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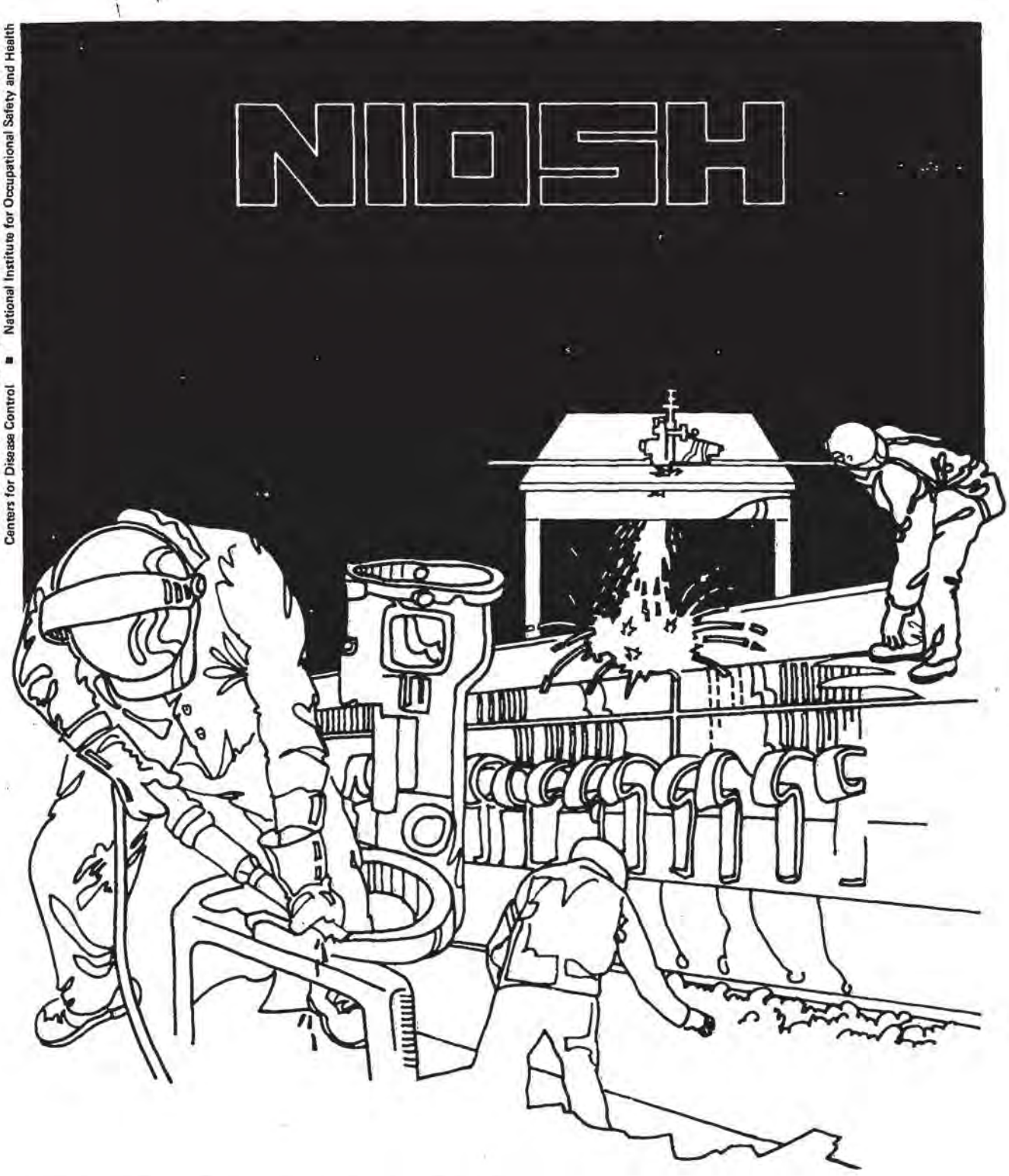

Health Hazard Evaluation Report

HETA 81-140-1318
GENERAL TIRE AND
RUBBER COMPANY
PERU, INDIANA

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.

