U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES ▫ Public Health Service
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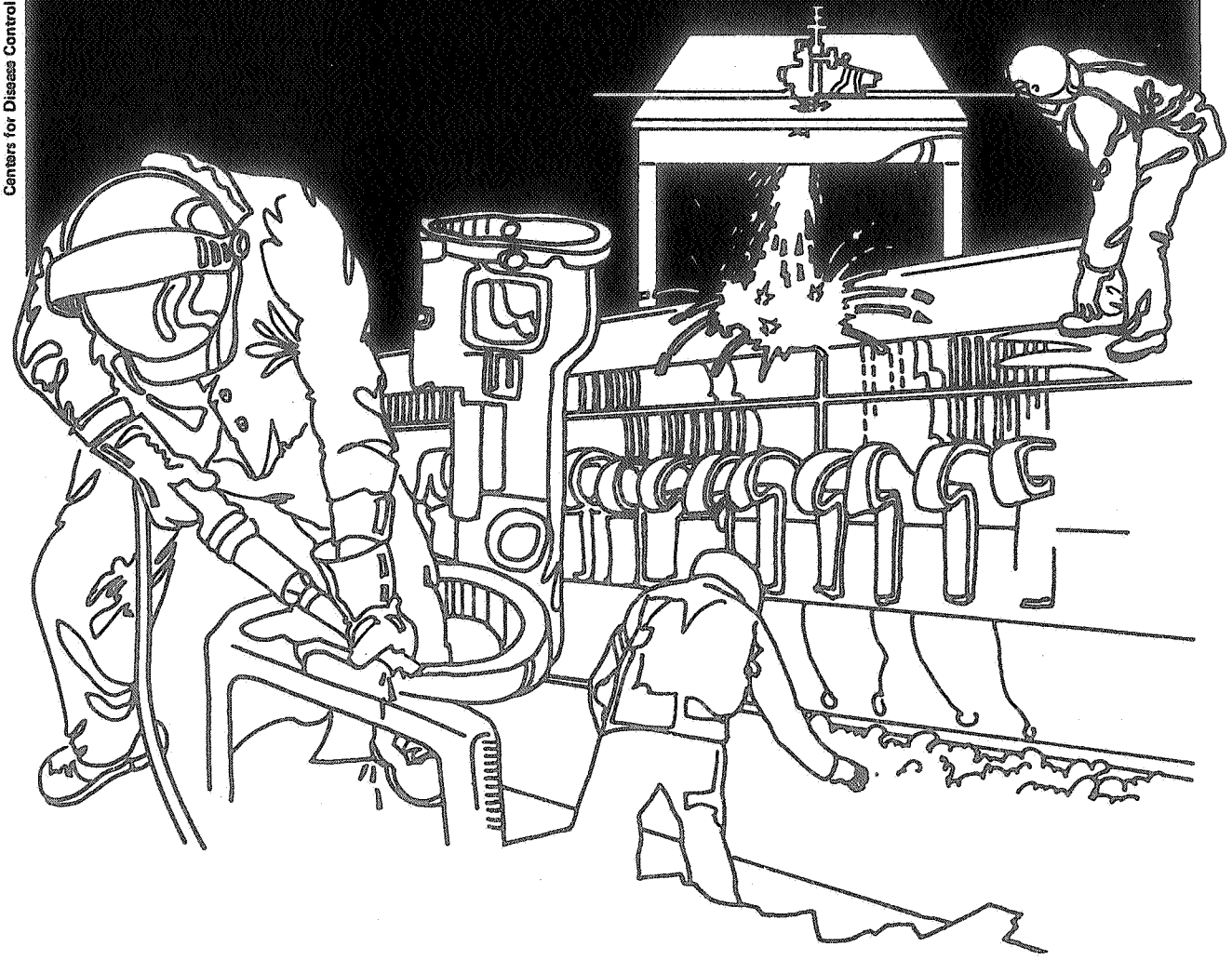

