U. S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE

CENTER FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45226

HEALTH HAZARD EVALUATION DETERMINATION
REPORT NO. 78-87-573

MELROE DIVISION OF CLARK EQUIPMENT CO.
GWINNER, NORTH DAKOTA

MARCH, 1979

## I. TOXICITY DETERMINATION

A health hazard evaluation was conducted by the National Institute for Occupational Safety and Health (NIOSH) on July 20-21, 1978, at the Melroe Division of Clark Equipment Company in Gwinner, North Dakota. Breathing zone and general area samples were taken for polynuclear aromatic hydrocarbons, iron oxide, manganese, copper, aluminum, zinc, oil decomposition products, xylene, and oil mist. Bulk samples of cutting oils were also collected, to be analyzed for the presence of nitrosamines and nitrosamine forming compounds. Samples taken, at the time of this study, were below the evaluation criteria, thus a health hazard did not exist. Recommendations have been offered at the end of this report regarding employee exposure to polynuclear aromatic hydrocarbons.

## II. DISTRIBUTION AND AVAILABILITY

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 ninety (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 the NIOSH Publications Office at the Cincinnati, Ohio address.

Copies of this report have been sent to:

a) Authorized Representative for Employees, Allied Industrial Workers, Local 560

b) Melroe Division of Clark Equipment Company

c) Allied Industrial Workers, International Office

d) U. S. Department of Labor - Region VIII

e) NIOSH - Region V

f) NIOSH - Region VIII

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

## III. INTRODUCTION

Section 20(a) (6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a) (6), authorizes the Secretary of Health, Education, and Welfare, following a written request by 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 National Institute for Occupational Safety and Health received a request from an authorized representative of employees regarding exposure to oily smoke that was produced when metal parts, coated with cutting oils, were welded upon.

## IV. HEALTH HAZARD EVALUATION

### A. Plant Process

The Melroe Division of Clark Equipment Company produces Bobcat(R) loaders and certain types of agricultural equipment. The request for a health hazard evaluation specified three areas of concern; the fabrication shop, machine shop, and welding shop. The fabrication and machine shops are responsible for the production of parts from metal stock, while the welding shop is responsible for welding parts of the loaders together which are later used in assembly. Many of the parts come from the fabrication and machine shops with a coating of cutting oils on them, which produces an oily smoke when the parts are welded upon. Employee handling of the parts also results in a great deal of skin contact with the cutting oils.

### B. Evaluation Design

An initial survey was conducted on July 20, 1978. The NIOSH Regional Industrial Hygienist and Regional Consultant made a complete walk through of the entire plant, accompanied by management and union representatives. Ten employees were given nondirected interviews to determine if they had experienced health problems as a result of their work place exposure. Five of the ten workers interviewed did not feel that they were affected. All of the remaining five indicated problems relating to certain jobs being run. Symptoms described were dermatitis, eye irritation, throat irritation, sinus irritation, bad smell, and prolonged colds during the winter months. Material safety data sheets on the substances used in plant were obtained from the plant safety director. The material safety data sheets indicated that the cutting oils used by the plant, might contain some polynuclear aromatic hydrocarbons.

On July 20-21, 1978, an environmental survey of the plant was conducted by NIOSH investigators. Personal breathing zone and general area atmospheric samples were taken in the welding shop for polynuclear aromatic hydrocarbons, iron oxide, manganese, copper, aluminum, zinc, oil decomposition products, xylene, and oil mist. The fabrication and machine shops were sampled for oil mist. Bulk samples of cutting oils

were taken to be analyzed for nitrosamines and nitrosamine forming compounds.

C. Evaluation Methods

Breathing zone samples for polynuclear aromatic hydrocarbons were collected on glass fiber filters followed by a silver membrane filter and a back-up pad which were mounted in a 37 mm cassette, using battery powered gravimetric pumps operating at a flow rate of 2.0 liters per minute (lpm). Samples were analyzed using a high pressure liquid chromatograph with a fluorescence detector.

Atmospheric samples for iron, manganese, copper, aluminum, and zinc were collected on 37 millimeter diameter mixed cellulose ester membrane filters using battery powered gravimetric pumps operating at a flow rate of 1.5 lpm. Samples were analyzed by atomic absorption spectrophotometer.

Oil mist samples were collected on 37 millimeter diameter mixed cellulose ester membrane filters using battery powered gravimetric pumps operating at a flow rate of 1.5 lpm. Samples were analyzed by infrared spectrophotometry.

Two bulk samples of cutting oils were submitted for determination of nitrosamines. These samples were tested by the Modified Greiss-Saltzman reaction, which is a colorimetric test for nitrites and nitrosamines with a sensitivity of <0.1 ug/ml. The samples contained <0.1 ug/ml.

