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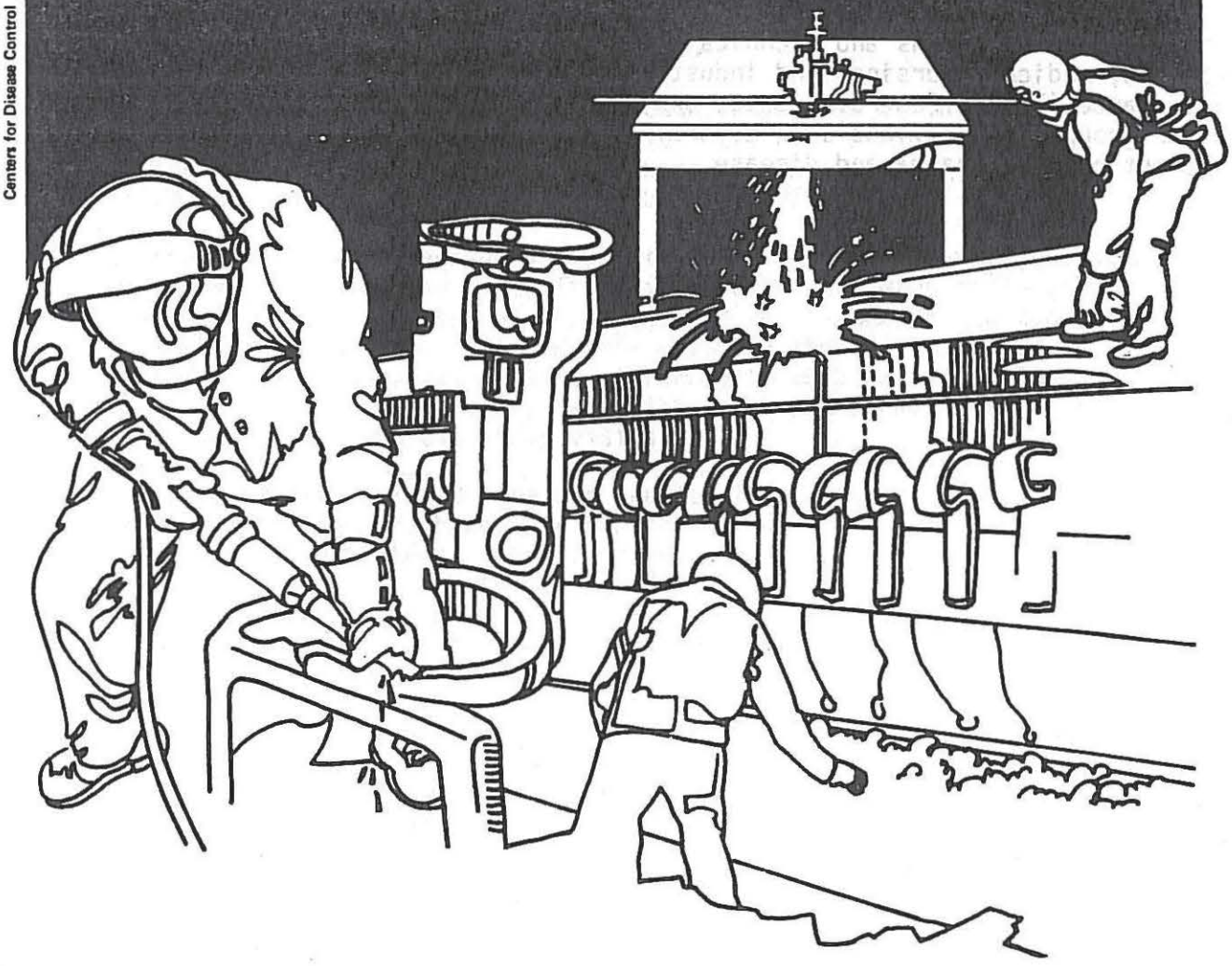

Health Hazard Evaluation Report

HETA 81-341-1188
EATON CORPORATION
FORREST CITY, ARKANSAS

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.

HETA 81-341-1188
SEPTEMBER 1982
EATON CORPORATION
FORREST CITY, ARKANSAS

NIOSH INVESTIGATORS:
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I. SUMMARY

On June 1, 1981, the National Institute for Occupational Safey and Health (NIOSH) received a request from the local union at Eaton Corporation in Forrest City, Arkansas, asking NIOSH for an evaluation of the machine shop employees. The request stated that employees exposed to the coolant (cutting fluid) used in machining metal parts, periodically had episodes of rash on their hands and arms. Additional concerns were: lack of local ventilation in the Airco Burner area, petroleum distillate "exposures incurred while using the "Magna-Flux" metal crack detector, toluene exposures when cleaning paint spray guns in the paint booth, and lead exposures when operating a lead melting pot used to make counter balance weights.

