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. 76-83-360

GENERAL REFRACTORIES COMPANY
BALTIMORE, MARYLAND

JANUARY 1977

I. TOXICITY DETERMINATION

A health hazard evaluation was conducted by the National Institute for Occupational Safety and Health (NIOSH) on August 23 and 24, 1976 at the General Refractories Company (Machine Shop) Baltimore, Maryland. Eleven workers were interviewed and examined. Seven of the eleven interviewed employees gave a history of development of dermatitis which appeared to be at least partly occupational in origin. The dermatitis appeared to be related to exposures either to grinding operations (where coolants were used) or to solvent degreasing operations. In one case, the dermatitis was severe and persistent. This case appeared to be at least exacerbated by work exposures, although whether this was because of repeated irritation by the work contactants, a specific allergy to a material contacted at work or an infection had not been definitively determined in a review of his medical records.

Recommendations for improved work practices and medical monitoring to improve control of dermatitis associated with exposure to cutting coolants and solvents used in the machine shop have been presented in the body of the report.

II. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this Determination Report are currently available upon request from NIOSH, Division of Technical Services, Information and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 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 NIOSH, Publications Office at the Cincinnati address.

Copies of this report have been sent to:

a) The General Refractories Company, Baltimore, Maryland
b) Authorized Representative of United Steel Workers of America (USWA) Local Union #14605
c) U.S. Department of Labor - Region III
d) NIOSH - Region III

For the purpose of informing the approximately 25 "affected employees" the employer shall promptly "post" for a period of 30 calendar days the Determination Report in a prominent place(s) near where exposed employees work.

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 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.

The National Institute for Occupational Safety and Health (NIOSH) received such a request from an authorized representative of United Steel Workers of America (USWA) Local #14605 regarding workers exposure to phenol used in the cutting coolant in the machine shop at the General Refractories Company in Baltimore, Maryland. The request stemmed from concern that cutting coolant had caused hand dermatitis.

IV. HEALTH HAZARD EVALUATION

A. Description of Process - Conditions of Use

The plant is engaged in the production of refractory materials. This is done in several connected buildings on the same site. A variety of processes is used to formulate refractory products from such raw materials as chrome ore, magnesite, CO_2, wood and paper.

This evaluation is concerned with the machine shop in which 25 workers machine parts used primarily for the production of refractory bricks. The machine shop is housed in a separate building which contains a Thompson and a Blanchard surface grinder, lathes, saws and a solvent dip for cleaning metal parts. The metal parts to be machined frequently come into the shop caked with residual brick material. Some parts are cleaned by hand in the solvent vat, which contains petroleum distillates and other solvents mixed when necessary by the employees.

The worker most affected with dermatitis had been engaged in operating the Blanchard and Thompson grinding machines. These large grinders differ in the configuration of the grinding wheel, but both use the same coolants. In general, the coolant used is Cimcool-S2® manufactured by Cincinnati Milacron, Cincinnati, Ohio. (On January 7, 1977 a company spokesman for Cincinnati Milacron stated that nitrites are not present in Cimcool-S2® coolant.) Qualitative test for the presence of nitrites in a bulk sample of Cimcool-S2® was performed by the NIOSH Measurements Support Branch in Cincinnati, Ohio. The presence of nitrites (a necessary component in the formation of nitrosamines) was not detected. Consequently, nitrosamines would not be present in this coolant. Cimcool-S2® is a water soluble chemical emulsion cutting fluid. This was supplied in the form of a concentrate which is mixed with water. Mixing was performed by an operator who changed this coolant whenever he felt it necessary. In particular, more concentrate was added if rust spots were noted on machined metal at the end of the shift. Water was also added