Mention of company names or products does not constitute endorsement by the National Institute for Occupational Safety and Health.

HETA 81-140-1318
MAY 1983
GENERAL TIRE AND RUBBER COMPANY
PERU, INDIANA

NIOSH INVESTIGATORS:
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I. SUMMARY

On January 2, 1981, the National Institute for Occupational Safety and Health (NIOSH) received a request to evaluate skin and respiratory problems resulting from exposure to metalworking fluids at the General Tire and Rubber Company in Peru, Indiana. NIOSH conducted an evaluation on February 12-13, 1981. The environmental component consisted of a review of a previous OSHA industrial hygiene inspection report, the chemical formulations of the metalworking fluids and their associated physical and chemical properties, exposure control systems, and conditions of exposure which was determined to be primarily dermal contact. Based on this information, no air sampling was judged to be warranted. The medical evaluation included employee interviews and a dermatological examination.

Fifteen of 20 (75%) employees exposed to one or more of four metalworking fluids reported a history of work-related dermatoses with 13 (65%) observed to have abnormal skin findings at the time of the study. Eight employees had chronic skin changes. All three employees having constant exposure through immersion to soluble fluids had both reported and observed skin problems, while eight of the nine with exposure to non-soluble fluids had reported work-related skin problems and seven had an observable skin disorder. Three of five employees with intermittent exposure to all four metalworking fluids had reported skin problems and two of these and one other had an observed skin problem.

On the basis of these results, NIOSH concluded that a dermatologic health hazard existed from both constant and intermittent immersion exposure to metalworking fluids at General Tire and Rubber Company. Recommendations for controlling exposure to metalworking fluids are offered in Section VII of the report.

KEYWORDS: SIC 3540 (Metalworking Machinery and Equipment), cutting oils, metalworking fluids, and dermatitis.

II. INTRODUCTION

On January 2, 1981, the National Institute for Occupational Safety and Health (NIOSH) received a request from an authorized representative of Local Union 626, United Rubber Workers of America, to evaluate skin and respiratory problems resulting from exposure to metalworking fluids at the General Tire and Rubber Company, Peru, Indiana.

A survey of the facility was conducted by NIOSH on February 12 and 13, 1981, at which time detailed recommendations were offered for controlling skin problems due to contact with metalworking fluids used.

III. BACKGROUND

The Peru facility of General Tire and Rubber Company is a metal stamping plant making automotive suspension components. The facility began operations in 1967 and at the time of the survey employed approximately 27 persons: two maintenance, six administrative, and 19 production. The average length of employment at General Tire and Rubber Company of these employees was 11 years.

Parts are stamped from low carbon steel supplied as tubular or flat-coiled steel. The tubular steel (Plymouth and Metal-Matic) is supplied by two manufacturers and is coated with an oil-base rust inhibitor and lubricant. The Plymouth tubing is coated with non-soluble napthenic-based (>95% by volume) oil and the Metal-Matic tubing is coated with American No. 2 diesel fuel (primarily composed of petroleum distillates).

The tubular steel is wet-cut to specified lengths in either Department 804 or 806 depending on the diameter of tubing. Department 804 employs Traub cut-off machines for tubing ranging from 1/4 to 1-1/2 inches outside-diameter (O.D.), and Department 806 employs Modern cut-off machines for tubing ranging from 1-1/4 to 2 inches O.D. Both machines use the automated flooding method for metalworking fluid application. A low-pressure pump delivers the fluid through pipes and valves to a nozzle, situated over the cutting zone, through which the fluid flows down and floods the tool, work, and swarf. The fluid is then collected in the swarf tray and returned by gravity to the sump pump. Both machines use the same metalworking fluid, which is basically a chlorinated paraffinic-based emulsifiable oil with several polar additives, emulsifiers, and extreme-pressure lubricants. The exact chemical composition of the metalworking fluid is considered to be trade secret by the manufacturer. The pre-cut tubing is then transferred to Department 805, where the sharp ends are chamfered. The chamfered pre-cut tubing, now referred to as cylinders, is transferred to Department 807 for assembly.

