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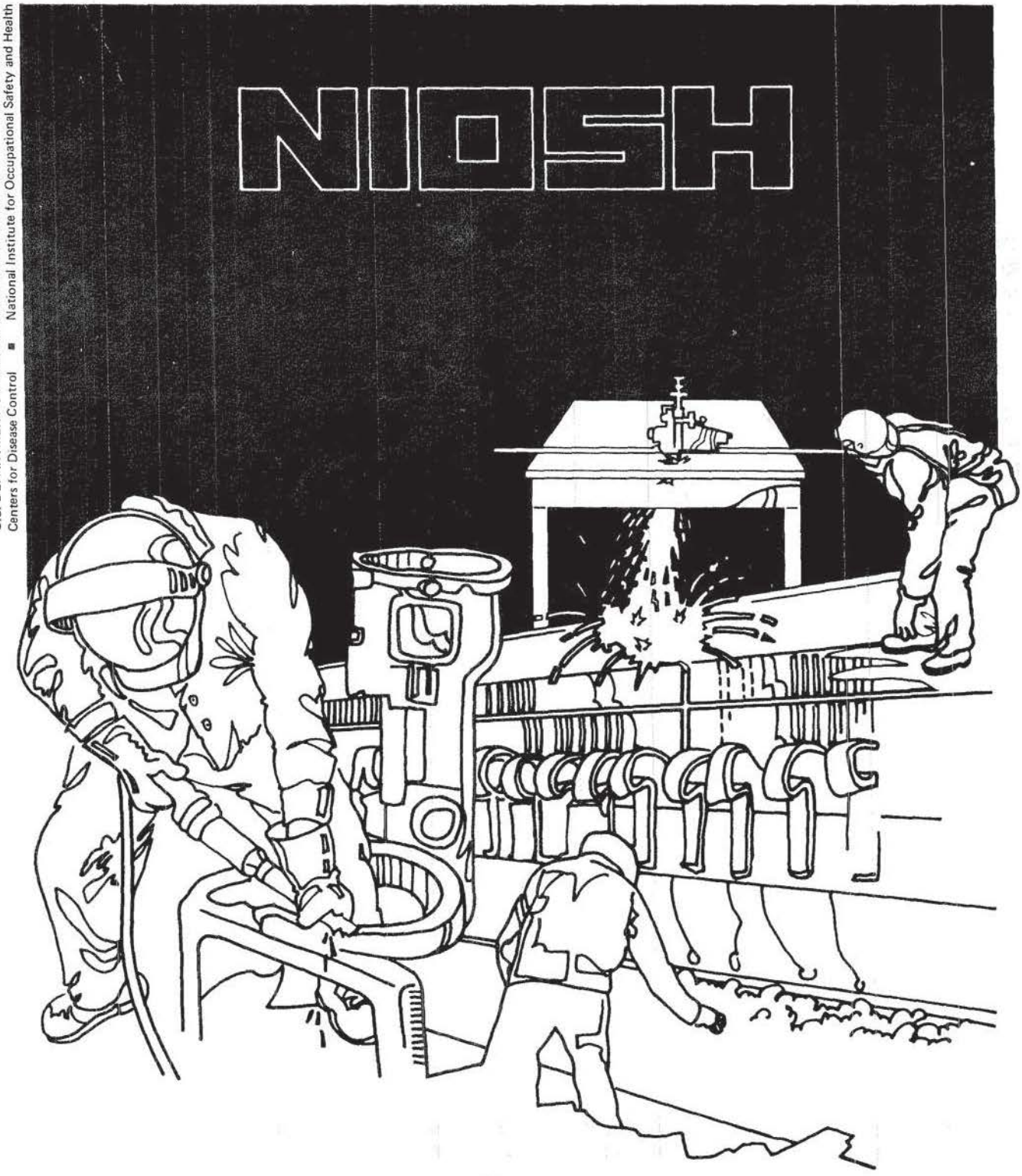

Health Hazard Evaluation Report

HHE 80-180-841
SCOTT PAPER COMPANY
CHESTER, PENNSYLVANIA

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.

Mention of company names or products does not constitute endorsement by the National Institute for Occupational Safety and Health.

