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. 77-77-464

BUCKEYE AUTOMATIC COMPANY
McArthur, Ohio 45651

FEBRUARY 1978

I. TOXICITY DETERMINATION

A health hazard evaluation was conducted by the National Institute for Occupational Safety and Health (NIOSH) at the Buckeye Automatic Co. on June 21-22, 1977 and August 10, 1977. The intent of the study was to determine whether exposures to cutting oils were posing health hazards to the employees. On the basis of environmental sampling and current toxicity information it is concluded that inhalation of oil mists did not pose a health hazard to the employees. However, the results of the medical interviews and examinations clearly showed a dermatitic hazard due to skin contact with cutting oils. Sixteen of twenty workers had cutting oil dermatitis in varying degrees, from slight to extreme. To alleviate and prevent the cutting oil dermatitis, recommendations for both workers and management are presented in the text of this report. The workers were educated in proper hygiene and self-examination practices during the study.

II. DISTRIBUTION AND AVAILABILITY OF REPORT

Copies of this report are currently available upon request from the National Institute for Occupational Safety and Health (NIOSH), Division of Technical Services, Information Resources and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be available from 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 address.

Copies have been sent to:

1. Buckeye Automatic Company
2. President, Local #1055, United Auto Workers
3. District Office, United Auto Workers, Columbus, Ohio

4. National Office, United Auto Workers, Detroit, Michigan

5. OSHA, Region V

6. NIOSH, Region V

III. INTRODUCTION

Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 699(a)(6), authorizes the Secretary of Health, Education, and Welfare, following a written request by an 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.

On May 2, 1977, an authorized representative of employees submitted a request for a health hazard evaluation in the Production Department of the Buckeye Automatic Company. The employee representative's principal concern was that three of seven employees present at a union meeting had a dermatitis problem. Apparently this dermatitis was the consequence of working with cutting oils.

IV. HEALTH HAZARD EVALUATION

A. Facility and Process Description

The company employs about 27 people of whom about 22 are production employees on a two-shift per day basis. The remaining employees have inspection, supervisory, and administrative functions. The production department occupies about 13,000 square feet of floor space, of which about 2,500 square feet is a new storage addition.

The principal products of the firm are automatic screw machine produced parts built primarily for the automotive industry. About 250,000 pounds of steel bar stock is used per month in the manufacture of studs, rollers, bleeder screws, etc. Production equipment includes 19 automatic screw machines, 4 broaching machines, 2 milling machines, a drill press and several grinders. The machining processes, other than with the screw machines, are referred to as "secondary" operations.

There are two basic cutting and lubricating oils used within the shop. The first, used at the screw machines, is basically a mineral oil with several additives considered to be a trade secret by the manufacturer. The other cutting oil, used for the "secondary" operations, is basically naphthenic petroleum oil, with treatments and additives again considered to be a trade secret by the manufacturer.

The company has been inspected by OSHA on two occasions. One of these inspections led to an OSHA citation for noise exposures. As part of the

noise abatement program, the company installed splash guard cabinets on the screw machines (1975). In addition to lowering the noise levels by about 10 dBA, the cabinets have reduced the ambient air levels of oil mist in the workshop. There is no objective data available on the magnitude of these reductions in oil mist concentrations.

B. Evaluation Sequence

6/21-22/77 Initial plant visit. Environmental study was conducted. On the basis of employee interviews, it was apparent that medical followup was needed to evaluate and make recommendations for a dermatitis problem.

8/10/77 Medical study was conducted. Study included employee interviews and examinations. Employees were educated in proper hygiene and self-examination practices as related to cutting oil exposures.

C. Evaluation Criteria

1. Physiological Effects of Mineral Oils

The term "mineral oil" includes all mineral oils such as light oils (motor spirits), paraffin (kerosine), gas oils, heavier burning oils, diesel oils, lubricating and coolant oils. Inhalation of mineral oil mists in sufficient quantities may cause mucus membrane irritation and pulmonary pneumonitis. Mineral oils affect the skin in relation to the amount and duration of exposure and to the type and grade of oil used. These oils produce "oil acne", which is an inflammatory skin condition characterized by the presence of blackheads, pimples, and pustules, due to oil blocking and irritating the pores of the skin. Septic infection from germs entering from the skin surface may follow. More rarely an acute inflammatory condition occurs, generally on the hands or forearms, such as might be produced by any powerful skin irritant with redness, local swelling, and blister formation. The arms are most affected, but the rash may occur on any part of the body where there is contact with oil, or oily clothing.