Health Hazard Evaluation Report

HETA 85-107-1841
GENERAL ELECTRIC COMPANY
SCHENECTADY, NEW YORK

PREFACE

The Hazard Evaluations and Technical Assistance Branch of NIOSH conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6) which authorizes the Secretary of Health and Human Services, following a written request from any employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

The Hazard Evaluations and Technical Assistance Branch also provides, upon request, medical, nursing, and industrial hygiene technical and consultative assistance (TA) to Federal, state, and local agencies; labor; industry and other groups or individuals to control occupational health hazards and to prevent related trauma and disease.

HETA 85-107-1841
OCTOBER 1987
GENERAL ELECTRIC COMPANY
SCHENECTADY, NEW YORK

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I. SUMMARY

In December 1984, the National Institute for Occupational Safety and Health (NIOSH) received a request from the International Union of Electrical Workers (IUEW) of AFL-CIO to evaluate employee exposures in Building 273, J-K 24 wind stand area at the General Electric Plant in Schenectady, New York. There was concern about whether there had been excess deaths and illness among the workforce since 1979. There was also a general concern regarding employee exposures to chemicals in this area. The "flooding operation", which involves the application of an epoxy resin coating to surfaces of large steam turbine generator stators, was of particular concern. This process was only being conducted twice per year.

Union safety and health officials identified a number of deaths and illnesses among the 60 workers assigned to the wind stand area which occurred since 1979. Review of available medical records, which included copies of death certificates, provided no evidence for, or against, work related disease. The number of workers was too small and there was no consistent repetition of morbid conditions or mortality.

It was noted during the early stages of this health hazard evaluation that there are over 50 different chemicals used in the wind stand area and that very little toxicity information was available to the workers. Labeling of repackaged chemicals, conflicting, or incorrect, data on many General Electric material safety data sheets (MSDS) and a lack of industrial hygiene air sampling data, were also identified as significant problems. A noticeable improvement with most of these deficiencies was evident toward the end of the investigation. The passage of the Hazard Communication Act in 1985 and the efforts of the new health and safety manager were key factors which precipitated this change.

Exposures during the "flooding operation" were monitored on May 16 and 17, 1986. Four workers were monitored via personal breathing zone air sampling techniques to evaluate airborne exposure to epoxy resin components (bisphenol A and diglycidyl ether of bisphenol A), epichlorohydrin and organic vapors. None of the resin components were detected in any of the air samples. The limit of detection (LOD) was 0.5 ug/m^3 for bisphenol A and the diglycidyl ether of bisphenyl A. Also, there was no evidence of airborne exposure to epichlorohydrin

using a sampling and analytical method with LOD of 0.6 ppm. The only organic vapor detected was Propasol® Solvent P (propoxypropanol isomers). Airborne concentrations ranged from 7.4 to 31.0 mg/m^3 (X=14.5) for the 4 personal breathing zone samples. The two area air samples, one from each end of the stator, measured 3.9 and 43.6 mg/m^3. There is no established exposure criteria for Propasol® Solvent P, which was used a solvent for the epoxy resin. According to the manufacturer, it is an irritant and has central nervous system depressant effects.

Occupationally related deaths and illness among wind stand workers could not be substantiated. The "flooding" operation, as monitored during this investigation, did not present a health hazard. Recommendations regarding protective gear and further industrial hygiene monitoring are made in Section VIII.

KEYWORDS: Sic 3621 (Manufacturing, Motors, and Generators) Epoxy Resin, Bisphenol A, Diglycidyl Ether, Epichlorohydrin, Propasol® P Solvent

II. INTRODUCTION

On December 11, 1984, the chairman of the Safety and Health Committee, Local 301, International Union of Electronic, Electrical, Technical, Salaried and Machine Workers, AFL-CIO at General Electric Company, Schenectady, New York requested that NIOSH investigate working conditions in the wind stand area of Building 273 (J-K 24). Concern was expressed over the large number of toxic chemicals used and the inability to get sufficient and accurate information on the potential hazards of working with these chemicals. The request was prompted because of a perceived excess of deaths and illness among wind stand workers since 1979.