HHE 80-180-841
MARCH 1981
SCOTT PAPER COMPANY
CHESTER, PENNSYLVANIA

NIOSH INVESTIGATORS:
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I. SUMMARY

In July 1980, the National Institute for Occupational Safety and Health (NIOSH) received a request from an employee and from the company for a health hazard evaluation at Scott Paper Company, Promotional Services Division, Chester, Pennsylvania. The employee complained of tightness of the chest, sinus irritation, bad nerves, coughing, and mucous production attributed to exposure to the workplace air.

Ventilation measurements were made throughout the workplace on August 28, 1980. Local exhaust velocity measurements (50 to 75 feet per minute) were below recommended design criteria of 100 fpm. No irregularities were found in the general ventilation system.

Environmental air samples were also taken for the decomposition products of polyolefin plastic wrap (particularly formaldehyde and aldehydes in the C_2-C_5 range) in the packaging area. Acetaldehyde, formaldehyde, alkenes, alkanes in the C_4-C_8 range, methyl isobutyl ketone, acetone and possibly crotonaldehyde were identified only in very low concentrations and well below recommended exposure criteria.

Medical interviews did not reveal any recognizable syndrome or toxic exposure associated with the work environment. The employee's symptoms were not typical of any recognizable syndrome or toxic exposure and were not clearly associated with work. The other workers had no significant complaints and it is therefore difficult to ascribe the one employee's complaints to occupational exposures.

- Based on the ventilation, environmental and medical studies, NIOSH determined that no occupational health hazard exists.

KEYWORDS: SIC 7399 (Coupon Redemption), advertising promotional sales materials, coughing, chest tightness, sinus irritation, mucous, nervousness, ventilation, aldehydes, alkenes, alkanes.

II. INTRODUCTION

On July 2, 1980, NIOSH received requests from both the company and from an employee for a health hazard evaluation of the Promotional Services Division of the Scott Paper Company in Chester, Pennsylvania.

III. BACKGROUND

Plant Process/Conditions of Use

The Scott Paper Company Promotional Services Division supplies advertising and promotional sales materials to the company, and redeems discount coupons sent by retailers and consumers.

The division employs approximately 100 workers (almost exclusively women) of whom 60% are employed on a temporary basis through three employment agencies. The number of workers employed varies weekly according to workload. Workers are employed in the following areas: (1) the advertising and sales materials section where promotional materials are packaged in polyolefin film using a hot wire sealing device; (2) coupon redemption - where incoming discount coupons are received and processed; (3) a warehouse where materials are stored; (4) a keypunch data processing area; and (5) the administrative offices.

The worker who submitted the HHE request had been employed in the advertising and sales materials area and first complained of health problems to the management on January 24, 1980. These included tiredness, confusion, virus colds with persistent cough, shortness of breath, low back pain, loss of appetite, nausea, intolerance of food, and weight loss.

The worker's private physician was concerned that these symptoms might be caused by an infectious illness among the workers, or a toxic substance in the workplace. On learning of the complaints through their medical director, the company became concerned and requested an evaluation of the workplace by both NIOSH and the Haskell Laboratories of the DuPont Company who manufacture the polyolefin film used in packaging.

On March 7, 1980, DuPont's Haskell Laboratories carried out an industrial hygiene investigation of the hot wire sealing area and interviewed workers. Measurements were made of aldehydes, carbon monoxide and particulate matter and the conclusion was that "the hot wire cutting and sealing of the Clysaro 50 Lite-F polyolefin film does not present a significant health hazard of employees".

IV. EVALUATION DESIGN AND METHODS

On July 30, 31, and August 28, 1980, NIOSH conducted ventilation, humidity, and temperature studies in the five work areas, and gathered bulk samples for analysis. Workers were interviewed in all areas.

A. Design

The hot wire sealing machines are used in the advertising and sales materials section. Polyolefin plastic wrap ("Clysar" and "Cryouac") is used for packaging. An 18" window fan is located above and behind each unit and on one unit a canopy hood is also used. Air velocity at the source of the "contaminant" emission is 25-50 feet per minute.

