HEALTH HAZARD EVALUATION DETERMINATION REPORT

MHETA 82-007-9003

Bethlehem Steel
Ellsworth Coal Preparation Plant
MSHA Mine I.D. 11-02632
Eighty-Four, PA

PREFACE

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) and the Federal Mine Safety and Health Act of 1977, Public Law 91-173 as amended by PL 95-164 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.

NIOSH 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.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers For Disease Control
National Institute for Occupational Safety and Health

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ELLSWORTH COAL PREPARATION PLANT
EIGHTY-FOUR, PA

I. SUMMARY

The United Mine Workers of America (UMWA) requested the National Institute for Occupational Safety and Health (NIOSH) to evaluate exposure to a coal antifreeze agent, Nalcoal 8894, in use at the Ellsworth Coal Preparation Plant, Eighty-Four, Pa.

A survey was conducted on February 23, 1982. Air samples were collected for Stoddard solvent which was determined to be the primary constituent of Nalcoal 8894. A bulk sample of the antifreeze was collected. The results of the environmental sampling showed very low levels of Stoddard solvent in the area where Nalcoal is sprayed on the coal. Workers are required to spend a minimum amount of time in the area, the automated spraying process is checked once or twice a shift. Stoddard solvent was not detected in the work area where the treated coal is loaded into rail cars. Workers on day and evening shifts were interviewed by a NIOSH physician.

Results of air samples collected during this investigation showed airborne concentrations of Stoddard solvent to be below the NIOSH recommended standard.(1) All workers reported symptoms, but only two of six felt their symptoms were work related. The low levels of Nalcoal detected, together with the minimal contact of workers with Nalcoal, do not support an association between symptoms and this agent. We were unable, however, to identify the cause of the symptoms reported by workers from our medical and industrial hygiene survey.

Key Words: SIC 1211, coal preparation, coal antifreeze agent.

II. INTRODUCTION

Under the Federal Mine Safety and Health Act of 1977, Section 501(a) (11), the National Institute for Occupational Safety and Health (NIOSH) investigates the toxic effects of substances found in the workplace. In February 1982, NIOSH received a request from an authorized representative of the UMWA for an investigation at the Bethlehem Steel Corporation's Ellsworth Coal Preparation Plant, Eighty-Four, PA. The request was prompted by questions concerning the potential health effects from the use of Nalcoal 8894 Freeze Conditioning Agent. The freeze conditioning agent is used when temperatures are at 30^0 F or below. Nalcoal has been used for three winters.

The freeze conditioning agent is sprayed on the coal as it falls from a conveyor belt into a large hopper. The spraying operation is enclosed, except on one side to allow access for the conveyor belt. This enclosure in turn is located within a room that covers the top of the hopper. At the base of the hopper, the coal is loaded into rail cars. Approximately 1500 gallons of antifreeze agent is used a day. There are three employees per shift who work in this general area. A man in a small control room operates the hopper chutes to load the rail cars. Two other employees are in charge of moving the rail cars. Once or twice during a shift, a man checks on the spraying operation.

III. MATERIALS AND METHODS

ENVIRONMENTAL

According to its material safety data sheet, Nalcoal 8894, contains 80% petroleum distillates and 30% aromatic hydrocarbons with less than 0.1% benzene. Refined petroleum products are for the most part complex mixtures. Petroleum is separated into mixtures of hydrocarbons by fractional distillation. On the basis of boiling range, it was decided that Stoddard solvent with a boiling range from 160 to 210°C was the petroleum fraction closest to Nalcoal 8894 which boils from 150 to 260°C. Stoddard solvent is composed of organic compounds whose carbon chain lengths range from C_7 to C_{12}.

Airborne Stodddard solvent samples were collected and analyzed per NIOSH Physical & Chemical Analytical Method (PCAM) S382(2). Area samples were collected to represent the greatest potential exposure, workers did not spend entire shift in the areas of greatest concern, spraying and loading. Bulk samples of the antifreeze were collected for determination of aromatic hydrocarbon content. A portion of the bulk was placed in carbon disulfide and analyzed by gas chromatography using a 10% SP-2100 column and a flame ionization detector. Identities of analytes found were confirmed by mass spectrometry.

