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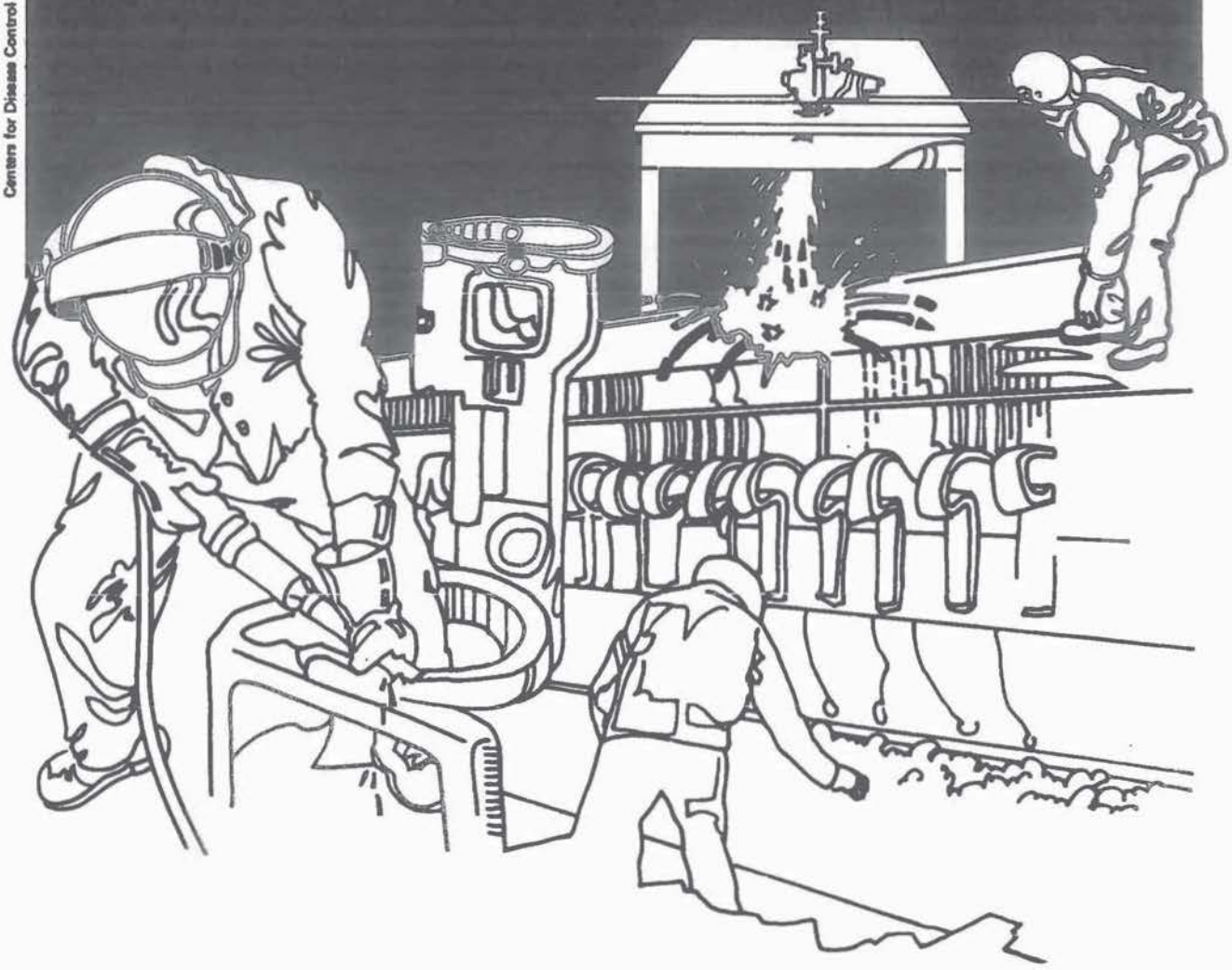

Health Hazard Evaluation Report

HETA 81-438-1090
MATRYX CORPORATION
SHARONVILLE, OHIO

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APRIL 1982
MATRYX CORPORATION
SHARONVILLE, OHIO

NIOSH INVESTIGATOR:
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I. SUMMARY

On August 10, 1981, the National Institute for Occupational Safety and Health (NIOSH) received a request from the Safety Coordinator, Matryx Corporation, for technical assistance in determining lead and chromium exposure in the paint spray booth at this plant. On October 1 and December 9, 1981, NIOSH conducted an environmental survey to determine employee exposures to lead and hexavalent chromium.

