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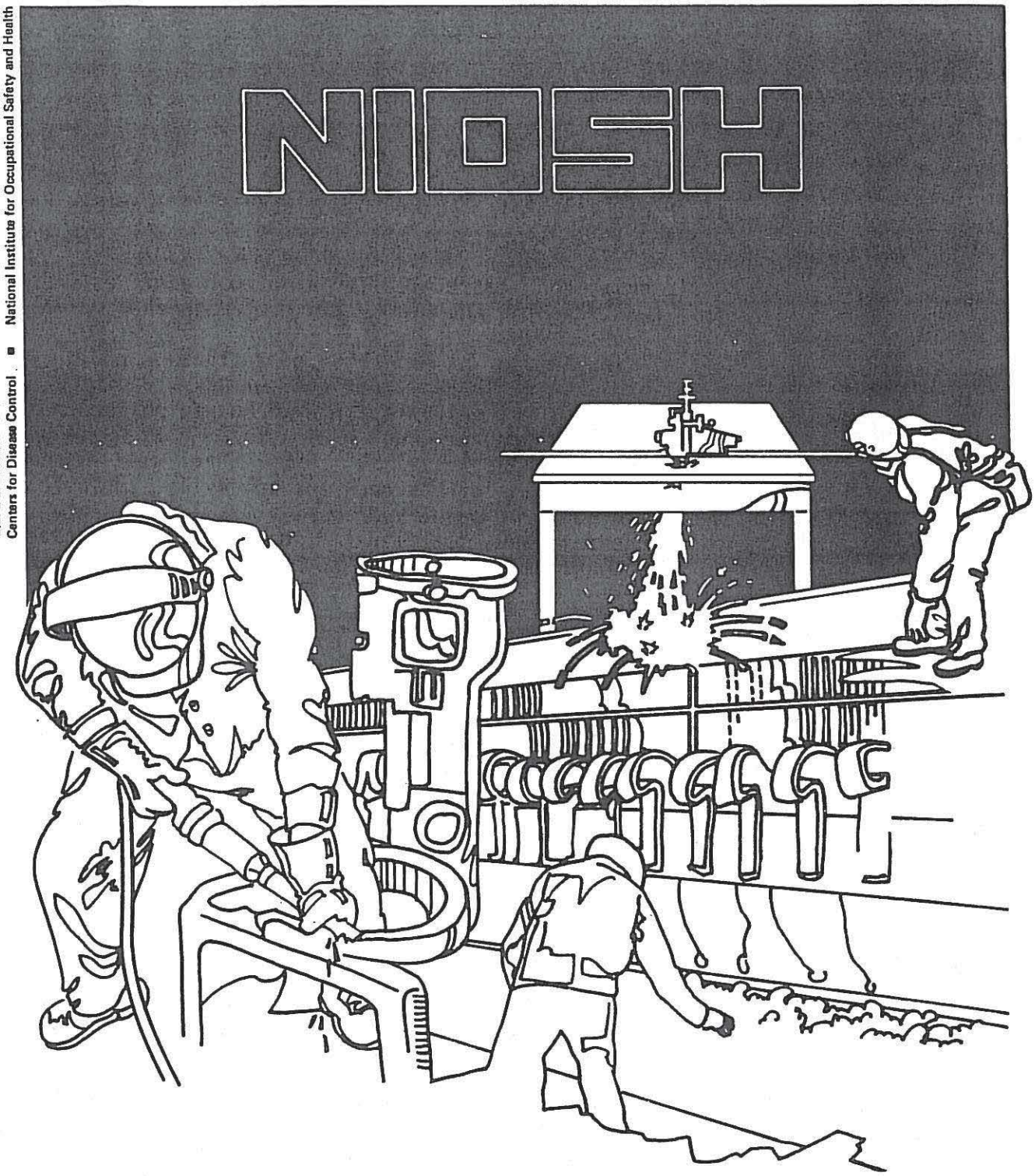
NIOSH



Health Hazard Evaluation Report

HETA 80-91-1185
DALLAS TIMES HERALD
DALLAS, TEXAS

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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September 1982
Dallas Times Herald
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NIOSH INVESTIGATORS:
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I. SUMMARY

In February 1980 the National Institute for Occupational Safety and Health (NIOSH) received a request from employees to evaluate press room/reel room employee exposure to surfactant and emulsifier products used in a wet scrubbing system at the Dallas Times Herald in Dallas, Texas. Approximately 95 persons are employed in these areas where the printing process takes place.