Bulk samples of the "Clysar" and "Cryouac" polyolefin plastic wrap sheets were gathered along with the decomposition residue of these plastic sheets collected from the ventilation window fan blades.

Ventilation measurements were taken of the two heat-sealing machines and humidity measurements were taken of each work area. The ventilation (heating and cooling) units are located on the roof and in the fan room. The units had been checked for Freon leaks and were found to be in working order. No humidifier is used in the system.

Workers were interviewed during a walk-through survey of the workplace as follows: (1) Three workers employed in the advertising material packaging center; (2) seventeen of the 37 (46%) women working in the coupon redemption center; (3) three workers (2 women, 1 man) working in the warehouse area; and (4) four women working in the punch card data processing area.

B. Evaluation Methods

Samples of the decomposition products of the "Clysar" plastic sheet (sample SP-1) were collected by heating it in a sample generation furnace set at 350°C. A glass fiber filter followed by an impinger containing 20 ml of a 1% $NaHSO_3$ solution were connected to the end of the furnace for sample collection. The sample was collected for one hour at a flow rate of 0.5 liters per minute.

The filter was placed in a vial and extracted with 2 ml of 1% $NaHSO_3$ and 2 ml of $NaHCO_3$. This was capped and placed in a water bath for one hour before the headspace analysis by gas chromatography (FID). A standard solution of aldehydes was analyzed under the same conditions as the filter extract as a control. Although peaks were detected eluting in the same area as the aldehydes, the concentrations were too low for peak identification by GC/MS. In order to increase concentrations, the plastic sheet was cut into small pieces, placed into a capped vial, and heated in a wax bath set at 200°C for one hour. The headspace was then analyzed by GC/MS and acetaldehyde was positively identified. Other peaks detected were alkenes and alkanes in the C_4-C_8 range. Additional peaks were tentatively identified as methyl isobutyl ketone, acetone, and a molecular weight to aldehyde (possibly crotonaldehyde), but there was too much interference from other low boiling compounds for accurate identification.

Two 4 ml portions of the impinger solution were taken. The first was used to detect aldehydes in the C_2-C_5 range and the second to detect formaldehyde. The first portion was put into a vial containing 4 ml of 1% chromotropic acid in concentrated sulfuric acid. At this point, the solution is colorless. Six milliliters of concentrated sulfuric acid was then added to the sample. The solution underwent a color change, colorless to purple, indicating formaldehyde was present.

The second plastic wrap sheet, "Cryouac" (SP-2) was treated in the same way as sample SP-1. The results were the same as for sample SP-1. Characterization of the peaks detected was successful only for the headspace analysis of the plastic itself. Acetaldehyde was the only aldehyde positively identified. The formaldehyde test was also positive for sample SP-2.

Sample SP-3, the decomposition residue, was divided into two portions. One portion was desorbed with xylene and analyzed by gas chromatography (FID) for any aldehydes in the C_2-C_5 range present. None were detected. The second portion was tested for formaldehyde using the above procedures. The test was negative for formaldehyde.

V. EVALUATION CRITERIA - TOXICOLOGY

Aldehydes and Ketones

Aldehydes are volatile, colorless flammable liquids (with the exception of formaldehyde, which is a gas). Typically, these compounds are strongly irritating to the skin, eyes, and respiratory tract. Acute exposure may result in pulmonary injuries such as edema, bronchitis, and bronchopneumonia. Skin and pulmonary sensitization may develop in some individuals and result in contact dermatitis and, more rarely, asthmatic attacks. After hypersensitivity develops, individuals may develop symptoms following exposure to other aldehydes.

Ketones are similar in their chemical and toxicological properties, and all are flammable, colorless liquids with a pungent odor similar to acetone. Prolonged exposure is uncommon because of the intense irritation caused to the eyes and respiratory tract.

The C_4-C_8 alkanes may produce respiratory irritation, central nervous system inhibition leading to respiratory arrest, and other neurological problems (polyneuropathy). (Refer to Table 1 for permissible exposure limits.)

VI. RESULTS AND DISCUSSION

A. Environmental

Bulk samples of "Clysar" polyolefin plastic wrap (DuPont Corporation) -- acetaldehyde, alkenes and alkanes in the C_4-C_8 range, methyl isobutyl ketone, acetone and possibly crotonaldehyde were detected in "very low" concentrations ($<$0.1 ppm). These are below the permissible exposure limits listed in Table 1, ranging from 1 ppm to 1000 ppm.