MEDICAL

A limited medical evaluation was conducted. The evaluation consisted of a short work and health questionnaire using the format in Appendix A. The purpose of this evaluation was to ascertain if a definitive medical study should be performed. All six workers on the day and evening shifts on February 23, 1982, were interviewed by the NIOSH physician.

IV. EVALUATION CRITERIA

NIOSH evaluation criteria are used in assessing worker exposure to potentialy hazardous agents except in cases where more current Federal or consensus standards exist or where sufficient health research information is available and can be applied. The standards are designed to protect the health and provide for the safety of employees for up to a 10 hour work shift, 40 hour work week, over a working lifetime.

Substance	Evaluation Criteria*
Stoddard Solvent	350 mg/m^3 NIOSH Recommended Standard (2)

* Expressed as a Time Weighted Average (TWA)

Stoddard solvent contains aliphatic and aromatic hydrocarbons in varying concentrations. In general the toxicity is related to the content of benzene and other aromatic hydrocarbons. The benzene content of Nalcoal is less than 0.1%.(3) The aromatic hydrocarbons may cause central nervous system depression.(4) Stoddard solvent is a mild narcotic and a mucous membrane irritant.(5)

The effects of Stoddard solvent exposure on humans have been reported by several investigators,(1) but few were quantitative inhalation studies. Carpenter et al (6) determined both the odor and the sensory thresholds for Stoddard solvent. The odor threshold was found to be between 0.5 and 5 mg/m^3. The sensory threshold was found to be between 850 and 2,700 mg/m^3 for a 15 minute exposure. No irritation was noted at 140 mg/m^3, while slight, transient eye irritation ocurred in one volunteer at 850 mg/m^3, and in all at 2,700 mg/m^3. Slight dizziness was reported at 2,700 mg/m^3 by some of the subjects. Nelson et al(7), similarily found that volunteers exposed to Stoddard solvent for 3-5 minutes at air concentrations in excess of 2,290 mg/m^3 suffered irritation of the eyes, nose, and throat.

Stoddard solvent defats the skin resulting in dryness, scaling and dermatitis.(1) The NIOSH recommended standard of 350 mg/m^3(TWA) should prevent sensory irritation and long term toxicity.

V. RESULTS

The bulk sample of Nalcoal contained mostly C_{10} to C_{20} alkanes, with small amounts of napthalene, methyl napthalene, and other napthalene compounds.

The charcoal tubes which contained analytes (some had no detectable amounts) had the same components on each tube. The analytes were mostly C_7 to C_{14} alkanes, toluene, xylenes, methyl napthalenes and other aromatic hydrocarbons. These compounds were quantitated collectively using Stoddard solvent as a standard, since Stoddard solvent matched the elution pattern of a majority of the peaks contained in the samples.

The sprayer area is the area with the greatest potential for exposure although the spraying process is automated. No employees are required to spend much time in the area, and the operation is checked briefly each day. One worker, the shipper, works inside an enclosed shed, where our environmental samples were unable to detect any exposure to Stoddard solvent. The other two employees work outside, moving rail cars.

Stoddard Solvent Sample Results

SAMPLE #	LOCATION	TIME WEIGHTED AVERAGE
1	Sprayer	64 mg/m^3
2	Sprayer	41 mg/m^3
3	Outside Shippers Shed	Not detected
4	Inside Shippers Shed	Not detected
5	Inside Shippers Shed	Not detected
6	Outside Shippers Shed	Not detected
7	Sprayer	59 mg/m^3
8	Sprayer	57 mg/m^3

Results of the medical questionnaire administered during during the walk through survey are presented in Appendix B. Skin irritation was reported by four of six workers. Other symptoms included headache (2/6), throat irritation (2/6), and acidic taste in the mouth (2/6). Only workers numbers 1 and 6 thought their symptoms were work related, despite all reporting improvement on weekends.

VI. CONCLUSIONS

The low levels of airborne Nalcoal detected, together with the minimal contact of workers with Nalcoal, do not support an association between symptoms and this agent. Since we were assured that work conditions on the day of sampling were representative of usual conditions, we do not feel that workers were exposed to harmful levels of Nalcoal. Further medical evaluation therefore, is not indicated. We were unable, however, to identify the cause of the symptoms reported by workers from our medical and industrial hygiene survey.