On October 21, 1980, NIOSH investigators performed an initial walk-through survey at the facility. During the initial visit 13 of 95 pressmen/foremen and 7 maintenance/engineering personnel--including the two workers who were most initimately involved in the installation/operation of the APAR™ air washer/demisting system--were interviewed. Fifty percent of the 20 workers interviewed had no symptoms. Five workers reported intermittent runny nose, nasal congestion and/or eye irritation at work. Three of those 5 workers gave strong past histories of allergy or "sinusitis." One of the 5 workers attributed episodes of burning eyes with exposure to the mist produced by the de-mist system.

The remaining 5 workers had considerable contact with the system between January 1979 and spring 1980. A "peculiar taste" in the mouth was described by all 5 following exposure to the APAR™ mist. Two of the 5 observed a local anesthetic effect on their lips during the splashing or siphonage of the solution. One worker denied any ill health during his months of work with the surfactant. The other employee experienced progressive ill health from March-December 1979, observing symptoms such as headaches, fatigue, sores in the mouth, chronic eye irritation, shortness of breath, nausea, vomiting, trembling and staggering, but stated that his symptoms abated following his termination of work with the de-mist system in December 1979.

Environmental monitoring was conducted on March 9, 1981. Results of 15 personal breathing-zone/general area air samples were as follows: Methyl cellosolve [8 air samples, 2 of which were below the lower limit of detection (LOD) of the analytical method...the remaining 6 samples ranging from 0.9-1.6 milligrams per cubic meter of air sampled (mg/M^3)]; and Ethylene oxide [7 air samples, all of which were below the lower LOD]. Monitoring results were, therefore, well below "recommended permissible exposure limits" for both substances.

Based on results of the environmental/medical evaluation, NIOSH found no evidence of methyl cellosolve concentrations in excess of recommended levels and no evidence of any ethylene oxide exposure. However, and in light of its recognition as a potential occupational carcinogen, NIOSH recommends that appropriate controls be used to maintain worker exposure at the lowest level feasible.

Recommendations relating to this evaluation are presented in Section VIII of this report.

KEYWORDS: SIC 2711 (Newspapers: Publishing, Publishing/Printing); Methyl cellosolve; Ethylene oxide; Surfactants/Emulsifiers/Wet scrubbing systems.

II. INTRODUCTION

Under the Occupational Safety and Health Act (OSHA) of 1970, the National Institute for Occupational Safety and Health (NIOSH) is authorized to investigate the toxic effects of substances found in the workplace. On February 27, 1980, NIOSH received a confidential request to evaluate press room/reel room employee exposure to surfactants and emulsifier products used in a wet scrubbing system at the Dallas Times Herald, Dallas, Texas.

III. BACKGROUND

The Dallas Times Herald is a daily newspaper publisher with complete facilities for gathering news, printing and photography. The operation consists of a press room which contains three letter presses, a reel room where the bulk paper is fed into the presses and a maintenance shop. Each press is provided with a centrifugal-type de-mister in which contaminated air is drawn from the room through ducts, directed to the inlet ports of the washer, then down the outer annular space, through the impeller and up the inner annular space in a spiral path. The cleaned air is then exhausted, through the circular diffusers, back into the room. The radial exhaust provides complete air distribution and eliminates high velocity jets. Chemicals present in the surfactants and emulsifiers are methyl cellosolve (ethylene glycol monomethyl ether) and nonylphenoxy polyethylene oxy-ethanol.

IV. EVALUATION DESIGN AND PROCEDURES

A. Environmental

An initial walk-through survey was performed at the facility on October 21, 1980. The purpose of that visit was to gather information on the characterization of substances used in the printing area, as well as the conditions of their use. All areas, where significant exposure to applicable chemicals might occur, were identified.

To evaluate employee exposure to chemicals/surfactants/emulsifiers used in or produced as a result of the printing operation, environmental monitoring was conducted on March 9, 1981. Personal breathing-zone and general area air samples were collected to evaluate press room/reel room employee exposures to methyl cellosolve (8 samples) and ethylene oxide (7 samples). Samples were collected by using standard charcoal tubes (methyl cellosolve) and Qazi-Ketcham large charcoal tubes (ethylene oxide) and analyzed by a gas chromatograph equipped with a flame ionization detector.

B. Medical

During the October 21, 1980, visit to the facility, the NIOSH medical investigator interviewed all available pressmen and foremen (13 of 95) and the 7 maintenance/engineering personnel on the afternoon shift--which included the two workers who were most intimately involved in the installation/operation of the APAR™ air washer/de-misting system. A general medical and occupational questionnaire was also administered to each individual.

V. EVALUATION CRITERIA

A. Environmental

Environmental standards and criteria applicable to this evaluation are shown below.

