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. 76-93-477

GENERAL ELECTRIC
PHILADELPHIA, PENNSYLVANIA

APRIL, 1978

I. TOXICITY DETERMINATION

No conclusions could be drawn relating two cases of cancer to occupational exposures. Past environmental sampling indicated levels capable of causing mucous membrane irritation, however, personal samples based on a 8 hour time weighted average could not be considered excessive. Recommendations are made to revise environmental sampling techniques, and provide additional controls during material transfer.

This determination is based upon review of medical data received, consultants environmental sampling data, inspection of the work area and materials used, and review of current literature.

II. DISTRIBUTION AND AVAILABILITY

Copies of this determination report are available upon request from NIOSH, Division of Technical Services, Information Resources 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 have been sent to:

a) General Electric Company, Switchgear & Business Division
b) Authorized representatives of the Employees, International union of Electric, Radio & Machine Workers of America
c) Director, Dept. of Social Action, International Union of Electrical Workers, 1126 16th St. N.W., Washington, D.C. 20036

d) U.S. Department of Labor - OSHA, Region III
e) NIOSH, Region III

For the purpose of informing the approximately 10 "affected employees", the employer should promptly "post" for a period of 30 calendar days the determination report in a prominent place(s) where affected employees work.

III. INTRODUCTION

Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(2)(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 a potentially toxic effect in such concentrations as used or found.

The National Institute for Occupational Safety and Health, (NIOSH) received such a request concerning the number of employees assigned to the Clean Dip Vacuum Parts area who have developed some form of cancer.

IV. HEALTH HAZARD EVALUATION

A. Process Description

The General Electric Elmwood Ave. Plant is engaged in the manufacturing of electric transmission and control systems. The area effected by this request is involved in the assembly of vacuum interrupters which are used in transmission systems to prevent overloading. Prior to assembly component parts are chemically cleaned in acid baths. Normally one employee handles the work in the chem clean area however in his absence other workers from the area will fill in. Cleaning is performed by placing parts in alternating room temperature baths of water and chromic, hydrochloric, nitric, sulfuric and acetic acids. Present operating conditions have been recently renovated to provide a minimum air flow of 100 linear feet per minute at the surface of the tank. The greatest inhalation exposure to acid mist and vapor occurs when baskets of parts are transfered from tank to tank. As with any operation involving acids the potential for burns always represents an ever present hazard. Once parts are clean remaining metal ceramic and glass components are assembled under clean room conditions by approximately six workers prior to evacuation and sealing of final interrupter units.

B. Evaluation Design

The initial survey at General Electric was conducted by Wesley Straub,

Industrial Hygienist of NIOSH on August 27, 1976. The area designated in the request was observed and reviewed with an employer and employee representatives. Actual operation of the chem clean area was not observed at this time due to the general renovation being done in this area. Results of environmental sampling conducted by a consultant were reviewed. Revisits were subsequently made on November 16, 1976 and January 19, 1977 to review chem clean equipment changes and conduct employee interviews. Medical releases for two present and two former workers were obtained and information was requested from their private physicians. Significant delays were encountered with this report due to operational changes at the plant and the inability to obtain medical data from associated private physicians. Interum reports were submitted with information to date on September 13, 1976 and January 20, 1977.

C. Evaluation Criteria

Airborne exposure limits intended to protect the health of workers have been recommended or promulgated by serveral sources. These limits are established at levels designed to protect workers occupationally exposed to a substance on a 8-hour per day, 40-hour per week basis over a normal working life time. For this investigation, the criteria used to assess the degree of health hazards to workers were selected from the following sources:

1. NIOSH Recommended Standards airbourne exposure limits which NIOSH has recommended to OSHA for occupational health standards.

2. OSHA Standards - the air contaminant standards enforced by the U.S. Department of Labor as found in 29CFR, Part 1910.1000, January, 1976.

SOURCE	SUBSTANCE	TIME WEIGHTED AVERAGE CONCENTRATION
NIOSH	Chromic Acid	0.05 mg/M^3(a)
OSHA	Hydrochloric Acid	5.0 ppm(b)
OSHA/NIOSH	Nitric Acid	2.0 ppm
OSHA/NIOSH	Sulfuric Acid	1.0 mg/M^3
OSHA	Acetic Acid	10.0 ppm

a) mg/M^3 denotes milligrams per cubic meter of air.
b) ppm denotes parts per million parts of air.

D. Toxic Effects

Acids in general both organic and inorganic are corrosive especially

at high concentrations: they will destroy body tissue and cause chemical burns when in contact with the skin and mucous membranes. Acid mists and vapors are respiratory tract and mucous membrane irritants although the degree of irritation depends to a large degree on the concentration. Since the effect of acids are similar in nature the overall effects of the various acids used must be considered as additive. A brief description of some of the specific effects associated with acids used area as follows:

Acetic acid - in the concentrated form is a primary skin irritant and will produce erythema, chemical burns and blisters. In cases of ingestion severe lesions of the upper digestive track may occur. The vapors have an irritant action on exposed mucous membranes particularly the conjunctive, rhino pharynx and upper respiratory tract. The extent of acclimatisation is remarkable however following repeated exposure workers may complain of digestive disorders with pyrosis and constipation. The skin on the palms of the hands is subject to the greatest exposure and becomes dry cracked and hyperkeratotic and any small cuts and abrasions are slow to heal.

