 1918, and 1926 of title 29, Code of Federal Regulations, and in Part 50-204 of Title 41 of the Code of Federal Regulations. Therefore, these corresponding standards are superseded by the new standard in § 1910.93q.

1. In 29 CFR Part 1910, § 1910.93 is amended by deleting from Table G-1 the line: "* * * C Vinyl chloride * * * 500 * * * 1300".

2. Part 1910 of Title 29 of the Code of Federal Regulations is amended by adding thereto a new § 1910.93q to read as follows:

§ 1910.93q Vinyl chloride.

(a) *Scope and application.* (1) This section applies to any area or operation in which vinyl chloride (chloroethene), Chemical Abstracts Service Registry Number 75015, is manufactured, reacted, handled, processed, released, repacked, or stored.

(2) This section does not apply to the handling, storage, or other use of vinyl chloride polymers and copolymers in the form of fabricated products.

(b) *Permissible exposure.* The occupational environment shall be controlled so that no employee is exposed to vinyl chloride at a concentration in excess of 50 parts per million (ppm) (127.0 mg/cum).

(c) *Monitoring*—(1) *Initial monitoring.* As soon as possible but not later than April 22, 1974, every employer of an employee working in an area or operation in which vinyl chloride is manufactured, reacted, handled, processed, released, repacked, or stored shall begin monitoring the ambient air of the area to determine whether it contains vinyl chloride in concentrations in excess of 50 ppm.

(2) *Frequency.* Monitoring of a sufficient number of employees so that a representative sample of exposures to vinyl chloride may be determined shall be accomplished not less frequently than weekly until all results for three consecutive weeks are at or below 50 ppm. Thereafter, monitoring shall be conducted not less frequently than monthly so long as the concentrations of vinyl chloride do not exceed 50 ppm. If a monitoring sample reveals vinyl chloride in concentrations in excess of 50 ppm, weekly monitoring shall be resumed until all results for three consecutive weeks are at or below 50 ppm.

(3) *Method of monitoring.* Personnel monitoring shall be accomplished by collecting samples by suitable devices worn by the employee. The samples shall be analyzed by gas chromatography or by any other method which is of equivalent sensitivity. The analytical procedure shall be sensitive to 5 ppm of vinyl chloride in air with an accuracy of ±20 percent for a ten minute air sample.

(4) *Employee observation of monitoring.* Employees working in an area or operation whose ambient air is monitored, or their representatives, shall be given a reasonable opportunity to observe the personnel monitoring required by this section.

(5) *Recordkeeping.* The results of all monitoring shall be recorded in writing. The records shall be retained for at least 5 years and shall be made available for inspection and copying by representatives of the Assistant Secretary of Labor for Occupational Safety and Health and the Director of the National Institute for Occupational Safety and Health (NIOSH).

(6) *Employee access.* Each employee and former employee shall have access to such records of the results of monitoring required by this section as will indicate his own exposure to airborne concentrations of vinyl chloride.

(7) *Employee notification.* Each employer shall promptly notify any employee who has been or is being exposed to vinyl chloride in concentrations in excess of 50 ppm, and shall inform him of the corrective action being taken.

(d) *Compliance.* (1) Whenever any monitoring sample reveals vinyl chloride at a concentration in excess of 50 ppm, or whenever any accident, such as rupture of equipment or spillage, indicates the likelihood of a greater than usual release of vinyl chloride into the ambient air, all employees exposed to such concentrations shall be withdrawn to a safe area and shall not be permitted to reenter the work area unless they wear either Type C continuous flow or pressure demand air supplied respirators or self-contained breathing apparatus.

(2) Work which may reasonably be expected to release vinyl chloride in concentrations in excess of 50 ppm, such as repair, maintenance or cleaning of reactors or other equipment containing vinyl chloride, shall be accomplished only by employees wearing Type C continuous flow or pressure demand air supplied respirators or self-contained breathing apparatus.

(3) In any case covered by paragraphs (d)(1) or (d)(2) of this section, in addition to providing the required respirators, the employer shall examine and analyze the source of the excessive concentrations of vinyl chloride in order to determine feasible engineering or operational controls appropriate to reduce the airborne concentrations to the permissable level. Such controls shall be implemented as quickly as possible.

(4) Periodic tests shall be conducted for equipment leaks and for emissions of vinyl chloride which may result from work practices.

3. In 29 CFR Part 1910, § 1910.19 is revised to read as follows:

§ 1910.19 Special provisions for air contaminants.

(a) *Asbestos dust.* Section 1910.93a shall apply to the exposure of every employee to asbestos dust in every employment and place of employment covered by § 1910.12, § 1910.13, § 1910.14, § 1910.15, or § 1910.16, in lieu of any different standard on exposure to asbestos dust which would otherwise be applicable by virtue of any of those sections.

(b) *Vinyl chloride.* Section 1910.93q shall apply to the exposure of every employee to vinyl chloride in every employment and place of employment covered by § 1910.12, § 1910.13, § 1910.14, § 1910.15, or § 1910.16, in lieu of any different standard on exposure to vinyl chloride which would otherwise be applicable by virtue of any of those sections.

Effective date. These amendments shall become effective on April 5, 1974.

(Secs. 4, 6, and 8, 84 Stat. 1592, 1596, 1599 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order No. 12–71, 36 FR 8754.)

Signed at Washington, DC., this 2d day of April 1974.

JOHN STENDER,
Assistant Secretary of Labor.

[FR Doc.74–7890 Filed 4–4–74;8:45 am]

APPENDIX B

PROPOSED STANDARD ON VINYL CHLORIDE

DEPARTMENT OF LABOR

Occupational Safety and Health Administration

[29 CFR Part 1910]

[Docket OSH-36]

VINYL CHLORIDE

Proposed Standard

1. *Background*. Vinyl chloride (chloroethene) Chemical Abstracts Service Registry No. 75015, is a synthetic chemical made by oxychlorination of ethylene or by hydrochlorination of acetylene. It is the parent compound of a series of themoplastic resin polymers and copolymers which are widely used for containers, wrapping film, electrical insulation, pipe, conduit, and a variety of other products. Vinyl chloride has been made commercially in this country since 1939 and present production is in excess of seven billion pounds per year.

Vinyl chloride (VC) is a gas at ambient temperature and pressure and is a chlorinated hydrocarbon which has moderate liver toxicity. The previous standard set a ceiling value of 500 parts per million (ppm) (29 CFR 1910.93, Table G-1).

On January 22, 1974, the Occupational Safety and Health Administration (OSHA) was informed by the National Institute for Occupational Safety and Health (NIOSH) that the B. F. Goodrich Chemical Company reported that deaths of several of its employees from a rare liver cancer (angiosarcoma) may have been occupationally related. As a result of this notification and after consultation with the National Institute for Occupational Safety and Health (NIOSH), and a joint inspection of the plant by OSHA, NIOSH, and the Kentucky Department of Labor, a fact-finding hearing on possible hazards involved with the manufacture and use of VC was announced on January 30, 1974 (39 FR 3874) and held on February 15, 1974.