The flat-coiled steel is stamped and drawn into cylinders using standard rap and draw presses in Departments 801 and 808,

respectively. Both presses use the same metalworking fluid, which is basically a non-soluble chlorinated paraffinic-based mineral oil with treatments, extreme-pressure lubricants. The cylinders are then transferred to Department 807 for assembly.

The plant also has a material handling department (853), tool and die department (872), and maintenance department (873).

The Company has been inspected by the Occupational Safety and Health Administration (OSHA) on two occasions. One of the inspections conducted in May 1978, in Department 807 involved airborne sampling of petroleum napthas generated during chamfering of the pre-cut Plymouth tubing. The maximum airborne concentration of petroleum napthas measured in the breathing zone of a roller operator was 0.10 mg/m^3, 8-hour Time-Weighted Average (TWA). By comparison, the OSHA Permissible Exposure Limit (PEL) is 5.0 mg/m^3, 8-hour TWA. The second inspection conducted by OSHA was limited to safety issues.

IV. EVALUATION DESIGN AND METHODS

A NIOSH industrial hygienist and medical investigator conducted a survey at the plant on February 12 and 13, 1981. Information was obtained concerning plant processes, materials, conditions, employee exposures, the nature and route of exposure (inhalation and/or dermal), and exposure control systems.

The NIOSH medical investigator interviewed all day and evening shift production and maintenance employees working February 12-13, 1981, using a questionnaire that included occupational and smoking information and dermatological and respiratory symptoms, and then examined exposed skin (hands, arms, face, neck) and, when indicated by questionnaire information unexposed areas. The purpose of the questionnaire was to obtain the following information:

A. Prevalence of respiratory and dermatologic (skin) problems prior to employment - to determine employees' predisposition to potential adverse respiratory and dermatological effects in his/her environment and to identify non-occupational respiratory and skin diseases.

B. Prevalence of respiratory and dermatologic problems while employed at General Tire and Rubber Company - to determine processes or employees that might be associated with respiratory and/or skin disease.

C. History of consultation with health professionals for evaluation or treatment.

An employee was designated as having dermatitis possibly caused by industrial fluids if the following conditions were met:

A. There was a history of exposure to lubricating and/or cutting oils.

B. The process used resulted in skin contact with the oils.

C. Cutaneous problems characteristically caused by industrial fluids were observed on the arms, forearms, hands, nails, face; and where indicated the chest, anterior thighs, legs around the socks, and under the belt line.

Available employee medical records and the Log of Occupational Injury and Illness (OSHA Form 200) for January 1980 to 1981 were reviewed.

At the request of the union, a small group of laid-off and disability-retired employees with reported health problems, which the union believed were work-related, also were evaluated using the same methods (questionnaire and, where possible, skin examination).

Based upon a detailed review of (a) the report of the previous OSHA inspection; (b) chemical formulations of the metalworking fluids and associated physical and chemical properties; (c) conditions and nature (limited predominantly to dermal contact) of exposure; and the overall manufacturing process no air sampling was judged to be warranted.

V. EVALUATION CRITERIA

In general terms, mineral oil affects the skin in relation to the amount and duration of exposure and to the type and grade of oil used. The term "mineral oil" includes all mineral oils, such as light oil (motor spirits), paraffin (kerosene), gas oils, heavier burning oils, diesel oils, and lubricating and cutting oils. These oils produce "oil acne", which is an inflammatory skin condition characterized by the presence of blackheads, pimples, and pustules due to the oil blocking and irritating the pores of the skin. Infection from bacteria entering from the skin surface may follow. More rarely, an acute inflammatory condition occurs, generally on the hands and forearms, 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. Long exposure to mineral oil can result in warts and ulcers of the skin.

Cutting oils also damage the skin by degreasing it. Where the natural protective fat is constantly being removed from the skin, it will become dry, cracked and sore. Slight injuries to the skin, such as those caused by swarf or metallic particles removed by cutting tools in the cutting process, which are in the oil, make the occurrence of rashes more likely. Neglect of a cut or injury can lead to a rapid multiplication of bacteria, causing infection of the skin.