as necessary to replace evaporation. A variety of different employees operated both machines, and there was no particular person consistently responsible for the coolant composition. In order to decrease bacterial contamination, two products had been added prior to mid-May 1976: Wescol®, a coal tar disinfectant manufactured by West Chemical Products, Long Island City, New York, and Cimcool-00® wafers. Since May 1976, only Cimcool00® wafers manufactured by Cincinnati Milacron, Cincinnati, Ohio have been added. Wescol® was usually added a few quarts at a time. On the product label it was suggested that a dilution of 300 to 400 to 1 should be used. The 00 wafers are added at approximately 1 wafer per 25 gallons; the amount necessary is estimated by the operator. It appeared that sometimes in the past both wafers and Wescol® had been added. Odor problems were noted at times, particularly in summer and if the odor appeared to be troublesome, the operators added more of the above antibacterial products. Wescol® was stated by the manufacturers to be a coal tar disinfectant containing 41.5% coal tar neutral oils; 8% coal tar phenols; 18.2% sodium salt to 4-chloro-2-phenol and 2% sodium salt of 6-chloro-2-phenol. The Cimcool-00® wafers were described by the manufacturer as consisting of the active ingredient 2-(hydroxymethol)-2-nitro-1,3-propanediol (99.5%) and inert ingredients (0.5%). There was no scheduled change and no consistent monitoring system for the materials which had been added to the coolants nor any recording of the frequency of changes. If odor problems became particularly bad, the entire coolant solution for the machine in question was changed. There was no particular filtering system for metal chips which might be present within coolant, although in general these settled to the bottom of the coolant storage tank. This debris was removed at intervals ranging from 1 to 6 weeks whenever the coolant looked particularly dirty by visual examination. During machine operation, the coolant was pumped from the storage tanks to the machine to the area being machined. Coolant mist was observed to contact exposed areas on the workers' skin during the machining operations.

There was also potential exposure to the skin to caked residue, particularly to chromium and magnesium compounds on the metal parts. These materials in the dry form may also contaminate coolant. There was exposure to undertermined solvents including petroleum distillates in the solvent degreasing tank area. One employee was observed smoking in this area, which would constitute an important safety hazard. The degreasing tank was generally operated with the lid down and further amounts of petroleum distillate and unidentified solvents added from time to time.

Only one employee appeared to use protective measures to protect against exposures. He commenced to do this some time after he developed dermatitis. He used gloves, rubber apron, and various barrier creams. The other operators did not generally use such protective measures.

A hand cream was provided in a wall dispenser in the machine shop; however, the dispenser was noted to be clogged and did not appear to be used frequently. The washing facilities were located in another building.

Operators frequently used their own soap. They showered on the premises. Air blow dryers (World Dry Manufacturing Company, Chicago) were provided for drying. A liquid green soap "Grime Fighter"® (West Chemical Products, Inc., Rock Island City, New York) described as an extra heavy duty cleanser with Dermalian® was provided. Until recently, Sanitone® powdered hand soap fortified with Lanolin® (United Sanitary Chemicals Company, Baltimore, Maryland) had been used.

At the time of the evaluation visit, approximately 20 men were employed in the machine area in the categories of leaders, machinists, junior and trainee machinists, grinding hands, heat treaters and bench men.

In summary, potential sources of contact with substances which might potentially damage the skin in this area included exposures to the coolant, coolant additives, including Wescol and OO wafers, coolant contaminants including metal chips, the products of bacterial decomposition of the coolants, caked residual material, metal parts themselves, and skin and cleansing agents.

B. Study Progress

A walk-through survey followed by a medical evaluation was performed on August 23 and 24, 1976.

C. Evaluation Methods

2. Medical Methods

Eleven workers were interviewed and examined. Informed consent was obtained from each worker. A brief questionnaire was completed, containing identification data, occupational history and a medical history related to work exposures, in particular of skin or respiratory complaints. A physical examination of the skin was performed on each of the employees. Seven of these employees worked on the 7-3 shift, and four on the 3-11 shift.

Questionnaires were completed by each of the four employees on the night 7pm-7am shift, although these employees were not personally interviewed or examined.