2. *Carcinogenicity of VC*. Information produced at this hearing demonstrated that exposure of laboratory animals (mostly Sprague-Dawley rats) to VC by inhalation at and below the then current OSHA standard of 500 ppm induced tumors, including angiosarcomas of the liver. Professor Cesare Maltoni, of the Instituto di Oncologia, Bologna, Italy, reported on a series of experiments on the effect of exposure of rats, mice, and hamsters to VC at concentrations of 10,000; 6,000; 2,500; 500; 250; and 50 ppm for varying periods of time (TR-43-63). Some of the experiments have been concluded, and others are still ongoing. The experimental results reported were that tumors have been observed in groups of animals exposed to VC at concentrations as low as 250 ppm. No tumors were observed in the group of animals exposed to VC at a concentration of 50 ppm. It also appears that the total number of tumors, as well as the numbers of angiosarcomas of the liver, decreased as the concentrations of VC were reduced to 250 ppm. Another experiment by Professor Maltoni was reported underway involving the exposure of 300 animals to VC at concentrations of 50 ppm, in order to assess in a more definitive way whether that level of exposure produces tumors in animals. Data reported by Torkelson, Oyen and Rowe (American Industrial Hygiene Association J 22: 254-361 (1961)) indicate that exposure to VC at concentrations of 50 ppm failed to induce tumors in rats, hamsters, rabbits, and dogs.

The employees of the B. F. Goodrich Chemical Company who died from angiosarcoma of the liver had an average exposure of approximately 19 years to vinyl chloride, at unknown concentrations, and variable exposures to other volatile chemicals. (TR 93). Some employees of Union Carbide, Firestone Tire and Rubber, and Goodyear were also reported in post-hearing comments to have had exposure to vinyl chloride and to have died from angiosarcoma of the liver. Finally, autopsies of four deceased employees revealed their liver angiosarcoma tumors were histologically indistinguishable from the angiosarcoma tumors observed in Professor Maltoni's experimental animals.

3. *The Emergency Temporary Standard*. On the basis of all information available at that time, and the fact that employees were being exposed at levels around the experimentally observed effect level of 250 ppm, an Emergency Temporary Standard (ETS) was promulgated on April 5, 1974 (39 FR 12342) as 29 CFR 1910.93q. This standard reduced the level from a ceiling of 500 ppm to 50 ppm ceiling. It was expressly recognized that this standard limiting exposures to a 50 ppm level was intended to be a tentative, interim standard, to be in effect no longer than six months, during which time the whole question of possible safe exposure to VC would be reconsidered more fully and in the light of more information, especially results of experiments which were known to be underway at that time.

4. *Additional information*. On April 15, 1974, information and data were presented to representatives of OSHA, NIOSH and the EPA by the Industrial Bio-Test Laboratories, Northbrook, Illinois, concerning results of animal exposure studies with VC, sponsored by the Manufacturing Chemists Association (MCA). Although only preliminary in nature, these results revealed that 2 out of 200 mice exposed to VC concentrations of 50 ppm for 7 hours a day, five days a week, for approximately 7 months, developed angiosarcomas of the liver.

The Industrial Bio-Test Lab data indicate that exposure to VC at 50 ppm may well constitute a serious health hazard to employees. Also, the question of a safe level of exposure for humans cannot be determined at this time, and may continue as a matter for scientific deliberation for many years. We therefore conclude that it is now necessary to propose to change the 50 ppm level established in the ETS to as low a level as can be detected using methodologies outlined in this proposal.

(5) *The proposed permanent standard*. The requirements for a complete standard under section 6(b) of the Occupational Safety and Health Act of 1970 are much more comprehensive than the provisions of the ETS promulgated on April 5. The following proposals are responsive to the additional information on the carcinogenicity of VC, and the requirements of the Act.

A. *Level of exposure*. The proposed standard for employee exposure is set at no detectable level, as determined by a sampling and analytical method capable of detecting vinyl chloride at concentrations of 1 ppm with an accuracy of 1 ppm±50 percent. Although more sensitive methods may be available now or in the future, the methodological sensitivity proposed appears to be the most feasible and generally available. A method of 1 ppm sensitivity has been recommended to OSHA by NIOSH. To minimize the number of persons at risk, a requirement would be established for regulating areas where vinyl chloride is manufactured, reacted, stored, handled, released, repackaged, or used, including operations with polyvinyl chloride containing detectable levels of vinyl chloride. Access to the areas would be limited to authorized employees.

B. *Monitoring*. A program of monitoring would be required to establish whether there are detectable levels in regulated areas and to permit determination of employee exposures on an individual basis. Provision would also be

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made for an opportunity to observe monitoring by employees or their designated representatives, as required by section 8(c)(3) of the Act.

C. *Control methods.* Where detectable levels of VC are monitored, two programs would be triggered; an engineering and work practice program to reduce levels below detectability; and while this is on-going, a respiratory protection program for employees in the regulated area.

Engineering controls and work practices are favored methods of compliance because they tend to avoid contamination of the ambient air in the workplace. Accordingly, it is proposed to require the institution of engineering controls and of workpractice methods as soon as feasible, and to require the use of respirators pending the institution of such controls, to supplement such controls where they are insufficient to reduce concentrations of vinyl chloride below the detectable level, in specified work situations, and in cases of emergency. The proposal for continuous flow and pressure demand types of respirators is based on the recommendations of NIOSH, which has observed leakage through chemical cartridge respirators at high concentrations of VC.

A requirement would also be established for the provision and use of protective clothing for employees in the regulated areas. The protective clothing would minimize skin contact with VC vapor, and would provide some measure of protection from splash of liquid in the event of a spill or rupture of equipment. Food, beverages, and like products would be prohibited in the regulated area.

Written operational and emergency plans would be required, along with employee training in routine and emergency duties. Specific requirements would be established for emergency actions and for routine maintenance and decontamination operations, including vessel entry, which are known to present particular hazards.

The purposes of operational and emergency plans and training are to apprise employees of the hazards to which they may be exposed, of the precautions they must take to avoid such hazards, and to rehearse employees in the procedures they must follow in emergencies.

D. *Medical surveillance.* Comprehensive requirements for employee medical examinations are proposed, including necessary tests. Some additional guidance is included for the convenience of physicians. The proposed requirements have been recommended to OSHA by NIOSH as reasonably appropriate to detect liver dysfunction which may be indicative of, or predisposing to, the development of liver angiosarcomas.

E. *Records and reports.* Records of monitoring, medical examinations, and entry to regulated areas are proposed, with provision for access by appropriate OSHA and NIOSH officials. Specific provisions for employee access to monitoring records are included, as well as the requirement to furnish a copy of a medical record to an employee's physician on the employee's request. Establishments conducting VC operations would be required to identify themselves to OSHA, and to report incidents (accidents) resulting in the release of vinyl chloride.

Accordingly, pursuant to sections 8(b), 6(c), and 8(c) of the Occupational Safety and Health Act of 1970 (84 Stat. 1593, 1596, 1599; 29 U.S.C. 655, 657), Secretary of Labor's Order No. 12-71 (36 FR 8754) and 29 CFR Part 1911, it is hereby proposed to amend 29 CFR Part 1910 by revising § 1910.93q as set forth below.

Written data, views, and arguments concerning the proposals may be mailed to the Docket Officer, Docket OSH-36, Room 230, 1726 M Street N.W., Occupational Safety and Health Administration, Washington, D.C. 20210, postmarked not later than June 10, 1974.

