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

HEALTH HAZARD EVALUATION DETERMINATION
REPORT NO. 77-5-362

MATRYX COMPANY
A DIVISION OF XOMOX CORPORATION
CINCINNATI, OHIO
FEBRUARY 1977

I. TOXICITY DETERMINATION

The following determinations have been made based upon environmental air samples collected on November 19, and December 10, 1976, evaluation of work procedures, interviews with employees and available toxicity information:

1. Employees exposure to hydrogen sulfide and fluorides from the Dura Gard A1 degreaser did not constitute a health hazard at the concentrations measured during this evaluation.

2. No detectable levels of hydrogen gas were found in the area of the Dura Gard A1 degreaser. Based on this information, there is no evidence to suggest that an explosion hazard existed at the time of this evaluation.

3. Employees exposures, with the exception of the parts cleaner, to toluene, xylene and 1,1,1-trichloroethane did not pose a health hazard. The parts cleaner, however, may be exposed to excessive levels of 1,1,1-trichloroethane for short periods of time.

II. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this Determination Report are currently available upon request from NIOSH, Division of Technical Services, Information and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be available through the National Technical Information Service (NTIS), Springfield, Virginia. Information regarding its availability through NTIS can be obtained from NIOSH, Publications Office at the Cincinnati address.

Copies of this report have been sent to:

a) Xomox Corporation, Cincinnati, Ohio

b) U.S. Department of Labor, Region V

c) NIOSH - Region V

For the purpose of informing the approximately "20" "affected workers" the employer shall promptly "post" for a period of 30 calendar days the Determination Report in a prominent place near where exposed employees work.

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 an 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 a request from the Safety Coordinator of the Xomox Corporation regarding employees exposure to Dura Gard Al. Concern was expressed about the possible production of sulfides and hydrogen gas as a result of contact of the degreasing agent with metal parts other than aluminum.

IV. HEALTH HAZARD EVALUATION

A. Conditions of Use

The Matryx Company, a division of Xomox Corporation, is engaged in the manufacturing of matryx vane actuators. Dura Gard Al is used in a water solution as a degreasing agent for the aluminum vanes used in the actuators. The supplier of the Dura Gard Al states that when the degreaser is used on aluminum no hazards of any kind are present. The aluminum vanes which are degreased, however, contain a steel shaft with bronze bearings. The supplier indicated that when the degreaser is used on such metals, sulfide and hydrogen fumes could possibly be produced.

In the cleaning process, the parts are placed on a conveyor which passes through the Dura Gard Al degreaser, onto a 1,1,1-trichloroethane degreaser and then into the paint booth. The Dura Gard Al degreaser consists of two 55 gallon drums. The drum containing the Dura Gard Al is heated and is equipped with a metal housing over the drum. As the parts pass through the degreaser, the Dura Gard Al is sprayed onto the parts. The second drum, also enclosed by the metal housing, allows for the recovery of excess degreaser. The parts are then conveyed into the 1,1,1-trichloroethane degreaser where they are dipped into the solvent. The vanes then continue on to the paint booth.

In addition to the degreasers, parts are cleaned in various locations in the area with 1,1,1-trichloroethane. One covered cleaning tank is located in the area, with the remainder of the cleaning being done in five gallon cans containing varying quantities of the solvent. The frequency and duration of use varies considerably from job to job and is also dependent on the condition of the parts being worked on.

B. Evaluation Methods

An initial survey was conducted on November 19, 1976. Two impinger samples for hydrogen sulfide were collected adjacent to the degreaser containing Dura Gard A1. The Methylene Blue Spectrophotometric method was used for the analyses. Two impinger samples for fluorides were also collected at the degreaser. For fluoride analyses, the ion specific electrode method was used. An area charcoal tube sample for 1,1,1-trichloroethane was obtained at the other degreaser. A personal sample for organic vapors was collected on the painter. All charcoal tube samples were analyzed by gas chromatography. Samples were taken periodically for hydrogen sulfide using detector tubes (Range 5-60 ppm). A portable combustible gas meter was used to check for the presence of hydrogen gas.

On the follow-up survey conducted December 10, 1976, charcoal tube samples were collected for 1,1,1-trichloroethane. Long term as well as numerous fifteen minute samples were taken. Four area samples also were collected. Charcoal tube samples for toluene, xylene and 1,1,1-trichloroethane were collected on the painter.