Chromic Acid - has a direct corrosive effect on the skin and mucous membrances of the upper respiratory tract and although rare skin and pulmonary sensitization may occur. Chromic acid exposure may result in lacrimation, nasal itch and soreness, ulceration and perforation of the nasal septum congested nasal mucosa an turbinates chromic asthmatic bronchitis, dermatitis ulceration and discoloration of the skin and dental erosion.

Hydrochloric acid - will produce burns of the skin and mucous membranes the severity being determined by the concentration of the solution. This may lead to ulceration and scaring. Contact with eyes may produce reduced revision or blindness. Teeth may lose shine turn yellow become soft pointed then break off.

Nitric acid - will cause skin burns. Vapors are irritative to the skin and mucous membranes, lesions may range from irritation to burns and localized necrosis followed prolonged contact. Nitric acid mists are also corrosive to dental enamel.

Sulfuric acid - will cause mucous membrane irritation and on contact with the skin will cause violent dehydration and release of heat in sufficient quantities to produce burns that are similar to thermal burns. Inhalation of vapors may cause nasal secretion, sneezing, burning feeling in the throat followed by cough respiratory distress spasm of the vocal cords. Dental lesions are common with high

exposures and mainly effect the incisors and present as a brown staining, enamel striation, carries and rapid and painless distruction of the tooth crown.

E. Results/Discussion

Environmental

Area and personal environmental samples collected by the consultant indicated that almost no chromic acid or sulfuric acid was detectable during use of old ventilation systems. Acetic and hydrochloric acids, however, were detectable, but concentrations were within the evaluation criteria with the exception of one area sample for acetic acid. No data was presented for nitric acid.

While these results do not show any excessive exposure on a time weighted basis, they could explain complaints of workers of eye and respiratory irritation when mixing baths and when working directly over the tanks.

No environmental sampling was performed by NIOSH based on 1) work environment conditions related to this evaluation no longer exists, 2) air flow measurements of the new ventilation systems indicate that values recommended in the American Conference of Governmental Industrial Hygiene Manual of Recommended Practices were being met, 3) environmental results provided by the consultant indicated low concentrations in the old area, and 4) general feeling expressed by employees that conditions are improved in new chem clean when compared to previous conditions.

While the new chem clean area appears well designed worker complaints of irritation have continued. This irritation appears to be associated with the removal and transfer of baskets from tank to tank.

The associated acid drag out appears to be the greatest source of exposure at this time, since once the basket is above the tank, it is also no longer under the influence of the existing local exhaust. Efforts to provide added control measures during transfer operations should greatly aid in reducing employee fears relating exposures to complaints.

Medical

In collecting the medical data for the four cases in question it was found that; a) there were two cases of cancer, b) one individual who did not have cancer, and c) one individual upon whom no information could be obtained. The two cases of documented cancer were in different locations and of different cell type.

F. Conclusions

No conclusion can be reached in relating these two cancer cases to occupational exposures. Although it is a remote possibility that these cases could be occupationally related, it is unlikely that they are attributable to occupational exposure. Further, the small number of workers and the small number of cancer cases make further evaluation impractical at this time.

V. RECOMMENDATIONS

The National Institute for Occupational Safety and Health has proposed in each of its Criteria Documents (CD) or as part of the Standard Completion Project (SCP) that medical and environmental monitoring be performed when employees exposure exceed the action level (one half the time weighted average concentration). Detailed recommendations which should be followed for medical and environmental programs can be found for each of the acids used as follows: a) acetic acid; standards completion[3], b) chromic acid, criteria document[4], and standard completion, c) hydrogen chloride, standard completion d) nitric acid, criteria document and standards completion and e) sulfuric acid, criteria document.

The following recommendations are made to aid in improving environmental air samples collected in the chem clean area:

a) Personal breathing zone samples should be taken simultaneously for all five acids to give data regarding total acid exposure since exposures should be considered additive. Sampling in this manner will be a burden on the employee since he will have to wear four to five sampling pumps and sampling systems. Each system should be specific either by collection technique or analysis for each acid.

b) An alternate method would be to sample for total acid (non specific). This would avoid the problem of multiply sampling systems but would have the draw back in that results could only be interpreted as total acid for which there is no standard.

HE: 76-93

VI REFERENCES

1) Encylopaedia of Occupational Health and Safety. International Labor Office, Geneva, Switzerland, 1971.

2) Occupational Diseases, A Guide to Recognition and Control Revised Edition, National Institute for Occupational Safety and Health, NIOSH 77-181.

3) Summary and reprint of Standards Completion Proposals for analytical and sampling methods available from National Technical Information Service, Springfield, VA 22161

Acetic Acid, Set L	# PB254227	Price $5.00
Chromic Acid, Set O	# PB262402	Price $4.00
Hydrogen Chloride, Set R	# PB262403	Price $4.50
Nitric Acid, Set U	# PB262405	Price $3.50
Sulfuric Acid, Set L	PB254227	Price $5.00

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