Pursuant to 29 CFR 1911.11 (b) and (c), interested persons may file objections to the proposals, requesting an informal hearing with respect thereto, in accordance with the following conditions:

(1) The objections must include the name and address of the objector;

(2) The objections must be postmarked on or before June 10, 1974;

(3) The objections must specify the provisions of the proposed rule to which objection is taken, and must state the grounds therefor;

(4) Each objection must be separately stated and numbered; and

(5) The objections must be accompanied by a summary of the evidence proposed to be adduced at the requested hearing.

As revised, § 1910.93q would read as follows:

§ 1910.93q Vinyl Chloride.

(a) *Scope and application.* (1) This section applies to any area or operation in which vinyl chloride (chloroethene), Chemical Abstracts Service Registry No. 75015, is manufactured, reacted, released, repackaged, stored, or used, including areas and operations involving polyvinyl chloride where detectable levels of vinyl chloride are released.

(2) This section does not apply to the handling or use of fabricated products made entirely or in part of polyvinyl chloride.

(b) *Definitions.* (1) "Assistant Secretary" means the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor or his designee.

(2) "Authorized employee" means an employee whose duties require him to be in the regulated area and who has been specifically assigned by the employer; and any employee who enters such an area as a designated representative of employees to exercise an opportunity to observe monitoring and measuring of vinyl chloride.

(3) "Closed container" means any container which prevents the release of vinyl chloride to the environment.

(4) "Contaminated" means capable of releasing a detectable level of vinyl chloride.

(5) "Decontamination" means reduction of vinyl chloride concentrations to less than detectable levels.

(6) "Detectable level" means an airborne concentration of vinyl chloride measurable by a sampling and analytical method capable of measuring concentrations of 1 ppm, with an accuracy of 1 ppm±50 percent.

(7) "Director" means the Director, National Institute for Occupational Safety and Health, or any person directed by him or the Secretary of Health, Education, and Welfare to act for the Director.

(8) "Emergency" means an unforseen circumstance or set of circumstances, resulting in the release of vinyl chloride into areas occupied by employees.

(9) "Exposure" means actual contact with vinyl chloride when unprotected by required personal protective equipment and clothing.

(10) "Fabricated product" means a finished product or part of such product, made of polyvinyl chloride, entirely or in part, including semifinished products such as film, sheet, block, bar, or extrusion stock.

(11) "OSHA Area Director" means the Director for the Occupational Safety and Health Administration Area Office having jurisdiction over the geographic area in which the establishment is located.

(12) "Polyvinyl chloride" means polyvinyl chloride homopolymer or copolymer before such is converted to a fabricated product.

(13) "Protective clothing" means clothing protective against vinyl chloride.

(14) "Vinyl chloride" means vinyl chloride monomer.

(15) "Waste resin" means any resin or other reaction products removed in the cleaning of equipment, such as vessels and piping.

(c) *Reference.* College of American Pathologists. 230 N. Michigan Ave., Chicago, Illinois 60601.

(d) *Regulated areas.* (1) A regulated area shall be established where (i) vinyl chloride is manufactured, reacted, released, repackaged, stored, or used; or (ii) polyvinyl chloride capable of releasing detectable levels of vinyl chloride is manufactured, reacted, released, repackaged, stored, or used.

(2) Access to regulated areas shall be limited to authorized employees.

(3) A daily roster of employees entering regulated areas shall be made and maintained. The rosters, or summaries thereof, shall be kept for at least 20 years.

(e) *Monitoring.* (1) Every regulated area shall be monitored for detectable levels of vinyl chloride.

(2) The monitoring shall assure that any exposure may be determined for each authorized employee with a confidence level of 95 percent.

(3) Employees or their designated representatives shall be afforded an opportunity to observe monitoring and measuring required by this paragraph.

(i) Where exercise of an opportunity requires entry to an area where the use

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of protective clothing, equipment, facilities, or procedures is required, such clothing, equipment, facilities, and procedures shall be provided to all persons entitled to exercise the opportunity, at no cost to any of them.

(ii) Persons exercising the opportunity shall be instructed regarding:

(A) The toxicity and fire hazard of vinyl chloride; and

(B) The protective steps and measures necessary for their protection.

(iii) Observers shall be permitted, without interference to the persons performing the monitoring and measuring, to:

(A) Observe all steps and procedures related to the collecting, processing, and evaluation of particular monitoring and measurement samples;

(B) Record quantities and results obtained;

(C) Observe the condition of monitoring and measuring equipment;

(D) Receive a demonstration of the calibration and function tests of the monitoring and measuring equipment performed on site; and

(E) Examine instructions and documents related to the procedures and equipment for monitoring and measuring.

(4) Accurate and complete records of all required monitoring shall be made and maintained for not less than 20 years. Such a record shall (i) state the date of such monitoring and the levels determined; and (ii) identify the instruments and methods used.

(f) *Engineering controls and workpractice methods.* (1) Where detectable levels of vinyl chloride are measured, immediate protection shall be provided against exposure to vinyl chloride by the use of engineering controls, workpractice methods, and respirators as follows:

(i) Feasible engineering controls and workpractice methods shall immediately be used to reduce airborne concentrations of vinyl chloride below the detectable level;

(ii) Wherever feasible engineering controls and workpractice methods which can be instituted immediately are not sufficient to reduce concentrations of vinyl chloride below the detectable level, they shall nonetheless be used to reduce the concentrations to the lowest practicable level, and shall be supplemented by means of respirators in accordance with paragraph (g) of this section;

(iii) Wherever no feasible engineering control or workpractice method can be instituted immediately, immediate respiratory protection shall be provided in accordance with paragraph (g) of this section; and

(iv) In any case covered by paragraph (f)(1) (ii) or (iii) of this section, the employer shall also undertake as soon as practicable a program to reduce airborne concentrations of vinyl chloride below the detectable level, or to the greatest extent feasible, solely by means of engineering controls and workpractice methods and as soon as feasible.

(2) There shall be tests made for process or equipment leaks and for emission of vinyl chloride which may result from workpractices. The frequency of these tests shall be such as to insure the integrity of equipment and adherence to proper workpractices.

(g) *Respiratory protection.* (1) A respiratory protection program in accordance with § 1910.134 shall be established and implemented where respirators are required to be used by this section.

(2) Respirators shall be used only in cases of emergency and where required by any other provision of this section. Respirators may not be used in lieu of feasible engineering controls or workpractice methods.

(3) Respirators or combinations of respirators for protection against vinyl chloride shall be selected from among the following:

(i) A positive pressure full facepiece self-contained breathing apparatus;

(ii) A pressure-demand full facepiece self-contained breathing apparatus operating in the pressure-demand mode;

(iii) A combination type "C" pressure-demand full facepiece respirator operating in the pressure-demand mode and a pressure-demand self-contained breathing apparatus operating in the pressure-demand mode; or

(iv) A combination type "C" continuous flow respirator and a pressure-demand self-contained breathing apparatus operating in the pressure-demand mode.

(h) *Protective clothing.* (1) Employees entering regulated areas shall be provided full-body protective clothing, footwear or shoe covers, and gloves, at no cost to them, and required to wear it while in the regulated area.

(2) Where polyvinyl chloride powder containing detectable levels of vinyl chloride is handled, employees shall also be:

(i) Provided and required to wear headcoverings;

(ii) Required to remove all protective clothing at each exit from the regulated area; and

(iii) Required to shower after the last exit of the day.