The general composition of non-soluble and soluble metalworking fluids (typical of the soluble type used in Departments 804 and 806, and non-soluble types used in Departments 801 and 808, and that used to coat the tubular steel) is presented in Appendix A. Skin problems can result from major and minor components:

Major components and possible skin problems include:

A. Oil - sterile folliculitis (non-infective inflammation of hair follicles), comedones (blackheads), and papules (small, solid bumps).

B. Solvents - xerosis (dry skin)

C. Water - maceration

Minor components: additives which can cause either irritant and/or allergic dermatitis include:

A. Anticorrosive agents

B. Emulsifying agents

C. Pour-point depressants

D. Antimicrobials

E. Deodorizers

F. Plasticizers

VI. RESULTS AND DISCUSSION

A. Questionnaire and Skin Examination

Twenty of the 21 employees (19 men and 1 woman) representing all production workers, and one of the two maintenance department workers were interviewed and examined (Table I). The mean age of the 20 employees interviewed was 43 years. The average number of years of employment at General Tire and Rubber Company was 11.8 years.

The 20 employees were divided into three current exposure groups by present job classification titles (Tables I and II). It is important to note that while employees were divided by present job classification, some had recently worked in other job classifications with different exposures. Group 1 included those departments (853, 807, 872, and 873) who were exposed to all finished products or maintenance of any part or tool in the process. Group 1 employees were, therefore, potentially exposed to

all lubricating and cutting fluids in all processes, although on an intermittent basis. Group 2 included only departments working with the tubular steel (804, 806, and 805) and, therefore, exposed only to the Plymouth and Metal-Matic tubing and soluble chlorinated paraffinic-based emulsifiable oil metalworking cutting fluid. Group 3 (Departments 801 and 808) was exposed only to a non-soluble chlorinated paraffinic-based mineral oil metalworking fluid, which included extreme-pressure lubricants.

Seven of the 20 workers gave histories of 6 different respiratory problems (Table II): two of pneumonia and one each of bronchitis, pleurisy, sinusitis, pulmonary edema, and chest injury. Only one employee related a respiratory problem to work. These seven employees represented all three exposure groups. Since only one worker reported work-related respiratory disease, since six different problems were identified, and since all three exposure groups were represented, no association could be made between exposure and respiratory disease in the current group of employees.

Fifteen of 20 (75%) production and maintenance employees gave a history of skin disease (Table II). All 15 employees attributed their skin disease to work; in addition, five of the 15 also reported a history of non-work-related skin disease. Ten of the 15 employees had sought medical care for their skin problems, either through the company or privately. The prevalence of skin problems was high in all exposure groups: Group 1 - 60%, Group 2 - 67%, and Group 3 - 89%.

Fourteen of 20 (70%) employees examined had one or more skin findings, 13 of the 20 (65%) being potentially oil-related (Table II). In contrast, four employees who reported a past history of skin problems had negative physical examination findings, while one employee who reported a negative history of skin disease had positive oil-related cutaneous clinical findings. While Department 805 (Group 2) had no employees with oil-related dermatoses, all employees of Departments 804 and 806 had 3 possible oil-related skin problems on physical examination; work in Departments 804 and 806 involves constant immersion in both lubricating and cutting oil contaminated with metal chafings.

Twenty-five diagnoses in 14 employees were judged potentially attributable to either acute or chronic exposures to cutting and/or lubricating oils (Tables II and III). There were three diagnoses of rash (one papular and two macular), two of keratoses, seven of hyperpigmentation, three of hypopigmentation, and nine of xerosis. While one oil acne folliculitis (comedone) was observed on physical examination, there were two additional employees who reported oil acne in the past. Twenty of the 25 diagnoses were found in 8 employees from the following departments: 13 - Department 801, 2 - Department 804, and 5 - Department 806. The skin sites involved

were areas commonly oil-contaminated, namely: 11 of the extensor forearm, nine of the hands, two of the face, and one of the lower legs around the socks. Since all four metalworking fluids were involved (Department 801 was directly exposed to but one metalworking fluid, while Departments 804 and 806 were exposed to the three other lubricating fluids), no relationship can be established with any one of these specific cutting or lubricating oils. An association, however, can be made with exposure to the metalworking cutting and lubricating oils and contact dermatitis. Specific oil combinations used or contamination of oils are possible causative factors.

