U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45202

HEALTH HAZARD EVALUATION DETERMINATION
REPORT NO. 74-103-182

PICOMA INDUSTRIES
MARTINS FERRY, OHIO
APRIL 1975

## I. TOXICITY DETERMINATION

An evaluation of dermatitis related to cutting oils (Shell Hi-sulfur oils and Polar-Sol Base 208H) in use at Picoma Industries, Martins Ferry, Ohio was made November 11-12, 1974. It was concluded that the prevalence of oil acne occurring among machinists employed by Picoma Industries is excessive. While sporadic cases of this condition are common among machinists utilizing insoluble cutting oils, both the prevalence and severity observed suggest the need for more rigorous control measures to reduce this problem to a more acceptable level. This determination is based upon medical interviews and limited cutaneous examination of a representative number of employees by the investigating dermatologist. Recommendations for improved work practices and medical monitoring to improve control of dermatitis associated with exposure to cutting oils have been made in the body of the report.

## II. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this Determination Report are available upon request from the Hazard Evaluation Services Branch, NIOSH, U.S. Post Office Building, Room 508, 5th and Walnut Streets, Cincinnati, Ohio 45202. Copies have been sent to:

a) Picoma Industries, Martins Ferry, Ohio
b) Authorized Representative of Employees
c) U.S. Department of Labor - Region V
d) NIOSH - Region V

For the purposes of informing the approximately 400 "affected employees" the employer shall promptly "post" the Determination Report in a prominent place(s) near where exposed employees work 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 such a request from an authorized representative of employees regarding exposure of workers to cutting oils used in various machining operations.

The request alleged that there were numerous cases of dermatitis among employees exposed to cutting oils.

## IV. HEALTH HAZARD EVALUATION

### A. Plant Process - Conditions of Use

The principal products are oil pipe line couplings although some electric pipe conduits are also manufactured. The raw material consists of various grades of steel pipe which are cut to appropriate coupling length. The rough couplings are then bored or chamfered depending upon type, threaded, inspected electronically, fine plated, and painted. These machining processes require huge quantities of cutting oils principally Shell Hi-sulfur straight cutting oil and Polar Sol Base 208H, an oil-water emulsion coolant. Approximately six thousand gallons of the straight oil are replaced each five to eight week period. The Polar Sol 208 is presently used in only a few machining operations.

Economic conditions have resulted in a large increase in the need for couplings by the oil producing industry and consequently there has been a rapid increase in the size of the work force during the past year. No other changes in conditions of use could be identified which might relate to outbreaks of dermatitis.

### B. Evaluation Design

The operating areas of the plant were observed by the NIOSH investigators accompanied by representatives of the employer and employees. It was evident that the primary exposure in the plant was to the Shell straight cutting oil with only limited exposure to the Polar Sol 208H. There were no areas observed where a visible oil mist was apparent. It was decided that a representative group of employees should be interviewed and given limited cutaneous examinations by the dermatologist. Environmental air sampling was judged not necessary and inappropriate in view of the direct skin contact occurring with cutting oils.

### C. Evaluation Criteria

#### 1. Brief Discussion of Known Pathophysiologic Effects of Suspected Agents

Oil acne or oil folliculitis is a common dermatologic problem among machinists who utilize straight or insoluble oils as cutting fluids. The characteristic lesions result from a mechanical blockage

of the pilofollicular (hair) canal. Initial blockage results in blackhead formation which is followed by papular lesions, varying degrees of inflammation and finally cyst formation. Workmen commonly believe that these lesions result from bacteria in the oil, but the micro-organisms which commonly contaminate oils are nearly always non-pathogenic. The distribution is characteristic--the backs of the fingers, forearms, abdomen and anterior thighs are the usual sites of involvement. Persons with large amounts of body hair or those who practice infrequent skin cleansing and wear soiled clothing for prolonged periods are predisposed. Persons with adolescent acne frequently are worsened by contact with insoluble oils and such oils occasionally contain sufficient chlorinated compounds to initate chloracne or worsen pre-existing acne. Most oils today contain very little chlorine.

Soluble cutting oils and synthetic coolants also commonly cause dermatitis due to their irritating properties. Such fluids are usually quite alkaline (pH 9-10). This alkalinity leads to defatting of the skin with dryness, redness, scaling and cracking. In addition, many of these products contain germicidal agents, quaternary ammonium compounds, chlorine, alkanolamine surfactants, amines, and fatty acids which contribute to primary irritation. The hands are usually the only site involved in primary irritant dermatitis.

The control of cutting oil dermatitis requires the dedicated effort of both employees and management. It is a problem frequently associated to a large degree with poor work practices and inadequate hygiene. Sporadic cases become almost inevitable if breaks in technique allow sufficient skin contact.

2. Index of Severity

A crude index of severity for evaluating workers with oil acne lesions was devised. Class I severity encompassed persons with only a few lesions involving limited body areas, usually the forearms; Class II includes those with moderate numbers of lesions usually involving more than one anatomic distribution; Class III includes workers with extensive numbers of lesions usually involving the backs of the hands, forearms, neck, thighs and abdomen.

D. Evaluation Results and Discussion

1. Medical

A total of 37 employees (36 men and 1 women) were briefly interviewed and given limited cutaneous examinations. Most of these employees were operators of various machines, i.e., automatic threader operators, straight tap operators, tapper operators, reamer operators and threader operators. A few individuals were classed as inspectors, material handlers and maintenance men.