(3) Clean protective clothing shall be provided whenever contaminated or soiled, but not less frequently than weekly. Contaminated clothing shall be decontaminated before reuse by removal for laundering or disposal.

(i) *Hygiene facilities and practices.* (1) Where employees are required by this section to wear protective clothing and equipment, change rooms shall be provided in accordance with § 1910.141(e).

(2) Where employees are required by this section to shower, shower facilities shall be provided in accordance with § 1910.141(d)(3).

(3) Storage or consumption of food or beverages, storage or use of smoking or non-food chewing products, and the storage or application of cosmetics are prohibited in regulated areas.

(j) *Emergency situations.* (1) A written operational plan for emergency situations shall be developed for each regulated area.

(2) In the event of an emergency, appropriate portions of the plan shall be put into operation.

(i) Hazardous conditions created by the emergency shall be eliminated and the affected area shall be decontaminated prior to the resumption of normal operations.

(ii) Special medical surveillance by a physician shall be instituted within 24-hours for employees present in the affected area at the time of the emergency.

(iii) Where an employee has a known contact with liquid vinyl chloride such employee shall be required to shower as soon as possible, unless contraindicated by physical injuries.

(iv) An incident report on the emergency shall be reported as required in paragraph (q)(2) of this section.

(3) Each authorized employee shall be trained in a program relating to the hazards of vinyl chloride and the precautions for safe use.

(i) The program shall include:

(A) The nature of the fire hazard, and the necessary protective steps;

(B) The nature of the toxic hazard, including local and systemic effects, acute and chronic effects including specifically the carcinogenic hazard;

(C) The specific nature of operations which could result in exposure to vinyl chloride, and necessary protective steps;

(D) The purpose for and application of the medical surveillance program;

(E) The purpose for and application of decontamination practices;

(F) The purpose for and significance of emergency practices and procedures;

(G) The employee's specific role under normal operating or emergency conditions;

(H) Specific information to aid the employee in recognition and evaluation of conditions and situations which may result in the release of vinyl chloride;

(I) The purpose for and application of specific first aid procedures and practices;

(J) A review of this standard at the employee's first training and indoctrination program and annually thereafter.

(ii) All materials relating to the program shall be provided upon request to authorized representatives of the Assistant Secretary and the Director.

(k) *Signs and labels.* (1) Entrances to regulated areas shall be posted with signs bearing the legend:

CANCER-SUSPECT AGENT AREA
AUTHORIZED PERSONNEL ONLY

(2) Areas containing operations covered in paragraph (k)(1)(4) of this section shall be posted with signs bearing the legend:

CANCER-SUSPECT AGENT IN THIS AREA
FULL IMPERVIOUS AIR-SUPPLIED EQUIPMENT REQUIRED
AUTHORIZED PERSONNEL ONLY

(3) Containers of waste, or other materials contaminated with vinyl chloride shall be labeled:

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(2) In the event that the employer ceases to do business and there is no successor to receive and retain his records for the prescribed period, these records shall be transmitted by registered mail to the Director, and each employee individually notified in writing of this transfer.

(3) Employees and their designated representatives shall be provided access to examine and copy records of monitoring and measuring.

(4) Former employees shall be provided acces to examine and copy records reflecting their own exposures.

(5) Upon written request of any employee, a copy of the medical record of such employee shall be furnished to a physician designated by the employee in such request.

(q) *Reports.* (1) Not later than ______ ______ the following information shall be reported to the OSHA Area Director. Any change in such information shall be reported to the OSHA Area Director within 15 days of such change.

(i) The address and location of each establishment which has one or more regulated areas; and

(ii) The number of employees in each regulated area during normal operations, including maintenance.

(2) Incidents which result in the release of vinyl chloride into any area where employees may be exposed shall be reported in accordance with this paragraph.

(i) A report of the occurrence of the incident and the facts obtainable at that time including a report on any medical treatment of affected employees shall be made within 24 hours to the OSHA Area Director.

(ii) A written report shall be filed with the OSHA Area Director within 15 calendar days thereafter and shall include:

(A) A specification of the amount of material released;

(B) A description of the area involved and the extent of known and potential employee exposure and area affected;

(C) A report on any medical treatment of affected employees and any medical surveillance program implemented; and

(D) An analysis of the circumstances of the incident, and measures taken or to be taken, with specific completion dates, to avoid further similar releases.

(3) Upon completion of any monitoring and measuring which discloses that any employee has actually been exposed to detectable levels of vinyl chloride, each such employee shall be individually notified in writing. The notice shall:

(i) Be delivered not later than 10 working days after completion of the monitoring and measuring;

(ii) State the actual exposure in terms of concentration and time; and

(iii) State the steps which have been taken, are being taken, and will be taken, with specific completion dates, to terminate the exposure and prevent a recurrence.

(Secs. 6(b), 8(c), and 8(g), 84 Stat. 1593, 1596, 1599 (29 U.S.C. 655, 657); Secretary of Labor's Order No. 12-71 (36 FR 8754))

Signed at Washington, D.C. this 6th day of May, 1974.

JOHN STENDER,
Assistant Secretary of Labor.

[FR Doc.74-10768 Filed 5-9-74;8:45 am]

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APPENDIX C

INDUSTRIAL HYGIENE SURVEY REPORT ON VINYL CHLORIDE

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APPENDIX C

INDUSTRIAL HYGIENE SURVEY REPORT ON VINYL CHLORIDE AND POLYVINYL CHLORIDE MANUFACTURING FACILITIES

BY

DIVISION OF HEALTH STANDARDS DEVELOPMENT

OFFICE OF STANDARDS DEVELOPMENT

MARCH 1974

SUMMARY

1. Five vinyl chloride monomer (VCM) and two polyvinyl chloride (PVC) manufacturing facilities in the New Orleans - Baton Rouge area have been visited by the staff of the Office of Standards Development during a fact-finding survey.

2. The PVC manufacturers have a more serious problem of VCM exposure than the VCM producers because most of the polymerization process equipment in enclosed areas and ventilation is inadequate.

3. Leaks from the process equipment, vessel entry, VCM tank car loading, unloading, and process sampling, PVC reactor cleaning, compounding and packaging are the major potential sources of VCM exposure found during this survey.

4. Engineering technology for the control of VCM exposure is available and has been implemented by the industry.

5. The observed practices relative to equipment maintenance, monitoring, medical examination and surveillance, and training are considered to be inadequate to control the employee's exposure to vinyl chloride.

6. The fact-finding survey was found to be very useful in the development of proposed rulemaking of health standards.

INDUSTRIAL HYGIENE SURVEY REPORT ON
VINYL CHLORIDE MANUFACTURING AND
POLYMERIZATION FACILITIES

Introduction

A fact-finding survey of several vinyl chloride monomer (VCM) and polyvinyl chloride (PVC) manufacturing facilities has been conducted by the staff of the Office of Standards Development during the week of March 11. Five VCM Plants and two PVC Plants in the New Orleans and Baton Rouge area were visited during this survey. A list of all plants is presented in Table 1.

Process

The VCM is either produced by the direct chlorination or oxychlorination of ethylene to ethylene dichloride (EDC) and pyrolysis of EDC to VCM or by the reaction between acetylene and hydrogen chloride. The crude VCM is purified by distillation to yield a product having purity of 99.99%.