B. Review of OSHA Form 200

Review of the January 1980 to 1981 Occupational Injury and Illness Logs showed 15 entries, two of these were rashes (Departments 801 and 807), 2 abscesses (Departments 805 and 806), and 2 lacerations (Departments 801 and 872). No respiratory problems were reported. Four of the six skin problems were in employees who had histories of repeated skin problems while working at General Tire and Rubber Company.

C. Review of Company Medical Records

Company medical records were limited. From a list of 12 present, former, and laid-off employees, who the union reported had seen physicians for either skin or respiratory problems, the company was able to provide two employee medical records for review. Both employees (from Departments 805 and 806) were diagnosed as having oil-related rashes. An employee from Department 805 had "rash of the right index finger due to cutting oil with an accompanying small amount of rash on the arms, abdomen, and feet", and one from Department 806 had "contact dermatitis both forearms" exposed to lubricating oil at work - rash developed.

The four laid-off and/or disability-retired employees who reported respiratory and/or skin problems, had a comparable mean age and length of employment at General Tire and Rubber Company as the current employees. Three of these four women had a history of respiratory allergies (two asthma, one sinusitis), and two had skin allergies as well as (hives and allergy to nail polish). All four employees reported multiple episodes of respiratory problems for which they all saw doctors and which they identified as work-related. Two of the four were smokers. All four women reported histories of work-related skin problems: three cases of multiple infections of the fingers and nail beds and two cases of rashes of the forearms and neck associated particularly with new shipments of Plymouth tubing. Three of the 4 had seen a doctor for their skin problems. All four had worked in Departments 805 and/or 807.

D. General Observations

Material handling, inspection, assembly, tool and die, and maintenance provide opportunities for contact with skin irritants causing adverse skin effects. Employees must handle materials coated with anti-rust agents, use solvents, handle parts, and finished products coated with the residue from earlier processes, handle parts and finished products coated with the residue from earlier processes, or handle materials added for protection while parts are in storage or in transport.

In several departments such as 804 and 806 (traub and modern), the machining process necessitates an employee inserting an ungloved hand into the stream of cutting fluid to check dimension and accuracy of the machined part or to insert or remove the part. This maneuver results in repeated exposure. The usual custom of wiping off excess oil with a cotton rag kept in a pocket or waistband, leads to cumulative contamination of subjacent skin and clothing. Minor trauma or repeated traumas from metal shavings imbedded in rags used to wipe the forearms and hands are also common in such operations.

Because the production area is one large undivided space, indirect contamination from aerosolized oil can occur. Conceivably, this mist could be inhaled and deposited on exposed skin and absorbent clothing. With chronic exposure, irritant eczematous dermatitis, oil dermatitis, or hyperpigmentation can ensue.

VII. RECOMMENDATIONS

1. The Traub and Modern (Departments 804 and 806, respectively) machine operators (Plymouth, Metal-Matic, and soluble metalworking) have significant contact with the metalworking fluids during parts gauging and resultant machine adjustments. The procedure requires the machine operator to retrieve a part from the parts catcher grate, gauge the part's length dimension, and make the appropriate machine adjustments. During the procedure, the operators hands are repeatedly flushed/bathed with the fluid. Although impermeable protective gloves are available, they are quickly lacerated by the metal swarf when the operator retrieves a part and ultimately become internally saturated with the fluid.

   Since the current parts catcher grate is not part-size specific, i.e. cannot be adjusted according to the parts diametric dimension, the swarf from the larger diameter tubing remain on the grate's surface with the parts resulting in laceration of the glove material and minor hand traumas. The significance of the latter with respect to cutting oil dermatitis is discussed under Recommendation No. 3. The existing parts catchers on the Traub and Modern machines should be re-designed with a grate easily

adjustable to adequately receive the diametric dimension of the tubular steel being processed.

2. An extremely important means of controlling contact dermatitis from metalworking fluids is rigorous maintenance of the fluid system, with frequent changing and cleaning of the system and pump. Soluble oil emulsions (as used in the Traub and Modern machines) are breeding grounds for bacteria. Cookson[1] recommends effective draining and cleaning (both flushing with a chemical cleanser and physical cleaning) between changes as the most beneficial steps in controlling infection of the fluid system.