NIOSH personnel conducted a walk through inspection of the plant on August 5, 1981 and the NIOSH Industrial Hygienist performed environmental sampling for lead, toluene, petroleum distillate, iron oxide and total particulate on November 18, 1981.

During initial walk through on August 5, 1981 it was determined that no machinist had developed dermatitis since early June when most machines and coolant resevoirs had been cleaned and refilled with new coolant. Following the initial visit the only employee who currently had a coolant related dermatitis was transferred to work not involving coolant contact, and no other machinist developed dermatitis in the interval between the two NIOSH visits.

Analysis of personal and area air samples for inorganic lead taken at the lead melting pot showed air concentrations to be below the limit of detection (3 ug/filter). Levels of toluene exposure for the spray gun operator ranged from 4.0 to 4.1 mg/m^3, Permissible Exposure Limit (PEL) 375 mg/m^3. The petroleum distillate exposure for the "Magna Flux operator" was determined to be 15.4 mg/m^3 (OSHA PEL 2000 mg/m^3). Personal sampling of the Airco Burner operator showed that iron oxide (Fe_2O_3) concentration was 0.24 mg/m^3; (the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) for iron oxide is 5 mg/m^3. Total particulates exposure was 0.51 mg/m^3 (the ACGIH TLV is 10 mg/m^3).

Based on the environmental sampling results, employee's interviews, and available toxicological information, NIOSH concludes a health hazard did not exist at the time of this survey. Recommendations to aid in providing a safe and healthful working environment are presented in Section VII of this report.

KEYWORDS: SIC 3536 (Hoists, Industrial Cranes, and Monorail Systems), Inorganic Lead, Toluene, Petroleum Distillate, Iron Oxide, Total Particulates, Nitrosamine, and Cutting Fluid.

II. INTRODUCTION

On June 1, 1981, the National Institute for Occupational Safety and Health (NIOSH) received a request from a representative from Local 5681 of the United Steel Workers of America asking NIOSH for an evaluation at the Eaton Corporation, Forrest City, Arkansas. The request stated that employees in the machine shop exposed to the coolant (cutting fluid) used in machining metal parts, periodically had episodes of rash on their hands and arms. Additional concerns were: the lack of ventilation in the area containing the Airco Burner Operation, toluene exposure in the paint booth, and petroluem distillate exposure in the Magna-Flux booth. An initial survey was conducted by NIOSH on August 5 and a follow-up industrial hygiene survey on November 18, 1981. Preliminary findings of the industrial hygiene evaluation were reported in a letter report in February 1982.

III. BACKGROUND

The Eaton Corporation Plant in Forrest City produces large overhead hoist equipment; the plant has approximately 250 office employees and 300 hourly production employees. There are about 100 machinists who work in the machine shop and potentially can have contact with the coolant used in machining parts for the hoists. The machine shop is located in a central part of the factory. Since the area is not air-conditioned, there are numerous large fans in the area to provide sufficient cooling during the warm summer months. Most machines were located so that the fans did not cause collant spray to fall on the operator but there was a fan located above the vertical grinding machine that tended to cause coolant spray to fall onto the face and arms of that machine's operator. Reportedly, the large horizontal grinder when in operation also produced a considerable spray which unavoidably fell upon that machine's operator. The machine shop shut down in the early summer and most machines and coolant resevoirs were thoroughly cleaned and refilled with a new type of coolant.

Brief descriptions of the other operations of concern follow:

1. The Airco Burner which cuts large carbon steel parts using a propane gas flame, was located in the middle of the manufacturing area where the ceiling was greater than 40 feet in height. The metal burner operation usually cuts carbon steel, although occasionally nickel steel is cut. Reportedly, the burner is never used on galvanized or painted metal parts. One employee operates the burner from a control panel about 30 feet from the flame. The burner generates much fume and smoke during operation and since there is no local ventilation, this fume and smoke rises to the ceiling and spreads about the plant.

2. There is a small lead melting pot in the factory to melt lead for the weights used to counterbalance the overhead hoists (counterbalance station). The fumes from the lead melting pot are passed through an electrostatic precipitator and the air is then discharged into the work area. One employee, the cable operator, is designated to operate this melting pot on an intermittent basis.