An industrial hygienist and an epidemiologist from NIOSH, conducted an initial survey on May 7, 1985. An opening conference was attended by both company and union officials. Topics discussed included illness and death among wind stand workers, availability of accurate and complete MSDS sheets, confusion in labeling, availability and appropriateness of certain personal protective equipment and industrial hygiene data from the wind stand area. There after, a walkthrough of selected plant areas, including the wind stand area, was conducted. Results and recommendations from this survey were forwarded via letter on May 21, 1985. This letter also notified GE that NIOSH planned to monitor worker exposures during a major "flooding" operation. The next "flooding" operation was scheduled for November, 1985. A change in NIOSH project officers (the initial project officer left NIOSH) occurred before the November "flooding" operation. The new project officer visited the GE plant during the "flooding" operation on November 19-20, 1985 but, rather than conduct air sampling, used this opportunity to observe the conditions of exposure and collect additional information on the specific resin system and solvents used so that an effective sampling protocol could be developed for the next scheduled "flooding". A NIOSH letter was sent on February 6, 1986 which recapped the November visit, summarized informal worker interviews, commented on the epidemiologic issues regarding deaths and illness among the wind stand work force, and requested specific information related to the anticipated "flooding" operation.

The "flooding" operation was monitored on May 16 and 17, 1986. Results from this survey and recommendations were forwarded on September 9, 1986.

III. BACKGROUND

Steam turbine generators have been manufactured at the GE, Schenectady plant for more than 40 years. The wind stand area, which is the primary area under investigation in this health hazard evaluation, is

only a small part of the manufacturing process. Numerous operations requiring the use of many toxic chemicals take place; however, the "flooding" operation, where epoxy resin coating is applied to surface areas of large turbine stators, was identified as a major area of concern. There are two phases to the process. In the first phase, an epichlorohydrin and bisphenol A-derived epoxy resin is applied to stator surfaces using a gentle stream from a garden hose. After several applications to both ends of the turbine stator, the second phase, where tape and other protective coatings are stripped off and selected areas are cleaned with solvent (Propasol® Solvent P), takes place. The operation involves 6 workers at a time and can last up to 20 hours. Prior to 1985, ethylene glycol, which is now considered a carcinogen, was used as the resin solvent.

At the time of this investigation the major "flooding" operation was occurring at the rate of about two per year. A decline in customers due to changing technology made the future frequency uncertain.

IV. METHODS

A. Environmental

The environmental effort was divided into two primary areas of consideration:

1. Chemical Usage and Worker Education

   This area of consideration was evaluated by reviewing lists of chemicals used in the wind stand area, MSDS sheets on these chemicals, labeling practices, and training methods used to educate workers concerning potential hazards and appropriate work practices.

2. Exposure Monitoring during a "Flooding" Operation

   Exposures during a major "flooding" operation were evaluated on May 16-17, 1986. The sampling protocol used was developed based on the specific chemicals involved in the process. The epoxy resin was a two part system. Part A was the diglycidyl ether of bisphenol A which is derived by reacting bisphenol A with epichlorohydrin. Part B contains the co-reactive curing agent which is a polyamine. Part A is mixed with Part B in a prescribed ratio and the resulting liquid resin is applied to selected surfaces at both ends of the turbine stator. The solvent used, which replaced ethylene glycol in 1985, was Propasol® Solvent P and is a mixture of propoxypropanol isomers, primarily 1-propoxy-2-propanol. Therefore, the potential exposures included the resin components (bisphenol A, diglycidyl ether of bisphenol A, epichlorohydrin) and Propasol® Solvent P.

a. Bisphenol A (BPA) and Diglycidyl Ether of Bisphenol A (DGEBA)