VII. RECOMMENDATIONS

1) Employees should be provided with and required to use impervious clothing to prevent repeated or prolonged skin contact with Nalcoal. Splash-proof safety goggles should be used where Nalcoal may come in contact with the eyes.

2) Hands should be washed thoroughly with soap and water before eating.

3) The enclosure covering the spraying operation should be kept closed.

VIII. REFERENCES

1) Occupational Exposure to Refined Petroleum Solvents, Criteria for a Recommended Standard, U.S. Department of Health Education and Welfare. July 1977, DHEW (NIOSH) Publication No. 77-192.

2) NIOSH Manual of Analytical Methods, Vol. 3, U.S. Department of Health, Education, and Welfare, April 1977 DHEW (NIOSH) Publication No. 77-157-C.

3) Nalco Chemical Company, Material Safety Data Sheet for Nalcoal 8894, 2901 Butterfield Road, Oakbrook, Illinois 60521.

4) Occupational Diseases, A Guide To Their Recognition. U.S. Department of Health, Education and Welfare. DHEW(NIOSH) Publication No. 77-181.

5) Occupational Health Guidelines for Chemical Hazards. U.S. Department of Health and Human Services, U.S. Department of Labor. January 1981, DHHS(NIOSH) Publication No. 81-123.

6) Carpenter, C.D., Kinkead, E. R., Geary, D.L. Jr., Sullivan, L.J., King, J.M.: Petroleum Hydrocarbon Toxicity Studies III. Animal and Human response to vapors of Stoddard Solvent. Toxicol Appl. Pharmacol 32:282-97,1975.

7) Nelson, K.W., Ege, J.F. Jr., Ross, M., Woodman, L.E., Silverman, L.: Sensory Response To Certain Industrial Solvent Vapors. J Ind Hyg Toxicol 25:282-85, 1943.

IX. ACKNOWLEDGEMENTS

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X. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this report are currently available, upon request, from NIOSH, Division of Technical Services, Publications Dissemination, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be available through the National Technical Information Service (NTIS), Springfield, Virginia 22161.

Copies of this report have been sent to:

a) Bethlehem Steel Corporation
b) UMWA Region I
c) Mine, Safety and Health and Administration, District 2
d) NIOSH, Region III

For the purpose of informing the "affected employees," the employer shall promptly "post" the determination report for a period of 30 days in a prominent place near where exposed employees work.

APPENDIX A

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
SCREENING QUESTIONNAIRE FOR OCCUPATIONAL ILLNESS

PLANT NAME_____
ADDRESS_____
PHONE_____

NAME_____AGE_____SEX_____HOME TEL._____

HOME ADDRESS_____
Street City State Zip Code

WORK AREA_____JOB(Descript)_____SHIFT_____

DURATION OF EMPLOYMENT:_____TIME ON PRESENT JOB:_____

.....

1. Have you had any health problems or complaints since employed here?

   Yes_____No_____

   Describe (use back if additional space needed)_____

2. Did you have a similar problem(s) before starting work here? YES___NO___

3. Does this problem(s) improve or disappear when you are away from the job? (circle whether improves or disappears)

   YES_____No_____

   If Yes, how long until this improvement/disappearance occurs?

   (a) Overnight_____
   (b) Over the weekend_____
   (c) On vacations_____

4. Have you consulted a physician regarding this problem? Yes_____No_____

5. Do you or your physician think this problem(s) is related to your work?

   Yes_____No_____

   If Yes, what do you think is causing the problem?_____
   _____

APPENDIX B

ELLSWORTH COAL PREPARATION PLANT
EIGHTY-FOUR, PENNSYLVANIA
Report No. MHHE 82-007

RESULTS OF MEDICAL QUESTIONNAIRE
February 23, 1982

Worker No.	Symptoms Reported	Improvement In Symptoms On Weekends/ Vacations	Accompanied Health Problems Which Are Not Job Related
1	Occasional Nausea	Yes	None
2	Skin rash, head-ache, eye & throat irritation, dry nose, bad taste in mouth loss of appetite	Yes	None
3	Skin rash, nose irritation	Yes	None
4	Headache only if vapor is dense, metallic taste in mouth	Yes	None
5	Skin irritation in winter	Yes	Hypertension
6	Dry skin, sore throat, tingling sensation and acidic taste in mouth	Yes	Open Heart Surgery