3. In the process tradenamed "Magna Flux" an operator coats finished parts with a petroleum distillate based proprietary liquid and then examines the parts under ultraviolet light in a darkened booth to detect cracks or imperfections. A few weeks prior to August 5, 1981, initial survey, local ventilation had been installed to remove the vapors of the proprietary coating fluid (a petroleum distillate base) from the magna flux booth.

4. Employee toluene exposures while cleaning spray paint heads in a paint spray booth operation.

IV. ENVIRONMENTAL EVALUATION DESIGN AND METHODS

During the initial visit the capture velocity of the local exhaust ventilation on the lead melting pot and in the magna flux booth were evaluated using a velometer and smoke tubes. In addition two bulk samples of the cutting coolant (both used and unused) were obtained for nitrosamines determination. In the follow-up Industrial Hygienist Survey the following samples were obtained:

1. One personal and one area air samples for lead were obtained at the (lead melting pot) counterbalance station. These samples were collected on mixed cellulose ester filters using a MSA Model G battery-operated vacuum pump at a flow rate at 1.5 liters per minute (LPM) and were analyzed according to NIOSH Method No. S-341.

2. One personal breathing zone sample for iron oxide (Fe_2O_3) at the Airco Burner was collected on preweighed millipore M-5 PVC filter using a MSA Model G personal sampling pump operating at 1.5 liters per minute (LPM). The iron was analyzed according to NIOSH Method No. P&CAM 173. Perchloric acid was used to complete the ashing of the filter. The result was then calculated to FeO_3.

3. One personal breathing sample for total particulates was collected at the Airco Burner on preweighed millipore M-5 PVC filter using MSA Model G personal sampling pump operating at 1.5 liters per minute (LPM). The amount of particulate was determined by weight gain on the filter.

4. Two personal breathing zone air samples were collected on the paint spray operator for toluene. The samples were collected on charcoal tubes using a vacuum pump operating at 0.2 liters per minute and were analyzed by gas chromatography according to NIOSH Method No. S-343 with modifications.

5. One personal breathing zone air sample was collected on the magna flux operator for petroleum distillate. The samples were collected on charcoal tubes using a vacuum pump operating at 0.2 liters per minute and were analyzed by gas chromatography according to NIOSH Method No. P&CAM 127 with modifications.

During the initial visit, the one employee with active dermatitis was interviewed. During the second visit, medical questionnaires were completed on the four employees who were monitored to elicit symptomatology to determine any past or present occurrences of health problems associated with exposure to the chemicals being evaluated.

V. EVALUATION CRITERIA

A. Cutting Oils

Coolant fluids are an emulsion of fats and/or mineral oils in water. These fluids are used to cool the metal parts being machined and to wash away the metal shavings produced during the machinery process. Since such emulsions can readily support bacterial and fungal growth and these organisms can cause deterioration of the coolant; and the generation of noxious chemical vapors and chemical by products that can be primary skin irritiants. Therefore, biocidal agents must be added to the coolant periodically to suppress bacterial and fungal growth and contamination of coolant with human sputum, animal excreta, cigarettes, etc. must be prevented.

Additional compounds such as anti-corrsion agents, are commonly added to coolant fluids. Many of these additives contain irritating compounds and employees whose skin becomes excessively exposed to coolant fluids are subject to develop irritant contact dermatitis. The risk of developing coolant dermatitis can be lowered by:

1. Maintaining the proper PH and proper concentrations of biocidal agents and preventing the contamination of coolant fluids by dirt, animal excretion, cigarettes, insects and human spit, etc.

2. Maintain cleanliness of shop personnel. Hands and arms should be cleaned with water and mild soap at breaks and before departure. Coolant soiled clothing should be promptly changed.

3. Avoiding the use of solvents (kerosene, etc.) to clean skin since they injure skin and increase risk of developing dermatitis.

4. Machines should be equipped with splash guards to decrease amount of coolant that falls on machinists.

B. Lead[2]

Inhalation (breathing) of lead dust and fume is the major route of lead exposure in industry. A secondary source of exposure may be from ingestion (swallowing) of lead dust deposited on food, cigarettes, or other objects. Once adsorbed, lead is excreted from the body very slowly. Adsorbed lead can damage the kidneys, peripheral and central nervous systems, and the blood-forming organs. Chronic lead exposure is associated with infertility and with fetal damage in pregnant women.