Cutting oils also damage the skin by de-greasing. Where the natural protective fat is constantly being removed (de-greased) the skin will become dry, cracked and sore.

Slight injuries to the skin, such as those caused by swarf or metal particles in the oil, make the occurrence of rashes more likely, while neglect of a cut or injury, as for example, by failure to obtain first aid treatment, may lead to a rapid local multiplication of the germs causing infection of the skin. The addition of an antiseptic to the oil for the purpose of preventing infection is not advised, as no useful purpose is served and many antiseptics cause skin irritation.

Long exposure to mineral oil can result in warts or ulcers which may become cancerous. This may particularly occur on the scrotum. Early treatment will provide a certain cure and delay is dangerous.

2. Environmental Criteria

It is judged that the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) for oil mist is the most appropriate criteria for this study, as regards the inhalation exposures of the shop employees to oil mist.[1] The 1977 TLV for oil mist is 5 milligrams per cubic meter of air (mg/M^3) for an 8-hour time weighted average exposure. The TLV Short Term Excursion Limit (STEL) for oil mist is 10 mg/M^3 for a 15-minute average exposure. The current U.S. Department of Labor (OSHA) standard for oil mist is also 5.0 mg/M^3 for an 8-hour time weighted average daily exposure (adopted from the TLV's).

D. Evaluation Methods and Results

1. Environmental

On June 22, 1977, air samples for oil mist were collected using 37 mm diameter membrane filters (closed-face plastic cassettes) and personal air sampling pumps operating at 2.0 liters of air per minute (lpm). The filters were extracted with chloroform and the samples analyzed by fluorescence spectrophotometry (NIOSH Method P&CAM #159). The results (Table 1) indicate air concentrations ranging from 6% to 26% of the environmental criteria for oil mist used for this study.

Each of the cutting oils was sampled for a pH determination. Since pH is a property of an aqueous solution, a direct pH measurement of an oil is not possible. Therefore, 5 ml of each oil was shaken with 10 ml of double deionized water. The layers were allowed to separate and the pH of the water was measured with pH paper and compared with deionized water. The pH was essentially the same for all three solutions.

Four bulk oil samples (screw machines 6 & 13, broacher, slotter) were tested for bacterial growths. None showed significant growths. This suggests that bacterial contamination of the cutting oil is not a problem.

Four swab samples (screw machines 6 & 13, broacher, slotter) were taken for bacterial cultures. On three of these there was no growth. The swab from the broaching machine (external surface) gave a moderate growth of yeast. The bulk from the broaching machine gave no growth. This suggests that the yeast was a surface contaminent.

2. Medical

All available workers (20) signed a consent form, voluntarily agreeing to participate in the study. The medical evaluation consisted of a health questionnaire followed by examination of the skin of the arms, hands, faces, and, in some cases, legs of the workers. The workers were shown a photograph of a case of oil dermatitis, where one affected site had progressed to malignancy, and were advised on the observance of good work practices to mitigate the harmful effects of cutting oils on the skin.

This is a stable work-force with exposures to this particular process ranging from eight months to 24 years, with a median time of 12 years. All of the workers were white males, with the exception of one white female.

Of the total work-force, only four men had no obvious signs of oil dermatitis. Of the remaining 16 workers, oil dermatitis was present in varying degrees, from slight to extreme, the extreme case being a severe chronic inflammatory condition. Management was advised, and agreed, that the severely affected worker should have immediate and continuous medical surveillance. This advice was also given to the worker during the course of his examination. One of the affected workers also reported lesions on his scrotum. (This man was advised to seek urgent medical attention.)