The results of this survey show that the two paint spray operators were potentially exposed to airborne lead in concentrations of 321 and 1356 ug/m^3 (micrograms per cubic meter of air) for an 8-hour time-weighted average (TWA). The OSHA standard for occupational exposure to lead is 50 ug/m^3 (TWA). Samples collected by Matryx Corporation showed that the two employees had blood levels below 30 ug Pb/100 ml (micrograms of lead per 100 milliliters of blood); the upper limit of normal for blood lead in adults is 40 ug Pb/100 ml. Analysis of personal air samples for hexavalent chromium were less than detectable and 10 ug/m^3. The current OSHA standard for hexavalent chromium is 100 ug/m^3 as a ceiling value. NIOSH recommends a 1 ug/m^3 ceiling value. Improved work practices were initiated before the December evaluation. At that time, airborne lead exposures were 97 ug/m^3 and 172 ug/m^3 and hexavalent chromium concentrations were 16 ug/m^3 and 23 ug/m^3. The two paint spray operators interviewed reported no current health problems.

The operators wore NIOSH-approved high efficiency air purifying respirators for airborne lead while performing their duties on October 1 and December 9, 1981. The fact that a respirator was worn was not taken into consideration in calculating potential exposures. It can be assumed that exposures of these persons making proper use of prescribed respiratory protection were materially reduced from the calculated values. However, the use of respiratory protection should only be used as an interim control measure until the airborne lead levels are reduced below 50 ug/m^3 through engineering and administrative control.

Based on the results of this survey, NIOSH has determined that the two operators were exposed to airborne concentrations of inorganic lead above the OSHA PEL, and hexavalent chromium above the NIOSH recommended 1 ug/m^3 ceiling value. However, blood levels for both exposed operators were within current blood lead criteria. Recommendations to aid in providing a safe and healthful working environment are presented in this report.

KEYWORDS: SIC 3494 (Valves and Pipe Fittings) inorganic lead, lead chromate, hexavalent chromium, paint spray and valves.

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.

II. INTRODUCTION

On August 10, 1981, NIOSH received a health hazard evaluation request from the safety coordinator, Matryx Corporation, Sharonville, Ohio, to conduct an environmental survey at the paint spray booth at this plant. The purpose of the survey was to determine if employees were overexposed to inorganic lead and hexavalent chromium. On October 1 and December 9, 1981, NIOSH conducted environmental measurements in that area to determine employee exposures to lead and hexavalent chromium.

III. BACKGROUND

Matryx Corporation manufactures all types of valves for commercial use. This evaluation was limited to the paint spraying operation where two workers are employed as spray painters. This department is involved with painting valves and other components using conventional compressed air spraying techniques. The painting facilities include a dry filter spray booth and a low temperature drying oven. Valves suspended from an overhead automatic conveyor system are manually painted as they pass through the spray booth. The two spray painters alternate duties including unpacking and packing the valves and associated components in boxes.

The Safety Coordinator, Matryx Corporation, monitored for solvents exposure at the paint spray booth in the past and found the levels to be well below the OSHA standard, therefore, it was not necessary to monitor for solvents.

IV. EVALUATION METHODS

Personal samples for lead were collected on 0.8 um (pore size) mixed cellulose ester membrane filter using MSA Model G, battery-operated vacuum pump calibrated at a flow rate at 1.7 liters/minute (LPM) and analyzed by atomic absorption according to NIOSH Method No. S-341.

Personal samples for hexavalent chromium [hereafter referred to as chromium (VI)] were collected on 5.0 um (pore size) polyvinyl chloride filters using MSA Model G, battery-operated vacuum pump calibrated at a flow rate at 1.7 LPM and analyzed spectrophotometrically according to NIOSH P&CAM Method No. 169.

The face velocity of the paint spray booth was measured using a thermal anemometer. The measurements are reported as linear feet per minute (LFPM).

The paint spray operators were interviewed to elicit symptoms possibly related to their work environments.

On October 1, 1981, the blood lead samples collected by Matryx Corporation in September 1981 were reviewed.

V. EVALUATION CRITERIA

A. Lead[1]

Toxicological

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 absorbed, lead is excreted from the body very slowly. Absorbed 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/100 ml 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/100 ml must be immediately removed from further lead exposure and, in some circumstances, workers with lead levels of less than 60 ug/100 ml 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/100 ml and they can return to lead exposure areas.

B. Chromium (VI)[2]

NIOSH recommends two standards for chromium (VI): One addresses the noncarcinogenic forms, the other the carcinogenic forms associated with as increased incidence of lung cancer. NIOSH defines "noncarcinogenic chromium (VI)" as chromium (VI) in monochromates and bichromates (dichromates) of hydrogen, lithium, sodium, potassium, rubidium, cesium, and ammonium, and chromium (VI) oxide (chromic acid anhydride). NIOSH recommends 25 ug/m^3 for an 8-hour time-weighted average. NIOSH defines "carcinogenic chromium (VI)" as any and all chromium (VI) material not included in the group above, such as zinc, lead, and calcium chromates. Therefore, the chromium (VI) as lead chromate evaluated at Matryx Corporation under this hazard evaluation is considered to be carcinogenic chromium (VI). NIOSH recommends a 1 ug/m^3 ceiling value. The current OSHA standard for chromium (VI) is 100 ug/m^3 as a ceiling value. Other effects such as skin ulcers, irritation and ulceration of the nasal mucosa, kidney damage, liver damage, and erosion and discoloration of the teeth, have been reported and

have resulted from contact with many different chromium (VI) materials.