Organic vapor charcoal sampling tubes were submitted for identification and quantitation of organics that might be present as oil decomposition products. Two types of samples were taken for this procedure; a bulk air sample in which as much air as possible was drawn through a charcoal tube to be used for identification, and another set of charcoal tubes using portable battery powered sampling pumps operating at approximately 150 cubic centimeters (cc) per minute to be used to quantitate any identifiable organics. Laboratory analysis by GC/MS revealed trace amounts of methyl esters of fatty acids and quantitative amounts of xylene.

D. Evaluation Criteria

In order that workers may better understand the potential health hazards associated with the chemical substances evaluated during this study, the following discussion is provided.

PNA's (Polynuclear Aromatic Hydrocarbons) - No level has been established for these high molecular weight polycyclic hydrocarbons, although several of the PNA's are potential carcinogens.

BaP Benz(a)Pyrene - The ACGIH has identified BaP as a human carcinogen but has not established a TLV[1]. There is currently no federal standard but The Standard Advisory Committee on Coke Oven Emissions (Federal Register July 31, 1975, 29CFR 1910.1029) has recommended that employee exposure not exceed 0.0002 mg/M$^3$, 8-hour time weighted average

(TWA). This level was selected as representative of ambient BaP concentration in urban air.

Iron - inhalation of iron oxide fume or dust gives rise to apparently benign pneumoconiosis termed siderosis. Prolonged excessive exposure over a period of 6 to 10 years is usually required before changes recognizable by X-ray can occur. The iron deposition in the lungs gives X-ray shadows which may be indistinguishable from fibrotic pneumoconiosis.[2] The American Conference of Governmental Industrial Hygienists (ACGIH) recommends that no worker be exposed to a concentration greater than the Threshold Limit Value (TLV) of 5 milligrams per cubic meter determined as a TWA exposure for normal 8-hour workday or 40-hour workweek.[1] The OSHA standard is 10 mg per cubic meter.[3]

Manganese - symptoms of manganese poisoning include languor, sleepiness, weakness in the legs, emotional disturbances, and a spastic gait with tendency to fall on walking.[4] ACGIH recommends a TLV of 5 milligrams per cubic meter.[1] The OSHA standard is the same.

Copper - health effects from exposure to the fumes consist of irritation of the upper respiratory tract, metallic or sweet taste, nausea, metal fume fever, and in some instances discoloration of the skin and hair.[5] The ACGIH recommends a TLV for copper fume of 0.1 milligrams per cubic meter.[1] The OSHA standard is the same.

Aluminum - exposure to aluminum oxide produces Shaver's disease. The role of aluminum oxide in producing this disease is still not completely understood. The ACGIH recommends a TLV for aluminum oxide of 10 milligrams per cubic meter.[6] There is no OSHA standard.

Zinc - exposure to zinc oxide fume causes metal fume fever. NIOSH recommends an exposure limit of 5 milligrams per cubic meter.[8] The OSHA standard is the same.

Xylene - the major problem of xylene is its narcotic effects on workers. Symptoms and signs of these narcotic effects are experienced in the form of muscular weakness, incoordination, and mental confusion. NIOSH recommends an exposure limit of 100 ppm (TWA).[9] The OSHA standard is the same.

Oil Mist - for the most part oil mists present a very low order of toxicity. Inhalation of mineral oil mist in high concentrations may cause pulmonary effects although this has rarely been reported. Certain additives or thermal decomposition products may cause mild eye or upper respiratory irritation but these effects have not been fully evaluated experimentally. The current ACGIH TLV for oil mist is 5 milligrams per cubic meter of air.[7] The OSHA standard is the same.

E. Evaluation Results

Results from the personal breathing zone and area samples collected are shown in Tables 1-4. All samples are below the evaluation criteria. Laboratory analysis of the cutting oils revealed no nitrosamines or nitrosamine forming compounds.

F. Recommendations

1) The cutting oils used in the plant, should be substituted for cutting oils that do not contain polynuclear aromatic hydrocarbons.

2) Oil coated parts should be degreased before welding is performed on them.

V. REFERENCES

1. Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment with Intended Changes for 1978, American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio (1978)

2. NIOSH/OSHA Draft Technical Standard, Set 0, Iron Oxide Fume.

3. Federal Register, Volume 39, No. 125, Title 29, Code of Federal Regulations, Part 1910, July 1977.

4. American Conference of Governmental Industrial Hygienists: Documentation of the Threshold Limit Values for Substances in Workroom Air, third edition, 1971, page 149.