Blood lead levels below 40 ug/deciliter whole blood are considered to be normal levels which may result from daily environmental exposure. The new Occupational Safety and Health Administration (OSHA) standard for lead in air is 50 ug/m^3 calculated as an 8-hour time-weighted average for daily exposure.[1] The standard also dictates that workers with blood lead levels greater than 60 ug/deciliter must be immediately removed from further lead exposure and, in some circumstances, workers with lead levels of less than 60 ug/deciliter must also be removed. Removed workers have protection for wage, benefits, and seniority for up to 18 months until their blood levels decline to below 50 ug/deciliter and they can return to lead exposure areas.

C. Total Particulates (As Nuisance Dust)[3]

Nuisance dusts have been associated with very little adverse health effects on the lungs and do not produce significant organic disease or toxic effects when exposures are kept under reasonable control. Extremely high concentrations may cause mechanical irritation to the eyes, ears, and nasal passages and can dangerously reduce visibility. Indirectly irritation can result from the rigorous skin cleansing procedure necessary for their removal. The ACGIH threshold limit value for nuisance particulate as total dust is 10 milligrams per cubic meter of air. The current OSHA standard is 15 mg/m^3 for total particulates. These exposure limits are time-weighted average concentrations for a normal 8-hour workday and a 40-hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse effects.

D. Toluene[4]

Toluene is a clear, colorless, noncorrosive liquid with a sweet, pungent, benzene-like odor. Approximately 70% of all toluene that is produced is converted into benzene. Extreme caution when using toluene should be taken, since it is often contaminated with benzene. It is dangerously absorbed both by inhalation and skin absorption. Toluene is an irritant, a central nervous system depression. Some of the common symptoms include defatting dermatitis, bronchitis, pneumonitis, nausea, vomiting, headaches, dizziness, and irritability.

E. Iron Oxide[3]

Iron oxide is relatively nontoxic. Chronic exposures to high concentrations does cause a disease called siderosis. The main complication of this disease is that it prevents getting a good x-ray of the lung in case another lung disease occurs. Siderosis does not decrease pulmonary function or cause any other metabolic disturbances. Sufficient exposure to iron oxide can cause metal fume fever. This is characterized by fever, chills, and a "flu-like" illness lasting overnight. Tolerance builds rapidly, but also declines rapidly, so attacks are most likely after a person has been off work for a few days.

F. Petroleum Distillate[3]

Depression of the central nervous system is one of the symptoms of exposure. Prolonged exposure causes irritation to mucous membranes, skin irritation, and defatting dermatitis. Liver and kidney damage can occur if excessive exposure is long term.

This product should be used under well-ventilated conditions. If airborne concentrations are high (excess of 1000 mg/m^3, the action level or one-half the TLV or OSHA standard), local exhaust ventilation should be used.

VI. RESULTS AND CONCLUSIONS

Qualitative test for the presence of nitrites in two bulk samples of cutting coolant (obtained during the first site visit) were performed by the NIOSH laboratory in Cincinnati, Ohio. The presence of nitrites (a necessary component in the formation of nitrosamines) was not detected. Consequently, nitrosamines would not be present in the cutting coolant.

The capture velocity of the local exhaust ventilation on the lead melting pot was measured to be 200 FPM and smoke tube testing indicated that the ventilation would provide good capture velocity for any emission from the lead melting pot.

The capture velocity of the local exhaust ventilation in the magna flux booth was measured to be 150 FPM. Smoke tube testing indicated that the ventilation provided good capture velocity for the substance used in the booth.

Results of the environmental samples collected on November 18, 1981, are presented in Table I. Analysis of personal and area samples for inorganic lead showed the air concentration to be below the limit of detection (3 ug/filter). Levels of toluene ranged from 4.0 to 4.1 mg/m^3 (permissible exposure limit 375 mg/m^3) and the petroleum distillate concentration was 15.4 mg/m^3 (OSHA permissible exposure limit 2000 mg/m^3). Iron oxide concentration was 0.24 mg/m^3, the ACGIH TLV is 5 mg/m^3 and the OSHA PEL is 10 mg/m^3. Sample result concentration for total particulate was 0.51 mg/m^3, the ACGIH TLV is 10 mg/m^3 and the OSHA standard is 15 mg/m^3.

During the interval between the two site visits, the fan above the vertical grinding machine was relocated so that the coolant spray no longer falls upon the operator, and modification of the large horizontal grinder eliminated the coolant spray which fell upon that machine's operator.