The PVC is produced by either wet or dry polymerization process. The wet process is carried out by reacting VCM in aqueous solution containing dispersing or emulsifying agents and catalyst. The dry process produces PVC by direct reaction between VCM and catalyst in a two-stage reactor. The unreacted VCM is separated from the PVC and the raw PVC is classified into desirable size. Block diagrams of various processes are presented in Figure 1 through 4.

Potential Area of VCM Exposure and Its Control

Based on observations of this survey, the areas where exposure to VCM is likely in a VCM plant during normal operations are:

1. Sampling and analysis of VCM for quality control.
2. Loading of VCM for shipping.
3. Entry of VCM containing vessels for maintenance and repair work.
4. Leak of VCM in the process area.

The areas of VCM exposure in a PVC plant can be summarized as the following:

1. Unloading of incoming VCM.

2. Reactor cleaning.

3. Entry of VCM containing vessels for maintenance and repair work.

4. Entry of PVC storage silos.

5. Compounding of PVC into molding powder.

6. Shipping or packaging of PVC.

7. Leak of VCM in the process area.

The VCM plant is operated around the clock and usually five or less employees are worked on each shift. One or two of these employees have to stay outside for one or two hours per shift to take samples, check gages and handle minor maintenance or repair work. About ten VCM samples are collected per shift by one employee. The VCM is collected in a sampling bomb with the time of collection being about one minute. The sampling port can be modified to reduce the exposure of VCM during such operation.

Loading or unloading of VCM is another area of possible VCM exposure. Most loading is done on day shift only and the employee is loading eight or less tank cars at one time. Each loading operation takes about ten minutes. However, if more than one tank car is being loaded at one time the employee may spend as much as six hours on the loading deck every day. One company official claimed that they are installing a system to reduce the emission of VCM during loading. Since the loading deck is located in open space and ventilation is good and if the emission control system is installed and the employee is standing at the upwind direction with gloves and face shield, the exposure to VCM is insignificant.

The reactor cleaning is probably the area where VCM exposure is highest among VCM and PVC plants. The manufacturing of the PVC is still a batch process and the reaction time is about eight hours. The agitator and the bottom part of a wet process reactor is cleaned after two or three batches were made. The whole reactor of the dry process is cleaned after each batch was made. The average cleaning time is 30 minutes and usually two employees are performing the task. The dry process reactor is cleaned by using scraper and chisel under local exhaust ventilation. It is a dusty operation and no personal protective equipment of any kind is being used. A filter head which separates unreacted VCM from the PVC is cleaned by compressed air. The operator also uses compressed air to blow dust off his body. The cleaning should be performed by vacuuming or by using scraper equipped with local exhaust ventilation. In addition, the operator should wear coveralls, face shield and gloves with or without supplied air respirator depending on the residual concentration of VCM in the reactor. After the reactants and products have been removed from a wet process reactor vessel, it is filled with water and rinsed one time before cleaning. The cleaning is under local exhaust ventilation. Chisel and scraper are also used for cleaning this type of reactor. Since the reactor surface is wet, dust exposure is not a problem. However, the exposure to VCM may be likely because cold water rinse is not effective to remove the residual VCM adsorbed on the walls of the reactor and steam purging is preferred. No test for VCM concentration in the reactor was made prior to entry. It is a good practice to require the use of supplied air respirator for any reactor cleaning work.

Most employers indicated that they have established procedures for vessel entry and in some companies a permit is required prior to initiation of such operations. It is questionable whether these procedures are enforced, especially regarding VCM exposure A requirement containing details regarding entry of VCM containing vessel for maintenance or repair work should be included in the proposed standard.

There is no information available to date regarding the desorption of VCM from the surfaces of the PVC particles during storage and handling. However, it is preferable to establish a procedure for the entry of PVC storage silos and require local exhaust ventilation systems be installed in all PVC compounding, packaging and loading operations where PVC dust can be released. Although the manufacturing of VCM and PVC is under pressure in a closed system, exposure to VCM is unlikely during normal operation. However, inadequate maintenance and wear of packings and seals of process equipment can results in leaks of VCM.

Nearly all the VCM exposures are outdoors in the VCM plants while most PVC manufacturing operations except in the deep south and west coast where winter climate is mild are enclosed. The exposure of VCM from equipment leaks can be significant in a PVC plant. We found that most

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of the plants do not have maintenance crews on all three shifts and preventive maintenance program is inadequate or non-existent. We should ask the employer to implement a maintenance program to insure that the leakage of VCM is unlikely during normal operations. An equipment check list should be prepared and the frequency of inspection should be based on the probability of failure or malfunctioning of equipment, piping or fittings. The equipment maintenance and repair record should be included in the OSHA record keeping requirements.

The VCM samples collected in the bombs are analyzed by gas chromatography in a quality control laboratory. If the bomb is stored in an exhaust hood with good ventilation and the sample is withdrawn from the hood, no exposure of VCM is expected during such operations.

Monitoring

Before the outbreak of liver cancers in the Goodrich PVC plant, the VCM was considered a fire hazard and less precise sampling and analytical methods were used for monitoring. This still appears to be the case from the observations gathered on this survey. We obtained some monitoring data from several VCM plants. Only one PVC manufacturer promised us to send us monitoring data on PVC operations. Another PVC plant uses a combustible vapor tester for monitoring VCM exposure and this type monitoring is neither accurate, specific, nor sensitive to low concentrations of VCM.

Gas chromatograph (GC) appeared to be a common instrument used for the analysis of VCM. The VCM is either collected as grab or time-weighted-average (TWA) samples in gas-tight syringes, plastic bags or activated charcoal tubes.

By reviewing the monitoring data submitted by two VCM plants (Table II & III) though the data is limited; however, it does indicate that VCM loader, process sample man, and maintenance personnel are most likely exposed to higher levels of VCM than other employees in these plants. The method of control of VCM exposure for these employees are discussed in the previous section.

There is wide difference between the sampling method and analytical techniques for VCM. Standardized sampling and analytical procedures should be established for the monitoring of VCM. This may be obtained through NIOSH. Most plants indicated that they are acquiring fixed continuous monitoring stations and more sophisticated portable monitoring devices for VCM in their facilities. A guideline should be laid out to get the maximum benefit for the use of such instruments.

VCM can be detected by the GC techniques in the order of 1 ppm. The detectable range of two promising portable direct reading VCM detectors are in the order of 1 ppm. The accuracy of these instruments at such low concentration may be ±50%. The accuracy of GC is dependent on the preparation and calibration of the standard. The reliability of a prepared standard at 1 ppm may also pose a problem. A 2 ppm concentration may be the lowest limit at which we can have reasonable confidence on these instruments.

The required method of monitoring is dependent on the permissible limit on the proposed standard. If a limit is set, the VCM exposure for each job classification should be monitored on a TWA basis. Personal breathing samples should be collected on a sampling device having a collection efficiency of at least 95%. Sufficient number of area samples should also be collected to pin point high exposure areas for the implementation of control measures. The sensors of a continuous VCM monitoring system can be located at high exposure areas of VCM. The initial monitoring of the workplace should take abnormal operating conditions such as hot weather into consideration and monitoring should be repeated on a periodic basis or after process modifications and repairs.

If no exposure limit is being proposed, the initial monitoring is still required for the implementation of engineering controls. The use of direct reading and continuous monitoring instruments are more imperative since no leaks can be tolerated under such circumstances. The monitoring should be conducted on a daily basis at predetermined sampling points.