"Cryouac" polyolefin plastic wrap -- acetaldehyde and formaldehyde were detected also in "very low" concentrations (<0.1 ppm). These are below the permissible exposure limits listed in Table 1, ranging from 1 ppm to 1000 ppm.

The decomposition residue did not show any aldehyde and ketones or any other significant major peaks.

B. Ventilation

Ventilation and smoke tube measurements taken at the two heat sealing units showed 50 to 75 feet per minute capture velocity, which is below the prescribed minimum capture velocity of 100 feet per minute for this type of operation. An inspection of the general ventilation system showed no irregularities.

C. Humidity

Humidity readings in the work areas showed a range of 40-50% with no irregularities.

D. Medical Results and Discussion

In the heat sealing area, workers complained of sore throat, dry sinuses, occasional headaches and fatigue after operating the machine for 1-2 hours. Fumes from the machine had caused nausea in some workers and there was concern about the possible effects of these on pregnant women.

Few of the women who were working in the other areas had complaints. The most common complaint was of poor air quality, lack of ventilation, excessive seasonal variation in temperature, and dust from paper coupons mailed to the center. The area is located in a windowless ground floor building.

The employee who first complained of health effects was interviewed at length. She reported the symptoms previously mentioned and reiterated her concern that they were related to her work environment. The symptoms were not typical of any recognizable syndrome or toxic exposure and were not clearly associated with work. The other workers had no medically significant complaints and it is therefore difficult to ascribe her complaints to occupational exposure.

VII. RECOMMENDATIONS

1. Both heat sealing units using the plastic wrap should have local exhaust canopy hood arrangements set as close as possible to the emission source with a capture velocity of 100 feet per minute.

VIII. AUTHORSHIP AND ACKNOWLEDGEMENTS

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IX. REFERENCES

1. Occupational Diseases - A Guide to Their Recognition, Revised Edition, June 1977, U.S. HEW, PHS, CDC, NIOSH

2. Industrial Ventilation - A Manual of Recommended Practice, 15th Edition, 1978, American Conference of Governmental Industrial Hygienists.

X. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this Determination Report are currently 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 of this report have been sent to:

1. Scott Paper Company, Chester, Pennsylvania
2. Requester
3. NIOSH, Region III
4. OSHA, Region III

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

TABLE 1

EVALUATION CRITERIA
PERMISSIBLE EXPOSURE LIMITS

SUBSTANCE	NIOSH	OSHA	ACGIH
Acetaldehyde	--	200 ppm (TWA)	100 ppm (TWA)* 150 ppm (STEL)**
Acetone	--	1000 ppm (TWA)	1000 ppm (TWA) 1250 ppm (STEL)
Crotonaldehyde	--	2 ppm (TWA)	2 ppm (TWA) 6 ppm (STEL)
Formaldehyde	1 ppm, 30 mins.	3 ppm (TWA) 5 ppm (Acc. Ceiling) 10 ppm (Max. Ceiling, 30 mins.)	2 ppm (TWA)
Methyl Isobutyl Ketone	200 mg/m^3 (TWA)	410 mg/m^3 (TWA)	410 mg/m^3 (TWA) 510 mg/m^3 (STEL)
C_4-C_8 Alkanes			
Pentane	120 ppm (TWA)	1000 ppm (TWA)	600 ppm (TWA) 750 ppm (STEL)
N-Hexane	100 ppm (TWA)	500 ppm (TWA)	100 ppm (TWA) 125 ppm (STEL)
N-Heptane	85 ppm (TWA)	500 ppm (TWA)	400 ppm (TWA) 500 ppm (STEL)
Octane	75 ppm (TWA)	500 ppm (TWA)	300 ppm (TWA) 375 ppm (STEL)

Mixtures to be not greater than 350 mg/m^3 TWA; 1800 mg/m^3 ceiling singly or mixtures (15 mins.)

TWA = Time-Weighted Average

STEL = Short-Term Exposure Limit

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