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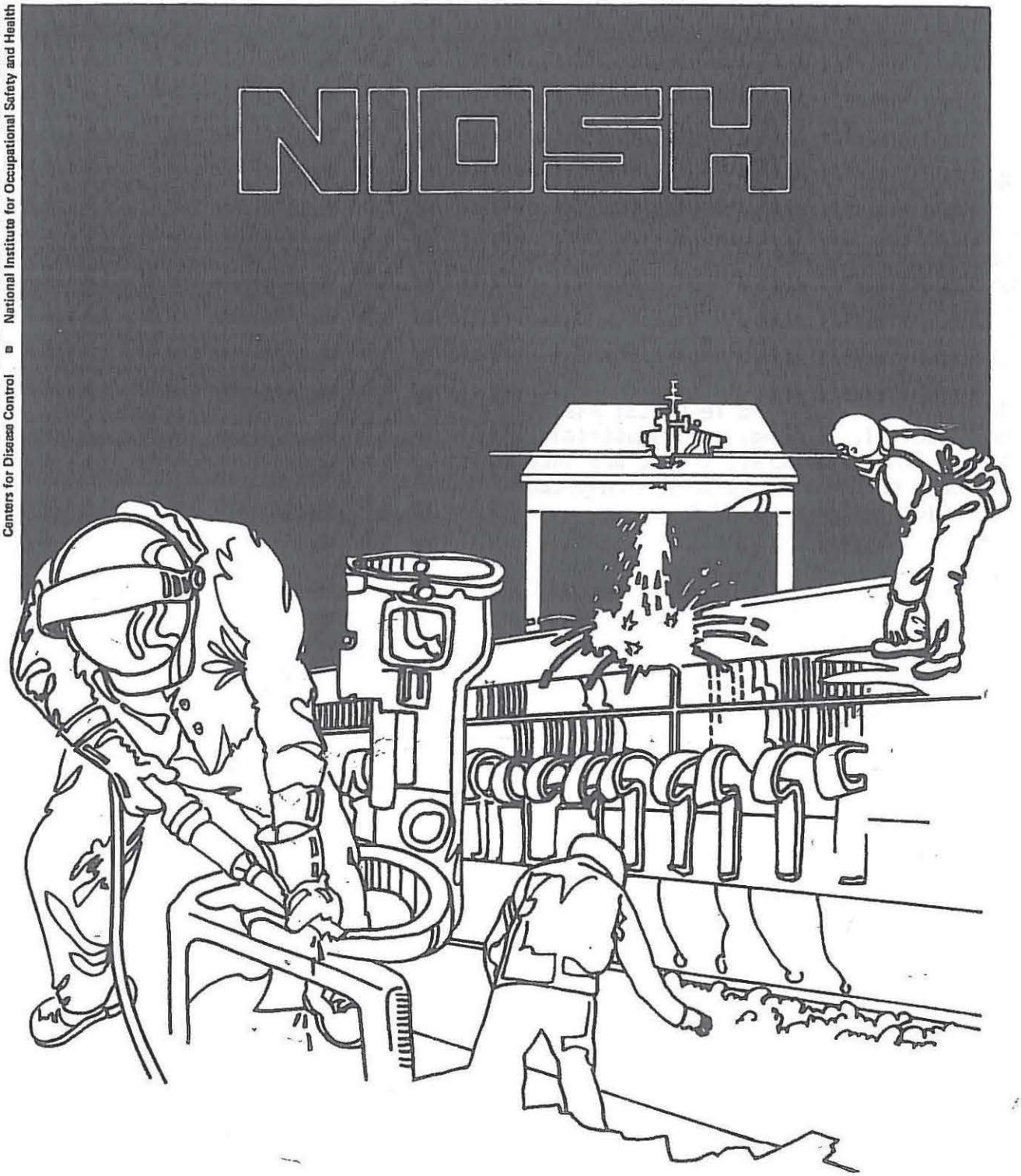

Health Hazard Evaluation Report

HETA 84-401-1784
NUTECH CORPORATION
DENVER, COLORADO

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.

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I. SUMMARY

In June, 1984, the National Institute for Occupational Safety and Health (NIOSH) was requested to evaluate exposures to employees who perform chemical mixing operations at NuTech Corporation, Denver, Colorado. The chemicals of concern included copper sulfate, sulfuric acid, and acetic acid. The company manufactured odorizing products and were concerned about the potential health hazards associated with these chemicals.

On August 27, 1985, and January 15, 1986, an environmental survey was performed in the mixing, storage, and container filling area where odorizing products are manufactured. Six personal breathing zone and twelve area air samples were collected to measure airborne concentrations of copper sulfate, sulfuric acid, and acetic acid.