Medical

All plants have preplacement physical examination programs. However, periodic physical examination is not a common practice. Two of the six plants have a physician and nurse staff on duty, the others have a physiaian and nurse on the part time basis. Most supervisors and selected employees are trained in first aid.

Since the outbreak of the Goodrich liver cancer, more companies have started providing SMA-12 or other tests to employees who are handling VCM. However, few of the companies indicated that they are conducting medical surveillance of their employees as a routine program.

Because Dow Chemical Company is the leading producer of chlorinated hydrocarbons in this country, they have put more emphasis on liver function testing of their employees. The medical surveillance program as presented to us by Dow (Table IV) can be used as a basis for the medical requirement in our proposed vinyl chloride standard.

Engineering Control

Ventilation is still an effective method to control the VCM exposure. The control rooms in all the VCM and PVC plants are air conditioned, however, the air is withdrawn from the process area and discharged outdoors without any purification. The inlet air to the control room should be treated if a standard with very low or no permissible limit is proposed.

Engineering control methods are available for the control of VCM exposures during sampling and loading operations. However, a reasonable time should be allowed for the implementation for such measures. This is also true for the installation of local exhaust ventilation systems. It may be more practical to allow time for the implementation of engineering control measures or an interim standard could be set to give employees some protection while the employer is provided with time for implementation of such controls. Usually, a time period of six months may be sufficient to install VCM emission control system and one year for ventilation systems.

Personal Protective Equipment

All plants visited have self contained breathing apparatus (SCBA) or Gas Mask for emergency use and they indicated that every employee is trained to use such equipment. Two plants use canisters made for acid gases or ammonia other than organic vapor to equip their gas masks which is not considered to be suitable and one plant uses a quarter facepiece emergency escape respirator as a standard accessory for every employee and visitor in the process area containing hydrocarbons. This practice may give an employee a false sense of security and he may be exposed to high concentrations of VCM and still believe he is adequately protected.

Supplied air respirators, either in continuous flow or pressure demand mode should be used for reactor cleaning or maintenance and repair work inside of a vessel containing VCM. One plant used supplied air for cleaning of reactors, however, no pressure reducer nor contaminant filtering device were found in the adjacent air supply. The present OSHA standard on breathing air quality is based on the recommendation of the Compressed Gas Association (CGA) which has higher tolerance for the common contaminants in the compressed air such as oil, carbon monoxide, etc. A low tolerance of these air contaminants and VCM in the breathing air and more specific, accurate and frequent monitoring methods should be proposed to insure that the quality of the breathing air is acceptable.

The use of gas masks equipped with activated charcoal adsorbent for the VCM will depend on whether we propose a standard with or without a permissible limit. Based on a test conducted by Gary Nelson of the Lawrence Livermore Laboratory, he indicated that the activated charcoal in a organic vapor canister or catridge is not a good VCM adsorbent. From his results, the time to reach 1% breakthrough of VCM at a concentration of 1,000 ppm, 50% relative humidity, 22° C and a breathing rate of 53.3 Lpm is 3.8 minutes against 77 minutes for carbon tetrachloride. The present problem with organic vapor adsorbent is there is no indication of the useful life of such substance. The manufacturer's common practice is to set a shelf life of about three years from the date of manufacture with the assumption that the seal of the canister or catridge is remained intact. Once the seal is broken, the useful life will be one year.

Use of gas masks give an operator more freedom of movement than a supplied air respirator or SCBA. This is particularly true for the process sample man and tank car loader. If gas masks are permitted to be used when a permissible limit of 5 or 10 ppm is proposed, the requirements for periodic renewal of canisters on different levels of VCM exposures should be specified in the proposed standard.

Safety glasses, goggles, hardhat and gloves are commonly used in all plants visited. Since liquid VCM is an irritant to skin and mucous membranes, the use of eye protective devices and gloves should be made mandatory for employees who may contact liquid VCM. The VCM vapor or gas is not considered to be absorbed through the skin in sufficient amounts. The use of ordinary protective clothing is useless, and the need for an air supplied impervious suit is questionable in operations involving VCM exposure. The PVC reactor cleaning can be a dusty task, and a cloth coverall or whole body covering is a good personal hygiene practice. If VCM is not found to be absorbed through the skin then the requirement for shower facilities may not be necessary.

Housekeeping

Except for one plant, the general impression on housekeeping is that it is inadequate. This problem is more evident in the PVC plant since particulate material is involved. More effort is needed on immediate cleanup of spills and keeping the work environment in a cleaner, more orderly fashion.

Maintenance is another problem area. Preventive maintenance seems nonexistant and most of the plants have maintenance staff on day shift only. Since the leak of VCM from the process equipment, pipelines and fittings may be the significant source of unnecessary exposure in the industry, a more stringent maintenance program is imperative.

Work Practice

Most of the plants visited have either written or informal procedures regarding operations where VCM exposure is likely, such as process sampling, tank car loading, reactor cleaning and vessel entry. We may issue mandatory work practice procedures on these operations. A written procedure and checklist should be prepared for these operations. Reactor cleaning and vessel entry should be performed by permit signed by the employer or his representative to insure that all precautionary measures regarding minimizing employee's exposure to VCM during such operations are enforced.

Quite a few chemicals are used in the manufacturing of VCM or PVC. Some of them can be very toxic such as hydrogen chloride, chlorine or mercury salt. The toxic properties of some raw materials are not available at this time. It should be a safe practice to require the employer to evaluate the toxicity of every raw material he uses and establish written procedures for the safe handling of such substances.

Training

Most employers indicate that they have training courses for VCM operators and regular safety meetings to educate their employees. Some companies use the word-by-mouth training techniques, and such training is conducted by foreman. The success of such type of training is dependent on the quality of the instructor. In general, a written training manual should be preferred and should include items such as the hazards of VCM and other toxic raw materials, work practices, use and care of personal protective equipment, first aid, emergency procedures, fire fighting and safe handling of the VCM. It is imperative that an untrained employee should not be permitted to work in the VCM or PVC process area and refresher courses on these subjects should be given on a periodic basis. A monitoring system should also be established to insure that an employee is benefiting from such training.

Waste Disposal

Both of the PVC plants claimed that the unreacted VCM is recycled back to the process. The off specification VCM is reprocessed to meet the requirement. One PVC producer discharges the scraps from reactor cleaning into a pond and another collects the waste into boxes for sale to a scrap dealer. One plant loads the PVC in box cars under pneumatic force. It is a closed system, any powder released from loading is sent back to the storage silos.

Since the toxic effect of PVC is not known to date, it may be unreasonable to require the manufacturers to dispose of the PVC waste in impermeable bags since the bags are probably made from PVC or to require the incineration of PVC or VCM as a means of disposal because the decomposition product is toxic. We may require procedures to be established for the destruction of these substances by a safe chemical method or just leave this paragraph open until we get more information.

Conclusion

The exposure to VCM is less of a problem to the VCM producers than to the PVC producers because all the process equipment of the former are located outdoors with fewer employees and control is less expensive to implement. Most of the PVC manufacturing facilities are enclosed and more employees are involved in the production. Engineering Control is more expensive because of the high volume of air to be ventilated. However, control technology is readily available and the cost of compliance may not be prohibitive.