A known volume of air was drawn through 37 millimeter, glass fiber (GE) filters at 500 cc/min. using battery-operated sampling pumps. The air samples were subsequently analyzed by NIOSH Method P&CAM 333. After preparing (desorbing) each GF filter with 3 ml of acetonitrile, sonicating for 20 minutes and filtering through a 0.45 micron Teflon filter, aliquots of the solution were injected into a high pressure liquid chromatograph for analysis of BPA and DGEBPA. The analytical Limit of Detection (LOD) for both compounds was 0.5 microgram per sample.

b. Epichlorohydrin

Airborne concentrations of epichlorohydrin were evaluated by drawing air at the rate of 13 to 35 cc/min through standard, 150 mg charcoal tubes. The A and B sections of each tube were desorbed with 1 ml of carbon disulfide; aliquots of the resulting solution were injected into a gas chromatograph (FID detector) and analyzed in accordance with the provisions of NIOSH Method 1010. The analytical LOD was 0.01 mg/sample.

c. Propasol® Solvent P (propoxypropanol)

At the time of this survey, there was no specific sampling and analytical method for this solvent; however, its' chemical properties are similar to butyl-cellosolve for which there is a standard method (NIOSH Method 1403). Therefore Method 1403 was modified and used as follows. A bulk sample of the liquid solvent (Propasol® Solvent P) was first used to set up and calibrate the instrumentation. The air samples were analyzed using a gas chromatograph equipped with an FID detector and a 6-foot stainless steel column containing 10% SP-1000 on Chromosorb W.

B. Medical

1. Informal Interviews

Wind stand workers were interviewed by the NIOSH industrial hygienist on November 19, 1985 to identify their concerns and symptoms which they associate with their job. A non-directed questionnaire was used to guide the interviews.

2. Epidemiology

Among the concerns listed in the request for NIOSH assistance was a general feeling among union representatives that an excess number of deaths and illnesses in this workforce had occurred since 1979. To evaluate these concerns a NIOSH epidemiologist met with union and company officials to review lists containing the names of wind stand workers who either had died or had a specific chronic illness. The work histories and medical records for these workers, which for those who were deceased, contain copies of death certificates, were reviewed at the plant industrial clinic. The GE corporate epidemiologist was also contacted to determine how personnel and work history data were maintained at the corporate level, and if any of these corporate-maintained data would support epidemiologic study.

V. CRITERIA

As a guide to the evaluation of the hazards posed by workplace exposures, NIOSH field staff employ environmental evaluation criteria for assessment of a number of chemical and physical agents. These criteria are intended to suggest levels of exposure to which most workers may be exposed up to 10 hours per day, 40 hours per week for a working lifetime without experiencing adverse health effects. It is, however, important to note that not all workers will be protected from adverse health effects if their exposures are maintained below these levels. A small percentage may experience adverse health effects because of individual susceptibility, a pre-existing medical condition, and/or a hypersensitivity (allergy).

In addition, some hazardous substances may act in combination with other workplace exposures, the general environment, or with medications or personal habits of the worker to produce health effects even if the occupational exposures are controlled at the level set by the evaluation criterion. These combined effects are often not considered in the evaluation criteria. Also, some substances are absorbed by direct contact with the skin and mucous membranes, and thus potentially increase the overall exposure. Finally, evaluation criteria may change over the years as new information on the toxic effects of an agent become available.

The primary sources of environmental evaluation criteria for the workplace are: 1) NIOSH Criteria Documents and recommendations, 2) the American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Values (TLVs), and 3) the U.S. Department of Labor (OSHA) occupational health standards. Often, the NIOSH recommendations and ACGIH TLVs are lower than the corresponding OSHA standards. Both NIOSH recommendations and ACGIH TLVs usually are based on more recent

information than are the OSHA standards. The OSHA standards also may be required to take into account the feasibility of controlling exposures in various industries where the agents are used; the NIOSH-recommended exposure limits, by contrast, are based primarily on concerns relating to the prevention of occupational disease. In evaluating the exposure levels and the recommendations for reducing these levels found in this report, it should be noted that industry is legally required to meet those levels specified by an OSHA standard.