   A trial-and-error method may ultimately prove to be the best procedure for determining how frequent the metalworking fluids require changing. It's not unlikely to expect that the soluble oil emulsion fluids will require changing more frequently than the non-soluble fluids. As a beginning point, it's recommended that the fluids in Departments 804 and 806 should be changed monthly, and those in Departments 801 and 808 quarterly.

   In attempt to establish a schedule for changing the fluid, the following procedure may be of value:

   a. Establish objective monitoring parameters, such as fluid pH (acidity/alkalinity). The suppliers of the metalworking fluids should be consulted for the most useful and effective parameters.

   b. Establish a dermatitis incidence log to determine whether any trend exists. A graphic display might more easily detect an increasing incidence.

3. A filtration system should be installed to remove metallic particles from recirculated oils. Slight injuries to the skin, such as those caused by swarf or metallic particles in the oil, make the occurrence of rashes more likely.

4. The risk of dermatitis also can be reduced by proper pre-placement and work practices.

   a. Consideration should be given to assigning current and future employees with chronic skin disorders to areas where their skin conditions will not be exacerbated by continual contact with metalworking fluids.

   b. At each work break, soiled skin should be washed and thoroughly dried, and an emollient cream should be applied.

   c. The use of barrier creams should be continued. It provides a barrier against the oil and facilitates its removal after work.

d. Workers should not wipe off the skin with oily clothes as abrasions may be caused by metal particles and result in infection. Disposable paper towels should be used.

e. The practice of keeping oil-soaked wipe rags in trouser pockets should be discouraged.

VIII. REFERENCES

1. Cookson, J.O. 1971. Machine Tool Design and Use in Relation to Cutting Fluids, Annals of Occupational Hygiene, Vol. 14, pp. 181-190.

2. O'Brien, D. and Frede, J.C. Guidelines for the Control of Exposure to Metalworking Fluids. National Institute for Occupational Safety and Health, Cincinnati, Ohio, Publication No. 78-165, 1978.

IX. AUTHORSHIP AND ACKNOWLEDGEMENTS

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1. The General Tire and Rubber Company, Peru, Indiana
2. Authorized Representative of Local Union 626, United Rubber Workers of America, Peru, Indiana
3. NIOSH, Region V
4. OSHA, Region V

For the purpose of informing 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.

APPENDIX A

METALWORKING FLUID COMPOSITION

I. Mineral Oil (Non-Soluble)

1) Base 60 - 100%, paraffinic or naphthenic
2) Polar additives
   a) Animal and vegetable oils, fats, and waxes to wet and penetrate the chip/tool interface
   b) Synthetic boundary lubricants: esters, fatty oils and acids, poly or complex alcohols
3) Extreme-pressure (EP) lubricants
   a) Sulfur-free, or combined as sulfurized mineral oil or sulfurized fat
   b) Chlorine - as long chain chlorinated wax or chlorinated ester
   c) Combination - sulfo-chlorinated mineral oil or sulfo-chlorinated fatty oil
   d) Phosphorous - as organic phosphate or metallic phosphate
4) Germicides

II. Emulsified Oil (Soluble Oil) - opaque, milky appearance

1) Base - mineral oil, comprising 50-90% of the concentrate; in use the concentrate is diluted with water in ratios of 1:5 to 1:50.
2) Emulsifiers: petroleum sulfonates, amine soaps, rosin soaps, naphthenic acids
3) Polar additives - sperm oil, lard oil, and esters
4) Extreme pressure (EP) lubricants
5) Corrosion inhibitors: polar organics, example: hydroxyl amines
6) Germicides
7) Dyes

TABLE I

Lubricating and Cutting Oils by Type, Department, and Number of Employees Exposed