C. Evaluation Criteria

1. Physiological Effects

The following is a brief summary of the adverse effects resulting from excessive exposure to each of the substances of concern:

Fluorides - The inhalation of fluoride fumes and gases may produce respiratory and eye irritation. Nose bleeds also may occur at higher concentrations. If fluoride intake exceeds fluoride excretion rate for a sufficiently long period of time, chronic bone damage may occur.

Hydrogen Sulfide - Hydrogen sulfide is an irritant gas. The odor is detectable as low as 0.025 ppm and is offensive and moderately intense at 3-5 ppm. Concentrations of 70-700 ppm may cause irritation of the mucous membranes of the eyes and respiratory tract. Exposures from 250-600 ppm may cause headache, dizziness, excitement, nausea, dryness and sensation of pain in the nose, throat and chest and coughing. When the amount of hydrogen sulfide absorbed in the blood stream exceeds that which is oxidized, systemic poisoning results, with a general action on the nervous system, hypernea occurs, and respiratory paralysis may follow. Unless fresh air is made available within a few minutes, death occurs.

1,1,1-Trichloroethane - The main effect of exposure to 1,1,1-trichloroethane is anesthesia. High concentrations may produce mild irritation and impairment of perceptual speed, reaction time, manual dexterity and equilibrium. The skin shows only slight reddening and scaliness from contact. The reaction is increased on repeated exposures.

Xylene - Excessive exposure to xylene may cause dermatitis, irritation of mucous membranes, nausea, vomiting, anorexia and heart burn. Dizziness, incoordination and staggering gait may also occur.

Toluene - Prolonged excessive exposure to this agent may acutely cause headache, weakness, fatigue, unconsciousness, loss of coordination, nausea, vomiting anorexia, acute dermatitis and irritation of skin and mucous membranes.

Hydrogen - Hydrogen, when present in a high concentration, acts as a simple asphyxiant without other significant physiological effects. A TLV is not recommended because the limiting factor is the available oxygen. Hydrogen also presents an explosion hazard. The lower explosive limit (L.E.L.) is 4% (40,000 ppm).

2. Environmental Standards

To assess the concentration of air contaminants found in the place of employment, three primary sources of criteria were used: (1) NIOSH criteria for recommended standards for occupational exposure to substances (Criteria Documents); (2) recommended and proposed threshold limit values (TLV's) and their supporting documentations as set forth by the American Conference of Governmental Industrial Hygienists (ACGIH) (1976); (3) occupational health standards as promulgated by the U.S. Department of Labor (29 CFR Part 1910.1000).

In the following tabulation, criteria selected for this evaluation by the author are presented with references.

Substances	Permissible Exposures (8-hour time weighted average
[1]Fluorides	2.5 mg/M[3]*
[2]Hydrogen Sulfide	10 ppm**
[3]1,1,1-Trichloroethane	350 ppm
[4]Xylene	100 ppm
[5]Toluene	100 ppm

[1]Reference: The 1976 ACGIH TLV and current Occupational Safety and Health Administration (OSHA) standard.

[2]Reference: The 1976 ACGIH TLV. The current OSHA standard is 20 ppm.

[3]Reference: The 1976 ACGIH - TLV and current OSHA Standard. The NIOSH 1976 Criteria Document recommend 350 ppm as a ceiling value for any 15 minute sample.

[4]Reference: The NIOSH 1975 Criteria Document, the 1976 ACGIH TLV and current OSHA standard.

[5]Reference: The NIOSH 1973 Criteria Document and 1976 ACGIH TLV. The current OSHA standard is 200 ppm.

Units of measured concentrations are:
*mg/M^3 - milligrams of substance per cubic meter of air
**ppm - parts of gas or vapor per million parts of air

TLV's or standards for substances are established at levels designed to protect workers occupationally exposed on an 8-hour per day, 40-hour per week basis over a working lifetime. Because of the wide variation in individual susceptibility some workers may experience discomfort at or below the designated levels. Thus, an evaluation of the work place cannot be based entirely upon comparisons made against such TLV's or standards, as various TLV's and standards do not represent absolute protection of all workers.