A time-weighted average (TWA) exposure refers to the average airborne concentration of a substance during a normal 8- to 10-hour workday. Some substances have recommended short-term exposure limits or ceiling values which are intended to supplement the TWA where there are recognized toxic effects from high short-term exposures.

A. Epoxy Resin Components[1,2]

1. General Comments

Epoxies are monomers or prepolymers that further react with curing agents to yield high performance thermosetting plastics. The epoxy resin used during this investigation, a diglycidyl ether of bisphenol A (DGEBA), is a very common system that is derived from bisphenol A and epichlorohydrin (EPCH). The DGEBA is part A of a two part epoxy system. Part B, for this study, was a aliphatic polyamine curing agent.

2. Bisphenol A (BPA) and Diglycidyl Ether of BPA (DGEPA) (Part A)

Glycidyl ethers are synthetic compounds that are common components of epoxy resin systems. The "diglycidyl ether of bisphenol A" has been a traditional active ingredient of epoxy resins; other glycidyl ethers are frequently incorporated into epoxy resin systems as reactive diluents. The epoxy group of the glycidyl ethers reacts during the curing process and glycidyl ethers are therefore generally no longer present in completely cured products. Epoxy resins containing glycidyl ethers are used in a variety of applications including protective coatings, reinforced plastics, as well as bonding materials and adhesives.

BPA and DGEBPA are of low toxicity based on animal feeding studies.[4] In animals, both compounds exhibit minimal eye and skin irritation. They are, however, capable of producing skin sensitization reactions on repeated contact. Mutagenesis studies with DGEBPA have thus far resulted in equivocal

findings.[2,15] NIOSH has recommended[8], based on evidence that some glycidyl ethers have the potential to produce tumorigenic, mutagenic or reproductive effects, and because few have been adequately tested, that caution be used when handling uncured resin components.

Worker exposures to BPA and DGEBPA were evaluated in a previous NIOSH report.[6] Exposure levels in this previous NIOSH study reached 1.06 and 0.20 mg/m^3, respectively. Reported health effects included eye and mucous membrane irritation, and mild skin manifestations, including red papules, erythema, and peeling which were confined to the hands, neck, and upper chest. No acute respiratory problems were noted. In another NIOSH report,[7] workers were exposed to BPA concentrations of up to 0.008 mg/m^3 and to DGEBPA concentrations of 0.0004 mg/m^3. These levels were judged not to be causing health effects.

No environmental criteria or standards have been recommended for BPA or DGEPA.

3. Epichlorohydrin

Epichlorohydrin, is intensely irritating and produces necrosis (tissue degeneration) on repeated contact. In October 1978, NIOSH recommended that this chemical be handled in the workplace as if it were a human carcinogen and therefore, that exposures to it be minimized to the extent feasible.[3] This recommendation was based on a thorough review of the literature which documented a statistically significant increase in respiratory cancer in workers exposed to epichlorohydrin and a statistically significant increase in nasal carcinomas seen in rat inhalation studies, as well as the chromosomal abberrations seen in the peripheral lymphocytes of exposed workers. The OSHA standard, ACGIH-TLV and NIOSH-REL for epichlorohydrin are 5 ppm, 2 ppm and "lowest feasible level" respectively.

4. Polyamines[9] (Part B)

The majority of studies of the effects of aliphatic polyamines have related to local action which is primarily irritative and sensitizing. Curing agents such as ethylenediamine, diethylenetriamine, and triethylenetriamine are highly alkaline and capable of causing extensive corrosive skin reactions. They are also skin sensitizers and hence may cause allergic skin reactions. Due to low vapor pressures, significant airborne vapor concentrations would not be expected at ambient temperatures; however; if heated, their vapors can cause eye irritation with lacrimation, conjunctivitis, and corneal edema, which result in "halos" around lights.