Substance	NIOSH, 8-10 hr. TWA Recommendation (mg/M^3)*	(a) ACGIH, TLV Committee 8-hr. TWA (mg/M^3)*	(b) OSHA, 8-hr. TWA Standard (mg/M^3)*
Methyl cellosolve	120	120	120
Ethylene oxide	90(c) 135(d)	10	90

* Eight or ten-hour, time-weighted-average (TWA) concentrations in milligrams of substance per cubic meter of air sampled.

(a) ACGIH - American Conference of Governmental Industrial Hygienists, Threshold Limit Value Committee

(b) OSHA - Occupational Safety and Health Administration

(c) Suspected carcinogen - NIOSH recommends that ethylene oxide (EtO) be regarded in the workplace as a potential occupational carcinogen and that appropriate controls be used to reduce worker exposure to the lowest level feasible. These recommendations are based primarily on an industry-sponsored study demonstrating that EtO is carcinogenic in experimental animals. On the basis of this information, NIOSH requests that producers, distributors and users of ehylene oxide and of substances and materials containing EtO give this information to their workers and customers and that professional trade associations and unions inform their members.

(d) Fifteen-minute ceiling

B. Toxic Effects

The non-ionic surfactant used in the APAR™ air washer/de-misting system is nonylphenoxy polyethylene oxy-ethanol. The surfactant functions because it contains both a hydrophobic portion (the nonylphenoxy group) and a hydrophilic portion (the ethyleneoxy-ethanol group). The aqueous solubility increases as the number of ethylene oxide molecules within the surfactant molecule increase..

Although the surfactant itself appears to be of low oral toxicity based on feeding studies in rodents, it contains two component molecules of substantially greater toxicity--namely, ethylene oxide and methyl cellosolve (ethylene glycol monomethyl ether). Neither compound is used per se in the demisting system, but the issue in the present setting is the extent to which either substance is present in the air of the press room as the result of aerosolization of the surfactant solution. The toxic effects of each are listed below.

Ethylene Oxide[1,2,3,4]

Ethylene oxide has a characteristic ether-like odor and is a colorless gas at temperatures above 12° centrigrade. It may be absorbed through inhalation and airborne exposure to high concentrations may initally cause irritation of the eyes and respiratory tract and a "peculiar taste" in the mouth. Continued exposure to high airborne levels of the gas may produce headache, nausea, weakness, incoordination, electrocardiographic abnormalities and pulmonary edema. Skin exposure to liquid solutions of ethylene oxide may produce characteristic burns and blisters followed by healing and a brown pigmentation of the burned area. Ethylene oxide has been shown to cause birth defects and cancer in highly exposed rodents.

Methyl Cellosolve[5,6,7]

Methyl cellosolve may be readily absorbed through the skin or through inhalation. It may affect both the central nervous system and the blood-forming system. Headache, drowsiness, lethargy and weakness have occurred at exposure levels as low as 60 parts per million. At higher levels staggering gait, slurred speech and tremor may occur. Prolonged exposures to lower levels are more likely to cause anemia, while acute exposures at higher levels result in the central nervous system symptoms described above.

VI. RESULTS

A. Environmental

Results appearing in Tables 1 and 2 show that airborne concentrations of eight (8) methyl cellosolve and seven (7) ethylene oxide personal breathing-zone/general area air samples were either below: (a) applicable NIOSH, 8-10 hour recommended levels; (b) ACGIH, TLV Committee 8-hour TWA recommended levels; (c) OSHA, 8-hour TWA standards; or (d) the lower detection limit of the analytical method.

B. Medical

Of the twenty workers interviewed, ten (50 percent) had no symptoms. Five workers (two pressmen and three maintenance engineers) reported intermittent runny nose, nasal congestion and/or eye irritation at work. Three of the five gave strong past histories of allergy or "sinusitis." One of the five attributed episodes of burning eyes with exposure to the mist produced by the de-mist system.

The remaining five workers had had more than brief contact with the system during the months of its installation between January 1979 and spring 1980. All five described a "peculiar taste" in the mouth with exposure to APAR™ mist. Two of five noted a local anesthetic effect on the lips after siphoning the solution or during splashings. Two of this group reported that they had had extensive direct skin contact with the surfactant in both its concentrated and dilute forms. One of these workers denied any ill health during his months

of work with the surfactant. The other employee experienced progressive ill health between March and December 1979. His symptoms included headaches, fatigue, chronic eye irritation, sores in his mouth, shortness of breath, nausea and vomiting, trembling and staggering. He reported that his symptoms gradually abated after he stopped work with the system in December 1979.