D. Evaluation Results and Discussion

Two impinger samples were collected for hydrogen sulfide adjacent to the degreaser containing Dura Gard A1. No hydrogen sulfide was detected. The two impinger samples collected for fluorides showed concentrations of 0.006 ug/M^3 and 0.007 ug/M^3. These values are well below the standard for fluoride of 2.5 mg/M^3. A portable combustible gas meter was used to check for the presence of hydrogen gas. No detectable levels of hydrogen gas were found. Based on this information, there is no environmental evidence to suggest that a health hazard or explosion hazard exists in relation to the use of the degreaser.

A charcoal tube sample collected in the area of the 1,1,1-trichloroethane degreaser showed the concentration of 1,1,1-trichloroethane to be 19 ppm. (The standard for 1,1,1-trichloroethane is 350 ppm.)

Charcoal tube samples collected on the painter were analyzed for 1,1,1-trichloroethane, toluene and xylene. No toluene was detected on any of the samples. Xylene concentrations ranged from nondetectable to 2.2 ppm. The concentration of 1,1,1-trichloroethane ranged from 64 ppm to 101 ppm. All concentrations were below the levels believed to cause adverse health effects.

The results of the charcoal tube samples collected for 1,1,1-trichloroethane on the parts cleaning operation are given in Table I. The results indicate that the concentrations of 1,1,1-trichloroethane in the areas adjacent to the cleaning tank are below the 350 ppm level and therefore pose no problem to employees working in the area of the cleaning tank. The results also show the time-weighted average concentration of 1,1,1-trichloroethane for the parts cleaner was 196 ppm. Of the nine fifteen minute samples collected on the parts cleaner, two showed concentrations at or above 350 ppm. The NIOSH criteria document for 1,1,1-trichloroethane states that occupational exposure shall be controlled so that workers are not exposed to 1,1,1-trichloroethane at greater than a ceiling concentration of 350 ppm as determined by a 15 minute sample. The employee also stated that he occasionally felt "groggy" or "high" from the solvent "fumes" after prolonged use. Based on the measured concentrations, it is recommended that a cooling coil be added to the tank. This should reduce the exposure of the employee and at the same time conserve solvent that is normally lost by evaporation. Until the cooling coil is added or some type of local ventilation can be installed, it is recommended that the employee wear a respirator approved for organic vapors when cleaning parts. The use of the respirator is particularly necessary after the tank has been cleaned and new solvent has been added. Review of the data shows that the concentrations measured in the afternoon, both personal and area samples, are higher than the levels measured during the morning. Work practices and procedures were consistant throughout the day with the only change being that the tank was cleaned and new solvent added.

Observation of work practices revealed that employees were having skin contact with 1,1,1-trichloroethane. Based on this observation, it is recommended that when cleaning parts with solvents, employees wear a protective skin cream and/or gloves that are not affected by the solvent. Gloves should be worn when contact with the solvent is anything but momentary. Rubber gloves should be worn with plain white cotton liners gloves to prevent maceration due to accumulated perspiration.

V. AUTHORSHIP AND ACKNOWLEDGMENTS

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TABLE 1

Xomox Corporation
Cincinnati, Ohio

December 10, 1976

Sample Location	Job Description	Sample Number	Sample Period	Sample Volume (liters)	1,1,1 Trichloroethane (ppm)
Parts Cleaner	Cleaning Parts	CT-1	7:14 - 10:56	14.2	166
" "	" "	CT-13	10:57 - 14:50	11.2	224
Work Bench Beside Cleaning Tank		CT-2	7:25 - 10:55	9.5	74
" " " " "		CT-14	10:56 - 14:50	10.4	85
Area Beside Cleaning Tank		CT-3	7:30 - 10:54	10.3	73
" " " "		CT-15	10:55 - 12:30	12.3	314
Parts Cleaner	Cleaning parts in 5 gal. can	CT-4	8:07 - 8:22	1.9	155
" "	Cleaning parts in tank	CT-5	9:25 - 9:40	1.9	291
" "	Cleaning parts in can & tank	CT-6	9:43 - 9:58	1.8	307
" "	Cleaning tank	CT-7	11:10 - 11:25	1.9	213
" "	Filling tank with solvent	CT-9	12:30 - 12:45	2.4	119
" "	Cleaning parts in tank	CT-10	12:55 - 13:10	2.0	396
" "	" " " "	CT-11	13:12 - 13:42	3.5	321
" "	" " " "	CT-17	13:45 - 14:00	2.0	350
" "	" " " "	CT-18	14:15 - 14:50	4.3	201