Personal breathing zone and area samples taken for copper sulfate and sulfuric acid were all non-detectable (ND), and therefore, less than the current OSHA Standards of 1 mg/M^3 for both substanes. Personal breathing zone and area samples for acetic acid (range 12.6 to 51.3 mg/M^3) did, however, exceed the OSHA Standard of 25.0 mg/M^3. No laboratory hoods were used in areas surveyed.

On the basis of the environmental results, it was concluded that a health hazard did not exist from exposure to copper sulfate or sulfuric acid. An overexposure to acetic acid existed during the survey period in the mixing and storage areas. Recommendations for reducing potential exposures to acetic acid are included in this report.

KEYWORDS: SIC 2842 (Specialty Cleaning, Polishing, and Sanitation Preparations) copper sulfate, sulfuric acid, acetic acid.

II. INTRODUCTION

The National Institute for Occupational Safety and Health (NIOSH) received a request in June, 1985 from a representative of NuTech Chemical Corporation, Denver, Colorado. The request was submitted by management whose concern was the potential occupational health hazards associated with a new chemical mixing process. The request specifically concerned the hazards associated with copper sulfate, sulfuric acid, and acetic acid and how exposures could be prevented. Air sampling was performed in the mixing, storage, and container filling areas.

The results of the evaluation were presented to the requestor and the employees as they became available. Recommendations to reduce potential exposures were given to management and employees during the survey period.

III. BACKGROUND

NuTech Chemical Corporation, Denver, Colorado is a diversified recycling manufacturing company who recently began production of odorizing chemicals. The odorizing products are used for a variety of concerns, sulfuric acid waste treatment, food and by-products operations, set odors, etc. The process began in 1984 and has progressed into the development of various chemical odorizing products. The base for many of these products are similar and include acetic acid, sulfuric acid, and copper sulfate. NuTech's initial concern was the potential for hazardous conditions created during the manufacturing process as well as the reduction of any hazards. They were also concerned about their responsibility under the new Hazard Communication Standard.

IV. SAMPLING DESIGN AND METHODS

Eighteen air samples, six (6) personal and twelve (12) general area samples were collected for each of the chemicals under study. Samples were collected by drawing air at a flow rate of 1 liter per minute through filters and sorbent tubes to trap the chemicals. AA filters were used to sample for copper sulfate and they were analyzed using NIOSH Method 7903. Silica gel was used to sample for acetic acid and sulfuric acid and these were analyzed via NIOSH Method 7903 with modification.

A review of the personal protective clothing, work process, and exhaust ventilation was also performed. The employees were interviewed regarding any adverse health effects experienced while working with the chemicals.

V. EVALUATION CRITERIA

A. Environmental

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 (TLV's), and 3) the U.S. Department of Labor (OSHA) occupational health standards. Often, the NIOSH recommendations and ACGIH TLV's are lower than the corresponding OSHA standards. Both NIOSH recommendations and ACGIH TLV's 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. The current criteria and/or standards for copper sulfate, sulfuric acid, and acetic acid are as follows:

	Environmental Exposure Limits 8-Hour Time-Weighted Average (TWA)	
Acetic Acid	OSHA/ACGIH	25.0 mg/M^3
Copper	OSHA/ACGIH	1.0 mg/M^3
Sulfuric Acid	OSHA/ACGIH	1.0 mg/M^3

mg/M^3 = milligrams of substance per cubic meter of air.

B. Toxicology

Acetic acid - Acetic acid is an irritant to the eyes, nose, throat, and lungs. It can produce pulmonary edema and chronic bronchitis. Acetic acid burns the eyes and skin and can produce skin sensitization. It may also produce dental erosions and black skin, hyperperatosis, as well as chronic inflamation of the nose, throat, and bronchi.

Sulfuric acid - Sulfuric acid, as with many acids, produces similar symptoms. Therefore, many of the signs and symptoms described for acetic acid also apply for sulfuric acid. On the respiratory tract, sulfuric acid principally effects the epitheluim. Breathing high concentrations of sulfuric acid causes tickling in the nose and throat, sneezing, and coughing. At lower levels, it produces increased pulmonary air flow resistance.

Copper sulfate - Copper sulfate is an irritant to the eyes, mucous membranes, and pharynx. It can produce nasal perforation, dermatitis, and create a metal taste in the mouth. It may also cause itching and erythema to the skin; conjunctivitis, ulcerations, and turbidity of the cerva.

VI. RESULTS AND DISCUSSION

This evaluation included environmental air monitoring, evaluating the ventilation system, and a review of the personal protective clothing used by the employees. The following are the results of this study:

A. Environmental

Eighteen samples were collected on January 15, 1986 for acetic acid, sulfuric acid, and copper sulfate at NuTech, six personal and twelve area samples. The sampling times were approximately 150 minutes. The personal breathing zone and area samples taken for sulfuric acid and copper sulfate were all non-detectable. A portion of the personal breathing zone and area samples for acetic acid (range 12.6 to 51.3 mg/M^3) did exceed the OSHA Standard and ACGIH Criteria of 25.0 mg/M^3.