Lack of maintenance programs, monitoring activities, inadquate employee training, medical examination and surveillance, and poor housekeeping are the common observations found during this survey. We may put emphasis on these areas in our proposed standard on the VCM.

All manufacturers were very cooperative during this survey. They answered all questions we asked and gave us the information we needed. From this survey, we were given the chance to communicate with the production people to find out which areas present potential exposures to VCM, what the producer has accomplished to control the exposures at each area, and at which areas further control of the problem and what enforcement is required. We sincerely believe that this type survey should be included in our regular rule-making procedures so far as health standards development is concerned.

LIST OF FIGURES

1. Manufacturing of VCM by Direct Chlorination and Oxychlorination of Ethylene
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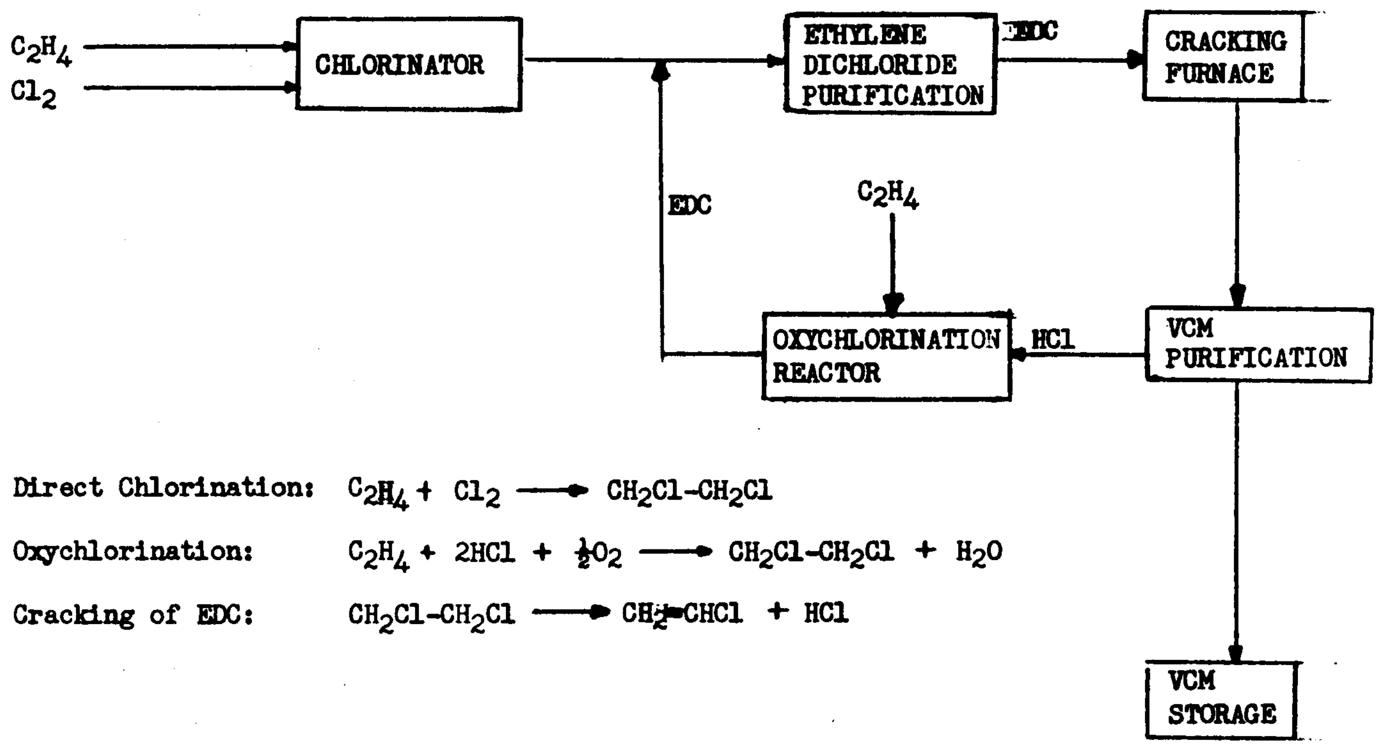
IV. Medical Surveillance Program at Dow Chemical U.S.A.

FIGURE 1.. MANUFACTURING OF VCM BY DIRECT CHLORINATION AND OXYCHLORINATION

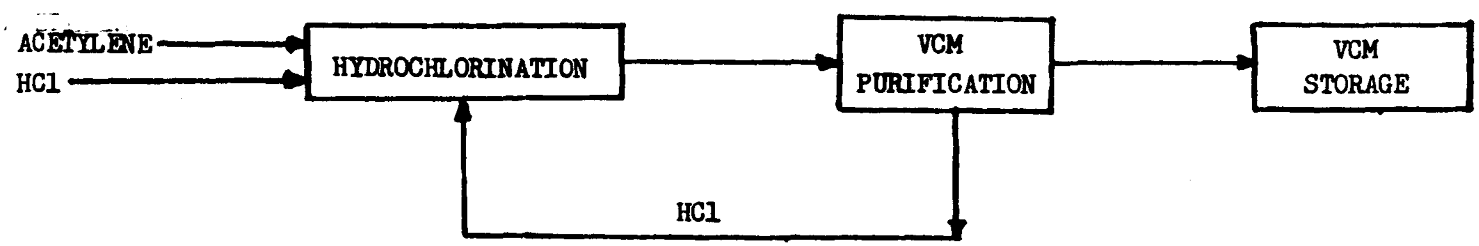


Direct Chlorination: $C_2H_4 + Cl_2 \longrightarrow CH_2Cl\text{-}CH_2Cl$

Oxychlorination: $C_2H_4 + 2HCl + \frac{1}{2}O_2 \longrightarrow CH_2Cl\text{-}CH_2Cl + H_2O$