No exposure criteria has been established for the of polyamine used as the curing agent in this investigation.

B. Propasol® Solvent P[10]

Propasol® is a registered trademark of Union Carbide. Proposal® solvent P is a mixture of isomers (2-propanol, 1-propoxy) and, at present, there has been no exposure criteria established for this substance. Inhalation of its vapors may be irritating, causing nasal and chest discomfort. Prolonged exposure to moderately high concentrations may product dizziness, drowsiness, incoordination, speech difficulties, headache and loss of consciousness. Contact with the skin for a few minutes may produce mild redness. Prolonged contact will produce severe redness and swelling. Eye contact with the liquid causes severe irritation, seen as marked by excess redness and swelling of the conjunctiva, discharge, and extensive corneal injury. A literature search did not produce any evidence that this substance is carcinogenic or mutagenic. Contact with its liquid or vapors should be avoided through the use of engineering controls, protective equipment and good work practices.

VI. RESULTS AND DISCUSSION

A. Environmental

1. Chemical Usage and Worker Education

Well over 50 chemicals are used in the wind stand area. Information requested from union and management health and safety representatives on these chemicals was incomplete and, in a number of cases, conflicting. Containers of chemicals in the work area were often labeled only with a GE code number with no information on the contents of the can or potential hazards. Although there was some evidence that employees had received general training on chemical handling, there is very little evidence prior to this investigation that workers received training on the specific chemicals used in the wind stand area. Only a very limited amount of industrial hygiene sampling had been collected, therefore worker exposures for many tasks had not been documented. In the few instances where industrial hygiene sampling had been accomplished, the data was not readily shared with the workers or their health and safety representatives.

As this investigation progressed, significant improvement was noted in most of the areas cited above. The passage of OSHA's Hazard Communications Act in 1985 and the appointment of a building health and safety officer was a major factor which contributed to this improvement. Examples of the progress noted include:

a. A complete set of MSDS sheets, many of which were updated, in accordance of the requirements of the OSHA, Hazard Communication Standard (CFR 1910.1200), were available near the work site.

b. Workers reported that they attended special training sessions which address the chemicals used during the "flooding" operations.

2. Exposure Monitoring During a "Flooding Operation"

Employee exposures to resin components (BPA, DGEBA and epichlorohydrin) and organic vapors were monitored in May, 1986. The "flooding", or application of the resin, started at 7:00 pm on Friday (5/16/86) and continued for approximately 6 hours. The second phase (stripping), where tape, wood and cardboard, used to protect surfaces not resin treated, were removed, began at 3:00 am on Saturday (5/17/86) and lasted for approximately 1 1/2 hours.

Four workers (two on each end of the generator) were monitored using personal breathing zone (PBZ) techniques during both the "flooding" and stripping" phases. Since the "flooding" operation extended into the next work shift, the PBZ samplers were transferred to workers on the next shift so that exposure data would represent an average for the entire process [on many occasions, this process would be done on one shift]. The second shift workers, who started the "flooding" operation, were monitored from 7:10 pm to 10:20 pm on May 16, 1986. The workers who continued the "flooding" on the next shift were monitored from 11:25 pm on 5/16 until 1:15 am on 5/17. The total sampling time during the "flooding" operation was about 5 hours. Air samples were also obtained near each end of the generator during the "flooding" phase to monitor airborne levels of epichlorohydrin and organic vapors near the points of resin application. Approximately 80 gallons of epoxy resin were applied during the "flooding" operation.