General Tire and Rubber Company
Peru, Indiana
HETA 81-140

February 1981

Dept. No./Name	Job Classification Machine/Process	Industrial Fluid(s)	Total Number Employees (Day/Evening Shifts)	Number of Employees Interviewed (Day/Evening Shifts)
853	Material Handler	Lubricating/Rust Preventive Oil - 1), 2) Cutting Oils - 3), 4)	1	1
804	Traub Operator	Lubricating/Rust Preventive Oil - 1), 2) Cutting Oil - 3)	1	1
806	Modern Operator	Lubricating/Rust Preventive Oil - 1), 2) Cutting Oil - 3)	2	2
805	Roller Operator	Lubricating/Rust Preventive Oil - 1), 2) Cutting Oil - 3)	3	3
807	Assembler	Lubricating/Rust Preventive Oil - 1), 2) Cutting Oils - 3), 4)	1	1
801	Die Setter Press Operator	Cutting Oil - 4)	8	8
808	Press Operator	Cutting Oil - 4)	1	1
872	Tool and Die	Lubricating/Rust Preventive Oil - 1), 2) Cutting Oils - 3), 4)	2	2
873	Maintenance	Lubricating/Rust Preventive Oil - 1), 2) Cutting Oils - 3), 4)	2	1
		Total	21	20

1) Lubricating/Rust Preventive Oil - Plymouth Tubing - non-soluble napthenic-based (>95% by volume) oil.
2) Lubricating/Rust Preventive Oil - Metal-Matic Tubing - coated with Ameuior No. 2 diesel fuel - primarily petroleum distillates.
3) Metalworking Fluid - Soluble chlorinated paraffinic-based emulsifiable oil with polar additives, extreme-pressure lubricants, emulsifiers.
4) Metalworking Fluid - Non-soluble chlorinated, paraffinic-based mineral oil with treatments, extreme-pressure lubricants.

TABLE II

Skin and Respiratory Findings in Employees Exposed to Lubricating and/or Cutting Oils

General Tire and Rubber Company
Peru, Indiana
HETA 81-140

February 1981

			Skin History			Skin Physical Examination				Respiratory History		
Exposure Groups*	Departments	Number of Employees	History of Dermatoses	History of Work-Related Dermatoses	History of Nonwork-Related Dermatoses	Dermatoses on Skin Examination	Oil-Related Dermatoses on Skin Examination	Nonoil-Related Dermatoses on Skin Examination	Previous Medical Consultation Sought	History of Respiratory Disease	History of Work-Related Respiratory Diseases	Smoking History
1	853	1	0	0	0	1	1	0	0	0	0	1
	807	1	0	0	0	0	0	0	0	1	0	0
	872	2	2	2	0	2	2	0	0	0	0	1
	873	1	1	1	0	0	0	0	1	0	0	1
2	804	1	1	1	1	1	1	0	1	1	0	1
	806	2	2	2	1	2	2	0	2	2	1	1
	805	3	1	1	0	1	0	1	0	0	0	0
3	801	8	7	7	2	6	6	0	5	3	0	6
	808	1	1	1	1	1	1	0	1	0	0	1
Total		20	15	15	5	14	13	1	10	7	1	12

* See text for rationale.

TABLE III

Oil-Related Skin Conditions in Employees Exposed to Lubricating and/or Cutting Oils

General Tire and Rubber Company
Peru, Indiana
HETA 81-140

February 1981

Exposure Group	Departments	Skin Conditions						Skin Sites					
		Oil Acne	Acute Inflammatory Condition, Rash	Keratoses	Hyperpigmentation	Hypopigmentation	Xerosis	Forearms	Hands	Face	Thigh	Lower Legs	Body
1	853 (1)**						1		1	1			
	807 (1)								-	-	-		
	872 (2)				1		1	2	1				
	873 (1)												
	Total (5)				1		2	2	2	1			
2	804 (1)		1			1		1	1	1			
	806 (2)				2	1	2	1	2				
	805 (3)		1					1					
	Total (6)		2		2	2	2	3	3	1			
3	801 (8)	1	1	2	3	1	5	5	3			1	
	808 (1)				1			1	1				
	Total (9)	1	1	2	4	1	5	6	4			1	
	Total (20)	1	3	2	7	3	9	11	9	2	0	1	2

* See text for rationale.
** Number in parentheses is the number of employees.