Cracking of EDC: $CH_2Cl\text{-}CH_2Cl \longrightarrow CH_2{=}CHCl + HCl$

FIGURE 2. MANUFACTURING OF VCM BY DIRECT CHLORINATION OF ACETYLENE



$CH \equiv CH + HCl \longrightarrow CH_2 = CHCl$

FIGURE 3. MANUFACTURING OF PVC BY SUSPENSION AND EMULSION POLYMERIZATION

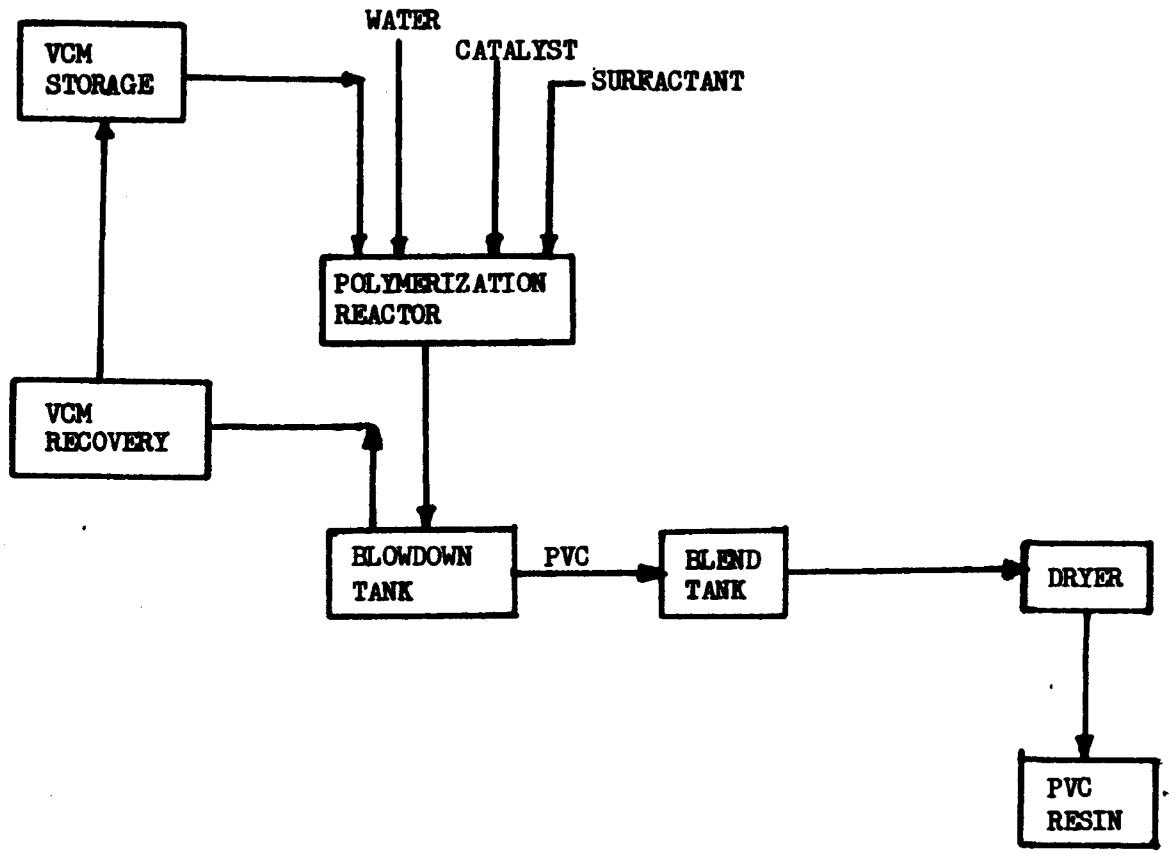


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FIGURE 4. MANUFACTURING OF PVC BY BULK POLIMERIZATION

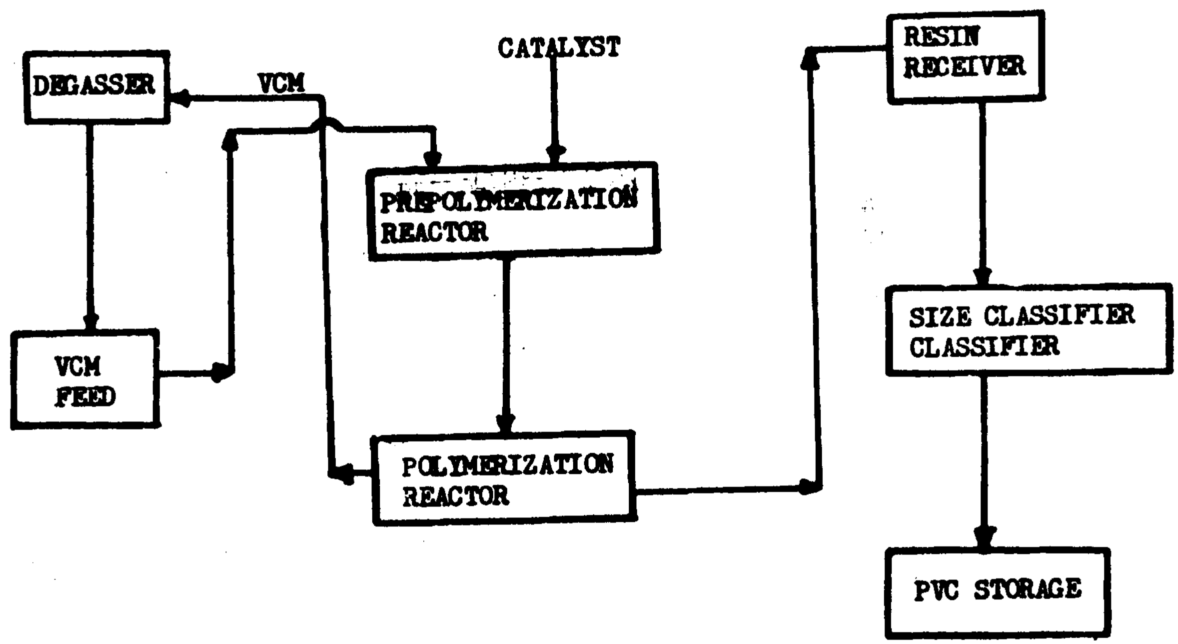

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TABLE 1

MANUFACTURING FACILITIES OF VINYL CHLORIDE
and
POLYVINYL CHLORIDE

Plane	Location	Process
Ethyl Corp.	Baton Rogue, LA	VCM- Direct and oxychlorination of ethylene
		PVC - Suspension and emulsion polymerization
Shell Chemical Co.	Norco, LA	VCM- Direct and oxychlorination of ethylene
Dow Chemical Co. U.S.A.	Plaquemine, LA	VCM- Direct chlorination of ethylene
Allied Chemical Co.	Baton Rogue, LA	VCM- Direct and oxychlorination of ethylene
Goodyear Chemical Co.	Plaquemine, LA	PVC- Bulk polymerization
Monochem Corp.	Geismar, LA	VCM- Direct chlorination of acetylene
(Borden and Uniroyal)		

TABLE II

INITIAL VCM MONITORING

DATA FROM PLANT A

Sampling Periods: November 1973

Job Classification	Sampling Time hr.	VCM Concentration ppm
VCM Operator	7.5	1.3
VCM Operator	7.5	1.7
EDC Operator	7.5	0.8
EDC Operator	25 min.	0.6
OXY Operator	7.5	0.3
VCM Loader	3.0	8.7
VCM Loader	25 min.	16.0
VCM Loader	3.5	13.4
VCM Loader	45 min.	43.0
Lab Technician	10 min.	3.2

TABLE III

VCM MONITORING DATA FROM PLANT B

Sampling period: September 1972, March & April 1973
VCM Concentration: ppm (V/V)

Job classification	Samples range high	Samples range low	Number of samples taken	TWA
Shift supervisor	3.7	0.1	10	0.4
VCM boardman	3.6	0.03	18	0.6
EDC boardman	5.5	0.07	10	2.4
Sample man	13.0	0.1	12	0.7
VCM loader	158.0	0.05	30	4.2
VCM loader	13.5	0.05	30	2.9
Shift supervisor	13.0	0.03	20	0.4
Junior operator	13.5	0.03	32	2.3
Q.C. specialist	32.1	0.05	28	3.0
Lab technician	158.1	0.06	26	10.3
Lab technician	229.0	0.1	30	15.0
Material controller	0.3	0.05	10	0.1
Instrument technician	13.0	0.03	30	1.9
Pipefitter	13.0	0.03	10	4.5
Millwright	13.0	0.03	10	4.4
Electrian	13.0	0.03	10	3.5
Laborer	13.0	0.03	12	4.5

APPENDIX D

DISTRIBUTION LIST FOR DRAFT ENVIRONMENTAL IMPACT STATEMENT

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