5. Ibid, Page 127.

6. Ibid, Page 10.

7. Ibid, Page 191.

8. NIOSH Recommended Standard for Occupational Exposure to Zinc Oxide, NIOSH, Cincinnati, Ohio (1976)

9. NIOSH Recommended Standard for Occupational Exposure to Xylene, NIOSH, Cincinnati, Ohio (1975)

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TABLE 1
Results of Environmental
Sampling for Oil Mist

| Job/Location | Sample Number | Time of Sample | Oil Mist $mg/M^3$ | Type of Sample |
|---|---|---|---|---|
| Welder - 54" Bucket | A-2 | 10:14 - 15:04 | 0.57 | BZ |
| Welder - 610 Upright | A-4 | 10:18 - 15:07 | 0.25 | BZ |
| Welder - 610 ROPS | A-6 | 10:26 - 15:03 | 0.75 | BZ |
| Chucker | A-7 | 10:39 - 14:55 | 1.0 | BZ |
| Drill Press Operator | A-8 | 10:41 - 14:53 | 0.14 | BZ |
| Welder - Plate Assembly | A-11 | 08:49 - 13:30 | 0.29 | BZ |
| elder - Air Cooler | A-13 | 08:52 - 11:00 | * | BZ |
| | | Evaluation Criteria | 5 | |

* = Contaminated by Tobacco smoke

BZ = breathing zone

$mg/M^3$ = milligrams of substance per cubic meter of air

Note: samples were taken outside welding helmets

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TABLE 2

Results of Environmental Sampling for Xylene

| Job/Location | Sample Number | Time of Sample | Xylene PPM | Type of Sample |
|---|---|---|---|---|
| Welder - Side Tanks | C-3 | 10:22 - 15:01 | * | BZ |
| Welder - 700 ROPS | C-4 | 10:03 - 15:05 | * | BZ |
| Welder - 700 ROPS | C-6 | 08:38 - 15:00 | 0.25 | BZ |
| Welder - 632 Boom | C-7 | 08:42 - 15:00 | 0.24 | BZ |
| Welder - 700 Side Tank | C-8 | 08:37 - 15:00 | 0.18 | BZ |
| Welder - 700 Frame | C-9 | 08:24 - 15:00 | 0.29 | BZ |
| | | Evaluation Criteria | 100 | |
| | | NIOSH Limit of Detection (micrograms/sample) | 10 | |

* = Below the limit of Detection

BZ = Breathing zone

PPM = Parts of Xylene per million parts of air by volume

Note: samples were taken outside welding helmets

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TABLE 3
Results of Environmental Sampling for fumes of
Iron, Manganese, Copper, Aluminum, and Zinc

| Job/Location | Sample Number | Time of Sample | $Fe_2O_3$ $mg/M^3$ | Mn $mg/M^3$ | Cu $mg/M^3$ | Al $mg/M^3$ | Zn $mg/M^3$ | Type of Sample |
|---|---|---|---|---|---|---|---|---|
| Welder - 630 Boom | A-1 | 10:08 - 15:06 | 4.92 | 0.36 | 0.02 | * | * | BZ |
| Welder - 60" Bucket | A-3 | 10:10 - 15:03 | 2.95 | 0.22 | 0.03 | * | * | BZ |
| Welding - North Wall | A-10 | 08:55 - 15:00 | 0.27 | 0.03 | * | * | * | GA |
| Welder - 632 Frame | A-12 | 08:54 - 14:37 | 1:48 | 0.16 | 0.01 | * | * | BZ |
| Welder - 310 Boom | A-14 | 08:50 - 14:35 | 4.06 | 0.33 | 0.02 | * | * | BZ |
| | Evaluation Criteria | | 5 | 5 | 0.2 | 10 | 5 | |
| | NIOSH Limit of Detection (ug/Sample) | | 3 | 2 | 2 | 10 | 2 | |

BZ = Breathing zone

GA = General area

* = below the limit of detection

$mg/M^3$ = millgrams of substance per cubic meter of air

Note: Samples were taken outside welding helmets

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TABLE 4
RESULTS OF ENVIRONMENTAL SAMPLING FOR
POLYNUCLEAR AROMATIC HYDROCARBONS

| Job/Location | Sample Number | FL ug/M3 | PY ug/M3 | BaA ug/M3 | CH ug/M3 | PER ug/M3 | BeP ug/M3 | BaP ug/M3 | Type of Sample |
|---|---|---|---|---|---|---|---|---|---|
| Welder - 632 Frame | AG-1 | 0.035 | * | * | * | * | * | * | BZ |
| Welder - 700 Side Tank | AG-2 | * | * | * | * | * | * | * | BZ |
| Welder - 60" Bucket | AG-3 | * | * | * | 0.142 | * | 1.73 | 0.124 | BZ |
| Welder - 632 Boom | AG-4 | 0.049 | * | 0.063 | 0.045 | * | * | 0.012 | BZ |
| Welder - 632 Boom | AG-5 | * | * | * | * | * | * | * | BZ |
| Welder - 700 ROPS | AG-46 | * | * | * | * | * | * | * | BZ |
| NIOSH Limit of Detection | (ug/sample) | 0.019 | 0.027 | 0.027 | 0.029 | 0.105 | 0.018 | 0.0077 | |

BZ = breathing zone

* = below the limit of detection

ug/M3 = micrograms of substance per cubic meter of air

Note: samples were taken outside welding helmets

FL - fluoranthene PY - pyrene BaA - benz(a)anthracene CH - chrysene
PER - perylene BeP - benz(e)pyrene BaP - benz(a)pyrene