None of the resin components evaluated (BPA, DGEBA, epichlorohydrin) were detected in any of the 10 air samples collected during the "flooding" operation. The analytical limit of detection (LOD) was 0.5 micrograms (ug) per sample for BPA and DGEBA. Considering that the volume of air sampled was about 750 liters, the LOD for the overall method was 0.7 ug/m^3 for each substance. The resin application technique, which utilized a gentle flow from a garden hose rather than other more vigorous techniques such as compressed air spraying, helped to minimize the aerosolization and, therefore, airborne levels of the resin material.

Epichlorohydrin was not detected in any of 4 PBZ air samples or in either of 2 area air samples collected during the "flooding" operation. The analytical LOD was ug per sample. Considering that the volume of air sampled was about 4 liters, the LOD for the overall method was 2.5 mg/m^3 (0.6 ppm).

Table 1 presents results from the analysis of the organic vapor samples. The only organic vapor emitted from the flooding operation was identified as the Propasol® Solvent P (propoxypropanol isomers). The predominant isomer identified was 1-propoxy--propanol. The concentrations given in Table 1 represent the total of the isomers present and will be referred to as propoxypropanol isomers (PPI). Worker exposures to PPI, during the "flooding" phase, ranged from 7.4 to 31.0 mg/m^3 and averaged 14.5 mg/m^3. This represents a time-weighted-average exposure for the period of sampling, which was 5 hours. PPI was not detected during the "stripping" phase which only lasted for about 1 1/2 hours.

None of the workers monitored complained of any symptoms during the "flooding" or "stripping" operations monitored. It should be noted that, due to the time of the year (May) ventilation of the area was at a maximum. Therefore, the process monitored represented a best-case situation. Exposures may be higher for the same operation if conducted in January or February under minimum ventilation conditions.

There is no established exposure criteria for propoxypropanol; however, the most recent MSDS sheet indicated that caution should be exercised when working with this material. The major adverse health effects from this material are reported, in the MSDS sheet, to be due to its irritant and central nervous system depressant effects.

Protective equipment in the form of boots, Tyvek® coveralls, gloves, plastic sleeves and organic vapor respirators were available at the work site. Protective skin cream was also available and applied under the gloves. Although some workers wore glasses, chemical splash goggles/face shields were not used. The Tyvek® coveralls did not hold up well under the vigorous tasks necessary during the stripping phase.

B. Medical

1. Informal Interviews

Nineteen workers were privately interviewed to evaluate their concerns and identify potentially work-related symptoms. The questionnaire in Enclosure A was used to guide the interviews. At the time of these interviews, workers were not involved in "flooding" operations.

All workers were classified as Winders and worked in the wind stand area. All were males and ranged in age from 35 to 62 years old (mean=44) with wind stand experience of 5 weeks to 33 years (mean=12). Three workers had less than 3 months experience in the wind stand area. Six workers smoked cigarettes. Eleven (58%) of the workers experienced symptoms they felt were related to their job and these symptoms went away with a short time in fresh air. The symptoms felt to be job related and the number of workers reporting them included: dizziness or lightheadedness (5), dry mouth (4), nausea (4), headache (3), shortness of breath (2), pains in chest (1), dermatitis (1 - no problem at time of this survey). Medical attention was not sought except for two incidents where resin material got on the eyelid or very near the eye.

There were no complaints during the time that workers exposures were monitored by NIOSH (5/16-17/87). The symptoms reported were therefore associated with other tasks or earlier flooding/stripping operations.

2. Epidemiology

Available medical and work history records of those wind stand workers who were identified by union safety and health representatives as being injured or recently (within last 3 years) deceased were reviewed for patterns of disease. No patterns of disease was noted; however, due to the small number and, undoubtedly not representative sample, no conclusion as to a pattern of mortality or morbidity could be derived. The two

most common causes of death among those records reviewed were heart disease and cancer. Since these are also the most common causes of deaths in the general population it is not possible, in so few deaths reviewed, to link the disease to occupational exposure. There were no extremely rare cancers that could be considered sentinel markers (such as hepatic angiosarcoma in vinyl chloride workers) Also, because workers commonly sought private medical care, rather than exclusively using the plant medical facility, the medical records would be inadequate to detect mortality or morbidity patterns. The corporate epidemologist reported that records are maintained by the corporate office that would allow identification of all workers by building, but not by location within building or by department. Hence, no cohort of individuals assigned to the wind stand could be identified for longitudinal morbidity or mortality study. Following up all workers at the Schenectady plant to later pull out the wind stand workers by review of all job histories is technically possible but prohibitively expensive. The information reviewed during this limited investigation provided no evidence to suggest the need for such a study.