E. Discussion of Results

The results of the air sampling indicated air concentrations of oil mist (at the time of the survey) which were well within the ACGIH environmental criteria of 5.0 mg/M^3. The nine personal air sample results ranged from 0.3 to 1.3 mg/M^3 with a mean of 0.6 mg/M^3. It is judged, by current criteria, that the air concentrations of oil mist present in the workshop at the time of the survey would not cause pulmonary injury (mucus membrane irritation-pulmonary pneumonitis) to the workers.

The oil splash guard cabinets show their value not only in reducing noise levels but in reducing air concentrations of oil mist. Without splash guard cabinets, it would be expected that the screw machine operators would have greater oil mist exposures than the secondary machine operators. However, the data of this study (Table I) show the average oil mist concentration for the screw machine operators (using splash guard cabinets) to be 43% that of the secondary machine operators. These data illustrate the value of the splash guard cabinets in reducing oil mist exposures.

Oil dermatitis is easily preventable in the majority of cases provided that good work practices are observed and that all unnecessary skin contact with cutting oils is avoided. The work practices observed during the survey left much to be desired. It is assumed that this was due to the lack of knowledge of the health hazards posed by skin contact with the cutting oils. The medical examinations showed that 16 of 20 workers had oil dermatitis in varying degrees, from slight to extreme. These medical results and the observations made during the study show the need for the following recommendations.

F. Recommendations

For the Workers:

1. Report any rash, wart, or sore on any part of the body, particularly the scrotum, to management and seek medical advice without delay. Self-examination of the skin, expecially of the scrotum, is recommended daily.

2. Care should be taken to prevent street clothes, especially underwear, from becoming oily, for thus the time of exposure is lengthened and serious disease of the skin may result. Light-weight, impervious aprons should be worn while at work. Work clothes should be changed and washed daily.

3. Before Work

Wash and thoroughly dry all exposed skin; and then apply a bland ointment, such as one consisting of equal parts of anhydrous lanolin and a vegetable oil. This provides a barrier against the oil and facilitates its removal after work. Repeat when work is resumed after a break, and wash off thoroughly at the end of a shift.

4. At Work

Do not wipe the oil off the skin with oily cloths as abrasions may be caused by metal particles and result in infection. Disposable paper towels should be used. Have first-aid treatment at once, for any injury, however slight, and keep covered until healed. It was noted that cotton and plastic ear-plugs were used in the plant. If these ear plugs are not kept clean and sanitary, fungus infections of the ears may develop which can lead to serious complications.

5. After Work

Wash thoroughly with soap and warm water. Rinse repeatedly with water until the exposed skin is clean. Dry carefully, and rub in the "barrier" cream to counter de-greasing of the skin. Shower immediately on reaching home and examine your skin carefully.

For Management:

1. Provide adequate washing facilities with a plentiful supply of bland soap and paper towels.

2. Provide a bland ointment for use as outlined above.

3. Provide work clothes to be laundered daily.

4. Provide light impervious aprons.

5. Oils should be changed in the machines at least once a week, and if it is to be reused, it should be screened to remove metal particles, filtered, and if necessary, neutralized to remove acidity, and heat sterilized to prevent bacterial buildup.

6. Display the enclosed cautionary leaflet in a place clearly visible to the workers.

V. REFERENCES

1. Threshold Limit Values for Chemical Substances in Workroom Air by ACGIH for 1976. American Conference of Governmental Industrial Hygienists, P.O. Box 1937, Cincinnati, Ohio 45201.

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Table I

RESULTS OF AIR SAMPLING FOR OIL MIST

Buckeye Automatic Company
McArthur, Ohio

June 22, 1977

Sample Time	Sample Description	Oil Mist Concentration (mg/M^3)*
0705-1144	Personal sample, screw machine operator	0.3
0707-1142	" " " " "	0.4
0708-1146	" " " " "	0.4
0713-1145	" " " " "	0.4
0715-1148	" " " " "	0.3
0716-1147	" " " " "	0.6
0718-1145	" " ,Broaching machine operator	0.8
0719-1144	" " " " "	0.7
0723-1143	" " ,Horiz. milling machine operator	1.3
0710-1140	Area Sample, inspection table	0.3

Environmental Criteria (ACGIH) 5.0

*Milligrams of oil mist per cubic meter of air.