The average age for the group was 32 (median 25) and they averaged 5 years of employment with Picoma Industries. However, the median employment was much shorter, i.e., approximately 8 months. They averaged 2 years on their present job assignment, but again, the median was much shorter--three months. Many had two months or less in their present assignments.

Using the index previously mentioned the 37 workers interviewed and examined may be grouped as follows:

| | |
|---|---|
| No evidence of oil acne | - 9 |
| Class I | - 12 |
| Class II | - 9 |
| Class III | - 7 |

No clear-cut association was apparent between the length of time on the present job and the severity of lesions observed, although all men with Class III lesions had at least four months on their current jobs and four of the nine without lesions had worked for less than four months. However, several individuals without lesions were long-term employees. Minimal numbers of lesions were also seen in a few individuals with employment as short as one month. Several cases deserve brief comment. Three young individuals had noted a marked worsening of their pre-existing facial acne since beginning employment and one moderately severe case of acne rosacea in a long time older employee was noted. This suggested that the oils in use might contain enough chlorine compounds to cause some chloracne although the effect might also merely be a non-specific one as has been reported for many oily substances. A chlorine analysis of Polar-Sol Base 208H and Shell Hi-sulfur oils was carried out and the chlorine contents (expressed as percent by weight) were 0.57 and 0.09 percent, respectively. These values are for specimens collected from operational machines. Chlorine levels exceeding 0.10 percent have been reported to cause chloracne. At the time of the survey, however, Polar-Sol Base 208H was being utilized in only a few machining operations and principally in a computer operated, highly automated operation with minimal employee exposure. However, since chlorine is released into the air by hot cutting edges, it is possible that it may worsen some cases of pre-existing facial acne. In general, the lack of correlation between the presence of oil acne and time on the job points to the importance of good personal hygiene measures in preventing this condition rather than exposure per se. Several older, long-term employees probably have remained free of lesions either because they have developed better work practices, i.e., careful adherence to frequent, meticulous skin cleansing and/or better utilization of

protective clothing. No cases of primary irritant contact dermatitis of the type that might be expected from contact with an oil-water emulsion cutting fluid were noted, probably because of the presently very limited use of this type agent in this workplace.

In summary, a total of 37 individuals were interviewed and briefly examined to ascertain the prevalence of dermatitis. Most of these employees were exposed to an insoluble cutting oil during the course of various machining operations utilized in the production of pipe couplings. A high percentage of workers (75%) were found to have lesions characteristic of oil acne. No other definite dermatologic or medical problems were identified.

2. Environmental

Despite the widespread use of cutting oils in this plant, no evidence of an appreciable oil mist was observed in any of the machining areas. Oil aerosol measurements were not deemed necessary since no medical complaints which might be related to oil mist were received and oil aerosol measurements had been made during an earlier OSHA inspection. During the OSHA inspection[1] in August 1974, oil aerosol measurements were made with results of 20-25% of the present Federal Standard of $5mg/M^3$.

E. Conclusions

It is concluded that the prevalance of oil acne occurring among machinists employed by Picoma Industries, Martins Ferry, Ohio is excessive. While sporadic cases of this condition are common among machinists utilizing insoluble cutting oils, both the prevalence and severity observed suggest the need for more rigorous control measures to reduce this problem to a more acceptable level.

## V. RECOMMENDATIONS

1. As much protective clothing as is consistent with job safety should be worn. This includes rubber gloves, sleeve gauntlets and rubber or plastic aprons. Cloth aprons are not satisfactory. Management should make these items freely available and avoid periods when stocks are not sufficient to meet the demand. Personal clothing should not be allowed to become saturated with oil and should be laundered after each day's wear. When protective gloves cannot be worn, barrier creams such as Ply No. 2 or No. 5 creams or Kerodex No. 51 should be made available and their use encouraged. Workers must be instructed in their proper use.

2. The external surfaces of splash guards, shields or other machine parts which frequently come into contact with clothing and/or skin should be frequently cleaned and wiped free of oil.

3. The proper removal of oils reaching the skin is very important. Since the amount of use received by a washing station is inversely proportional to the distance an employee must go to avail himself of it,

management should give consideration to the installation of additional Bradley basins and sink facilities. Organic solvents such as kerosine should not be used in personal cleanliness as they defat and irritate the skin.

Many industrial cleansers are unnecessarily harsh. Waterless hand cleaners are particularly valuable in removing insoluble oils. These can then be followed by washing with mild soaps. The importance of the foregoing recommendations should be repeatedly stressed to new employees.

4. Workmen should be urged to report any initial signs of developing dermatitis. A plant nurse is particularly important in this regard since she can supervise a proper therapeutic regime to minimize dermatitis problems. It is generally recommended that plants employing over 250 persons have a full time industrial nurse.

5. During the pre-employment physical examination the physician should carefully evaluate the presence of pre-existing acne. Persons with active acne should not be placed in positions where they will commonly be exposed to insoluble oils.

## VI. REFERENCES

1. Fullmer, Mary, Personal Communication, October 4, 1974.

## VII. AUTHORSHIP AND ACKNOWLEDGMENTS

Reported Prepared By:

James B. Lucas, M.D.
Dermatologist
Medical Services Branch
Cincinnati, Ohio

Robert E. Rosensteel
Industrial Hygienist
Hazard Evaluation Services Branch
Cincinnati, Ohio

Originating Office:

Jerome P. Flesch, Chief
Hazard Evaluation Services Branch
Cincinnati, Ohio

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Laboratory Analyses:

A. W. Smallwood
Chemist
Physical and Chemical Analysis Branch
Cincinnati, Ohio