VII. CONCLUSIONS

Occupationally related deaths and/or illness among wind stand workers could not be substantiated. The "flooding" operation, as monitored during this evaluation did not present a health hazard. Future "flooding" procedures should be monitored closely, especially in the winter when ventilation would be minimal because the large hanger-type doors would be closed.

VIII. RECOMMENDATIONS

1. In addition to the personal protection gear (boats, coveralls, gloves, plastic sleeves, hoods and respirators) already used, it is recommended that anti-fogging, chemical splash goggles be worn during "flooding" and "stripping" to minimize the potential for eye injury.

2. "Flooding" and "stripping" operations should be monitored closely, especially in winter weather condition when ventilation from open doors would be minimal. As a minimum, these evaluations should include; a symptom questionnaire, and quantitation of solvent (Propasol® Solvent P) exposures for the two workers at each end of the assembly.

3. Wind stand workers with health complaints related to their job should be encouraged to report their concerns to the medical director through the safety and health representative in their area. Specific tasks that generate health complaints should be evaluated from both an industrial hygiene and medical point of view.

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XI. DISTRIBUTION AND AVAILABILITY OF REPORT

Copies of this report are currently available upon request from NIOSH, Division of Standards Development and Technology Transfer, Publications Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be available through the National Technical Information Service (NTIS), 5285 Port Royal, Springfield, Virginia 22161. 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:

1. General Electric Company
2. IUE, Local 301
3. NIOSH, Boston Region
4. OSHA, Region II

For the purpose of informing affected employees, copies of this report shall be posted by the employer in a prominent place accessible to the employees for a period of 30 calendar days.

Table 1

Propasol® Solvent P(1)
General Electric Company
Flooding Operation
HETA 85-107

May 16-17, 1986

Sample No.	Job Description/ Location	Sample Type(2)	Sampling Time (hours)	Concentration(3) mg/m^3
P50	Winder	PBZ	5.0	31.0
P51	Winder	PBZ	5.0	11.1
P53	Winder	PBZ	5.0	7.4
P53	Winder	PBZ	5.0	8.3
P55	Near turbine end	PBZ	5.9	3.9
P56	Near collector end	PBZ	5.9	43.6
P64	Blank	BL	-	N.D.(4)
P65	Blank	BL	-	N.D.

Notes:
(1) Propasol® Solvent P is a registered trade name for a Union Carbide Corporation product which contains 100% propoxypropanol.
(2) PBZ = Personal Breathing Zone, A = Area, BL = Blank.
(3) Time-weighted-average for period of sampling.
(4) ND = Not detected. The analytical limit of detection (LOD) was 0.01 mg per sample. Considering the flow rates and sampling times for this survey, the LOD for the sampling and analytical method for the (PBZ) and (A) samples was 2.5 and 0.7 mg/m^3 respectively.

Enclosure A

Questionnaire

Wind Stand Area (Flooding)
General Electric
Schenectady, New York
HETA 85-107

November 19-20, 1985

A. Name: _____ F ___ M ___ Age: ____

B. Smoking history:

C. Job History:

Current Job Title: _____ How Long: ____ Shift: ____

Duties:

Previous Job Titles:

D. Health Problems Related to Job: Yes ___ No ___

If yes explain:

Visits to clinic:
Under doctors care: Yes ___ No ___
If yes for what:
Medication:

E. Personal Protective Equipment:

F. Training/Education:

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