B. Ventilation

A ventilation system was partially in place in the chemical mixing area. This consisted of an exhaust fan which was positioned to the side of the chemical mixing table. This was not operating during the surveys, however, because of its distance and location, it could only be considered general ventilation. Both the storage area and container filling area had only general exhaust ventilation, i.e., exhaust fans mounted on walls and/or ceilings.

C. Personal Protective Clothing

A variety of personal protective clothing was available to the employees during the mixing and packaging process. This included chemical splash suits, gloves, and NIOSH/MSHA approved organic vapor respirators. In conjunction with proper exhaust ventilation, these personal protective garments should be sufficient to protect against exposures to the chemicals evaluated.

D. Medical Concerns

The employees were questioned regarding any health problems which were thought to be attributed to the work with the chemicals in question. Irritation to the eyes, nose, and throat were said to occur prior to using personal protective clothing. These conditions were said to increase during the winter months, however, the employees would typically leave the work area if the symptoms became too severe.

VII. SUMMARY AND CONCLUSIONS

We were unable to confirm overexposures to the employee from sulfuric acid or copper sulfate. NIOSH did, however, confirm an overexposure to the employee from acetic acid. This exposure existed in both the mixing and storage areas of the building.

VIII. RECOMMENDATIONS

Based on our environmental evaluation, as well as personal communications with the individual who performs the mixing and container filling process, the following recommendations are made to reduce and/or eliminate potential health hazards to the employees covered by this investigation.

NuTech Chemical should develop a Hazard Communication Program (HCP) if one has not been fully established to date. The required activities in the HCP include: (1) Hazard Determination; (2) Material Safety Data Sheets on all chemicals found within the plant; (3) Proper Labeling of materials/containers; (4) A Written HCP; and (5) Education and Training for all employees who are exposed to chemicals in the workplace. For further information, refer to OSHA's Hazard Communication Standard, 29 CFR 1910.1200.

The following recommendations are provided to assist in the reduction and/or elimination of acidic acid exposures to the employees.

1. A local exhaust ventilation system should be installed at the chemical mixing location. This system should enclose the mixing process to maximize exhaust flow without creating a hinderance in the mixing operation. The exhaust flow at the face of the hood should be approximately 100 feet per minute. Once the exhaust system is operating effectively, an annual review of the systems operation should be performed.

2. Personal protective clothing currently used by the employees should be worn during mixing, filling, or working in the storage area during the general mixing operation. This clothing should also be worn during maintenance operations involving chemicals.

3. An eyewash station and safety shower should be immediately accessible to workers. If eye contact occurs, the employee should flush the eyes with running water immediately for 15 minutes, including under the eye lids. A physician should also be contacted immediately.

4. Preplacement and periodic medical examinations should give special consideration to possible effects on the skin, eyes, teeth, and respiratory tract. Pulmonary function testing should also be performed.

IX. REFERENCES

1. NIOSH Pocket Guide to Chemical Hazards, DHEW (NIOSH) Publication No. 85-114.

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5. American Conference of Governmental Industrial Hygienists, TLV's, 1986 - 1987.

6. Proctor, N.H. and Hughes, J.P., Chemical Hazards of the Workplace, J.P. Lippincott Company, Philadelphia, 1978, pp. 112-113.

X. AUTHORSHIP AND ACKNOWLEDGMENTS

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XI. DISTRIBUTION AND AVAILABILITY

Copies of this report are currently available upon request from NIOSH, Division of Standards Development and Technology Transfer, 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 of this report have been sent to:

1. NuTech Chemical, Denver, Colorado
2. U.S. Department of Labor/OSHA - Region VIII.
3. NIOSH - Denver Region
4. Colorado State Health Department
5. State Designated Agency.

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

TABLE 1

BREATHING ZONE AND AREA AIR CONCENTRATIONS
FOR ACETIC ACID, SULFURIC ACID, AND COPPER SULFATE
NuTech Corporation
Denver, Colorado
January, 1986

AREA/JOB DESCRIPTION	SAMPLING TIME (MINUTES)	mg/M^3 ACETIC ACID	SULFURIC ACID	COPPER SULFATE
Mixing				
Personal	150	26.0	ND	ND
Personal	150	20.0	ND	ND
Area	150	38.6	ND	ND
Area	150	51.3	ND	ND
Storage				
Area	150	30.6	ND	ND
Filling				
Area	150	12.6	ND	ND
EVALUATION CRITERIA: (mg/M^3)		25.0	1.0	1.0
LABORATORY LIMIT OF DETECTION: (ug/sample)		3.0	3.0	6.0

ND = Non Detectable.
mg/M^3 = milligrams of substance per cubic meter of air.
ug/sample = micrograms per sample.