During the initial visit the union requestor and the company representative both reported that only one employee was currently experiencing coolant dermatitis. They also said that several cases of such dermatitis had occured among machinists during the previous year but that no machinists had developed dermatitis since the machine shop had shut down in early summer and most machines and resevoirs had been cleaned and refilled with fresh coolant. The employee with dermatitis was interviewed and reported that he had had dermatitis on his arms for many months. His skin would improve when he was able to avoid contact with coolant but would rapidly worsen after he had contact with coolant. There were no cases of coolant dermatitis reported during the period from the initial visit on August 5, 1981, to the follow-up visit on November 18, 1981. The one employee known to the union members and company officials to have an active dermatologic condition secondary to contact with coolant, was transferred to another department where the employee does not come in contact with coolant solution.

The inspector who operated the Magna Flux Booth reported that prior to the installation of local exhaust ventilation for the booth, he was exposed to a strong odor while operating the booth, but that the newly installed ventilation effectively removed the vapor. The operators of the Airco Burner, the lead melt pot, and the painter who cleaned spray guns were interviewed and none reported experencing ill health effects secondary to performing their respective operations.

Based on the environmental sampling results and available toxicological information, NIOSH concludes that a health hazard did not exist at the time of this study.

VII. RECOMMENDATIONS

1. Cutting coolants should be used and maintained according to the manufacturer's directions. One employee should be responsible for all changes in coolant composition and all alterations in composition should be recorded. Coolant should not be allowed to become heavily contaminated with metal chips or other materials or to become rancid.

2. Barrier creams may be used, but it must be remembered that these are useful only to enable contaminating materials to be easily washed off the skin.

3. All containers containing chemicals, solvents, and acids should be properly marked.

4. Good personal hygiene and good work practices should be observed by all employees. Washing hands before smoking, eating, and drinking will help reduce contamination.

5. The coolant fluid should be regularly monitored and maintained in accordance with the coolant suppliers recommendations regarding coolant concentation, PH, and biocidal concentration.

6. In the machine shop splash guards should be maintained on machines and fans positioned so that machines are not unnecessarily exposed to coolant spray.

7. Employees should be informed that avoidance of coolant contact with skin and prompt removal of coolant that does contact the skin (using mild soaps - not solvents) can lessen the risks of developing irritant dermatitis.

VIII. REFERENCES

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2. Occupational Safety and Health Administration. Occupational exposure to lead - final standard. Federal Register 1978, November 14:53007.

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4. National Institute for Occupational Safety and Health. Criteria for a recommended standard -- occupational exposure to toluene. Cincinnati, OH: National Institute for Occupational Safety and Health, 1973. (DHEW Publication no. (NIOSH) 73-11023).

IX. AUTHORSHIP AND ACKNOWLEDGEMENTS

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X. DISTRIBUTION AND AVAILABILITY OF REPORT

Copies of this report are currently available upon request from NIOSH, Division of Standards Development and Technology Transfer, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be available through the National Technical Information Service (NTIS), 5285 Port Royal, Springfield, Virginia 22161. 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. Eaton Corporation, Forrest City, Arkansas
2. Local 5681, United Steel Workers of America
3. NIOSH, Region VI
4. OSHA, Region VI

For the purpose of informing the 100 affected employees, copies of this report shall be posted by the employer in a prominent place accessible to the employees for a period of 30 calendar days.

TABLE I

Results of Personal Breathing Zone and General Area Concentration of Inorganic Lead, Toluene, Petroleum Distillate, Iron Oxide, and Total Particulate

Eaton Corporation
Forrest City, Arkansas
HETA 81-341

November 18, 1981

Job and/or Location	Sampling Period	Sample Volume (Liters)	Inorganic Lead mg/m^3*	Total Particulate mg/m^3	Iron Oxide mg/m^3	Toluene mg/m^3	Petroleum Distillate mg/m^3
Cable Operator	0742-1505	753	L.D.**	-	-	-	-
Cable Area	0743-1503	748	L.D.	-	-	-	-
Airco Burner Operator	0739-1501	751	-	0.51	-	-	-
Airco Burner Operator	0739-1501	751	-	-	0.24	-	-
Paint Spray Operator	0755-1100	9.9	-	-	-	4.0	-
Paint Spray Operator	1130-1506	11.8	-	-	-	4.1	-
Magna Flux Operator	0804-1020	26.1	-	-	-	-	15.4
Environmental Criteria			50 ug/m^3	10 mg/m^3	5 mg/m^3	375 mg/m^3	2000 mg/m^3
Limit of Detection			3 ug	0.01 mg	5 ug	0.01 mg	0.1 mg

* mg/m^3 = milligrams of substance per cubic meter of air sampled.
** L.D. = less than detectable limits.

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