VII. DISCUSSION

At the time of the NIOSH surveys, there appeared to be no significant airborne exposures to methyl cellosolve and no measurable exposure to ehylene oxide. Current symptoms among a minority of workers in the press room are confined to the upper respiratory tract and mucous membranes. Past symptoms in those five workers with more extensive contact with the surfactant during installation may have been due to exposure to some components of the surfactant, although air monitoring by a consulting firm in January 1980 showed acceptable air levels of methyl cellosolve. That firm conducted no ethylene oxide monitoring.

Some of the features of the illness in the one employee who reported prolonged and more severe symptoms are theoretically compatible with exposure to high levels of both ethylene oxide and methyl cellosolve. However, of the two substances, only methyl cellosolve is readily absorbed through the skin, as well as through inhalation. Since most of the unusual contact with the surfactant during the months of installation appeared to have been skin contact, with occasional mouth contact through siphoning, and since no employee developed the characteristic dermal blisters of ethylene oxide solution burns, it would seem more likely that any systemic effects, if work-related, would have been due to methyl cellosolve than to ethylene oxide. As noted earlier, NIOSH (and prior industrial hygiene work) found acceptable airborne levels of methyl cellosolve. We found no measurable levels of ethylene oxide and it appears likely that current airborne exposures from the APAR™ de-mist system are confined to low levels of methyl cellosolve.

VIII. RECOMMENDATIONS

1. Siphoning the surfactant solution by mouth is unacceptable. A pump apparatus should be substituted, if siphoning again becomes necessary.

2. Since methyl cellosolve is absorbed through the skin, any worker having accidental contact with the surfactant solution should immediately remove soaked clothing or shoes and flood the affected skin or eye with fresh water.

IX. REFERENCES

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XI. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this Determination 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 ninety (90) days, the report will be available through the National Technical Information Services (NTIS), Springfield, Virginia. Infor-

mation 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. Dallas Times Herald Publishing Company
2. Authorized Representative of Employees
3. U. S. Department of Labor, Region VI
4. NIOSH, Region VI
5. Texas State Department of Health.

For the purpose of informing the approximately ninety-five (95) affected employees, a copy of this report shall be posted in a prominent place, accessible to the employees, for a period of thirty (30) calendar days.

Table 1

Methyl Cellosolve Concentrations

Dallas Times Herald
Dallas, Texas

March 19, 1981

Sample Number	*Type of Sample	Location	Sampling Period	**Concentration (mg/M^3)
CT-1	P	Press Room - Folder, Press #1	1005-1505	1.2
CT-2	P	Press Room - Folder, Press #3	1007-1516	1.4
CT-3	P	Reel Room - Reel Operator	1008-1502	1.2
CT-4	P	Reel Room - Reel Operator	1012-1504	(a)
CT-5	P	Reel Room - Reel Operator	1018-1509	1.6
CT-6	GA	Reel Room - NE End, Press #3	1100-1459	0.9
CT-7	GA	Reel Room - Center, Between Presses #1 & #2	1116-1457	(a)
CT-8	GA	Reel Room - SE End, Press #1	1118-1458	1.2

U.S. Department of Labor (OSHA), 8-yr. TWA, Standard.....120
NIOSH, 8-10 hr. TWA, Recommendation.....120
American Conference of Governmental Industrial Hygienist (ACGIH).....120
8-hr. TWA, Recommendation

* P = Personal breathing-zone; GA = General Area
** mg/M^3 = milligrams of substance per cubic meter of air sampled
(a) - Below lower limit of detection of analytical method

Table 2

Ethylene Oxide Concentrations

Dallas Times Herald
Dallas, Texas

March 19, 1981

Sample Number	*Type of Sample	Location	Sampling Period	**Concentration (mg/M^3)
EO-1	P	Press Room - Color Man	1002-1519	(a)
EO-2	P	Press Room - Crew Chief	1008-1501	(a)
EO-3	P	Reel Room - Reel Operator	1012-1504	(a)
EO-4	P	Reel Room - Reel Operator	1018-1509	(a)
EO-5	GA	Reel Room - NE End, Press #3	1102-1459	(a)
EO-6	GA	Reel Room - Center, Between Presses #1 & #2	1116-1457	(a)
EO-7	GA	Reel Room - SE End, Press #1	1118-1458	(a)

U.S. Department of Labor (OSHA), 8-hr. TWA, Standard.....90
NIOSH, 8-10 hr. TWA, Recommendation.....90
American Conference of Governmental Industrial Hygienists (ACGIH).....90
8-hr. TWA, Recommendation

* P = Personal breathing-zone; GA = General Area
** mg/M^3 = milligrams of substance per cubic meter of air sampled
(a) - Below lower limit of detection of analytical method

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