VI. RESULTS AND DISCUSSION

Results of the environmental samples collected on October 1 and December 9, 1981, for airborne lead and chromium (VI) are presented in Table I. The two paint spray operators were potentially exposed to airborne lead concentrations ranging from 97 to 1356 ug/m^3. All four personal samples were above the OSHA Permissible Exposure Limit (50 ug/m^3). Analysis of personal air samples for hexavalent chromium were less than detectable to 23 ug/m^3. NIOSH recommends a 1 ug/m^3 ceiling and the OSHA standard for hexavalent chromium is 100 ug/m^3 as a ceiling value.

The walk-in dry filter paint spray booth has an average face velocity of 70 linear feet per minute (FPM) which does not adequately control concentrations of lead and chromium VI generated during the spraying operation. By comparison, the average air velocity over the open face of this type of spray booth should be 100 FPM minimum. However, on occasion (as was done during the October 1 period of sampling), the paint spray operator, while spraying the valves, works his way to the end of the conveyor. This area of the conveyor is not under the influence of the ventilation system. Thus, this work practice would result in increased exposure.

A review of the company blood lead data revealed the two paint spray operators had blood levels below 30 ug lead/100 ml in September of 1981.

Interviews with two workers performing the paint spray duties reported no health problems on the day of the survey.

Based on the environmental sampling results, workers were exposed to lead in excess of the OSHA standard of 50 ug/m^3, however, none of the blood lead levels exceeded the upper limit of normal for occupational exposure to lead. These low blood leads indicate the value of properly worn respiratory protection. Personal air samples for hexavalent chromium ranged from less than detectable limits to 27 ug/m^3. Three of the four samples exceeded the NIOSH recommended 1 ug/m^3 ceiling value. The OSHA standard is 100 ug/m^3 ceiling value.

VII. RECOMMENDATIONS

1. The paint spray operators should be instructed to spray paint the valves and accessories inside the ventilated enclosure at all time. The paint spray operator should stay upwind and spray toward the hood.

2. Increase the paint spray booth average face velocity to 100 FPM to adequately capture lead and chromium VI generated during the spraying operation.

3. Respiratory protection should only be used as an interim control measure until the lead levels are reduced below 50 ug/m^3 and hexavalent chromium below 1 ug/m^3 through engineering and administrative controls. NOTE: Chromium (VI) measured during the follow-up survey are beyond the capability of the respirator currently being used.

   The NIOSH criteria document for chromium (VI) recommends the following respirators when the TWA is in excess of 10X the criteria or equal to 100X.

   a. Full facepiece respirator with replaceable high efficiency filter(s).

   b. Type C supplied-air respirator, demand type (negative pressure), with full facepiece.

   c. Self-contained breathing apparatus in demand mode (negative pressure), with full facepiece.

4. Replace the filters in the paint spray booth frequently to increase the average face velocity.

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

6. Until the air leads are reduced below 50 ug/m^3, a medical surveillance program should be continued as per the lead standard - 1910.1025.

VIII. REFERENCES

1. Occupational Safety and Health Administration. Occupational Exposure to Lead - Final Standard, 29 Code of Federal Regulations 1910.1025, Federal Register 1978, November 14:53007-53014.

2. National Institute for Occupational Safety and Health. Criteria for a recommended standard: occupational exposure to chromium VI. Cincinnati, Ohio: National Institute for Occupational Safety and Health, 1976. (DHEW publication no. (NIOSH) 76-129).

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. Matryx Corporation, Safety Coordinator
2. NIOSH, Region V
3. OSHA, Region V

For the purpose of informing two 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 Samples for Lead and
Hexavalent Chromium in the Spray Paint Area

Matryx Corporation
Sharonville, Ohio
HETA 81-438

Job	Date	Sampling Period	Sample Volume (Liters)	8-Hour TWA Air Concentration - ug/m^3	
				Lead*	Chromium VI
Spray painter operator (A)	10-1-81	0853-1516	646	1356	10
Spray painter operator (B)	10-1-81	0855-1520	650	321	L.D.
Spray painter operator (A)	12-9-81	0833-1516	585	172	16
Spray painter operator (B)	12-9-81	0837-1520	583	97	23
Environmental Criteria (ug/m^3, 8-hour TWA)				50	1 (Ceiling)
Limit of Detection (ug/Filter)				5	0.2

L.D. - Less than detectable limits.

* The 8-hour TWA PEL for inorganic lead has been reduced from 200 ug/m^3 to 50 ug/m^3 (29 CFR 1910.1025). Pending current litigation of the 50 ug/m^3 lead standard, employers must achieve the 200 ug/m^3 level through engineering and administrative controls, and must protect workers at the 50 ug/m^3 PEL through any combination of controls, including the use of proper respirators.