Certain medical records pertaining to affected workers were obtained from the individual worker's physicians and were reviewed.

D. Evaluation Results and Discussions

2. Medical Results and Discussion

The eleven examined employees ranged in age from 21-59, with a mean of 48 years. They had worked at General Refractories for periods ranging from 6 months to 29 years, with a mean of 14 years and had worked in the

machine shop for an average of 11 years. Nine of the 11 employees complained of skin problems occurring during their employment at General Refractories, Baltimore. Two of these complaints appeared to be non-occupational (dyshidrotic eczema, and an eruption on the legs of undetermined nature). Seven employees had complaints which appeared to be occupational in nature - five related to exposure to coolants and two due to exposure to cleaning solutions. The five complaints related to exposure to coolants consisted of: erythema of the hands in three employees, with eczematous changes including vesiculation in two employees; one employee complained of frequent cuts from metal chips and two of nail problems either excessively soft nails or chronic paronychia. Two employees described scaling, redness and sometimes vesiculation following exposure to solvents used in the degreasing operations. The latter were transient and short-lived reactions. One employee complained of a cough which occurred only at times when he was exposed to coolant mists from the grinding machines. The employees gave the history that one previous employee who worked on the grinding machine much of the time within the last five years had suffered from severe contact dermatitis. In addition to the employees seen at the plant, of the four night shift employees unavailable for examination, one complained that his hands frequently broke out when he was exposed to coolant.

On examination, skin abnormalities possibly related to work were seen in two of the eleven examined employees. One employee had an eczematous eruption on the dorsal surface of his hands, a second had evidence of staining and horizontal ridging of the nails. The latter employee gave a history of skin problems, mainly on the hands, but also on the feet, requiring repeated medical attention over the last few years. From the history given by the employee and information supplied by the attending doctors, he appeared to have suffered from a chronic eczematous dermatitis which, at least on the hands, was exacerbated by occupational exposures particularly to coolants, although the inciting cause of the dermatitis, whether occupational or non-occupational, could not be definitively determined from any information available. In this case, the eruption had improved steadily since May 1976. The improvement appeared to be related to one or more of a number of factors including a change in the exposure, in particular the cessation of exposure to Wescol, the institution of protective measures including barrier creams and gloves and a change in his treatment regime. Patch testing had been performed on this employee using some agents he contacted during his employment; however, for technical reasons the results from his testing as performed could not be relied upon to provide precise evidence as to the presence or absence of specific allergy to a work contactant in this employee.

E. General Findings and Conclusions

1. Seven of the eleven interviewed employees gave a history of development of dermatitis which appeared to be at least partly occupational in origin. The dermatitis appeared to be related to exposures either to grinding operations (where coolants were used) or to solvent degreasing

operations. In one case, the dermatitis was severe and persistent. This case appeared to be at least exacerbated by work exposures, although whether this was because of repeated irritation by the work contactants, a specific allergy to a material contacted at work or an infection had not been definitively determined in a review of his medical records.

2. Coolant used in the grinding machines is not used in accordance with the manufacturer's directions.

3. There are numerous potential exposures to materials which may cause skin damage in this machine shop. In general, few measures are taken to minimize these exposures.

4. There appears to have been some improvement since May 1976, at which time the use of Wescol was ceased and a few employees commenced to use precautions such as gloves and barrier creams.

V. RECOMMENDATIONS

1. Unless there are urgent reasons to the contrary, coolants should be used according to the manufacturer's directions. One employee should be responsible for all changes in coolant composition and all alterations in composition should be recorded. Coolant should not be allowed to become heavily contaminated with metal chips or other materials or to become rancid.

2. Although the overall prevalence of dermatitis as diagnosed from physical examination within this population is not high, certain steps can be taken to prevent its occurrence:

a. Gloves should be used when there will be significant exposure of the hands to the solvents and coolants. Such gloves should be impervious, should be changed if ever they become contaminated, and should not be allowed to become wet or soggy on the inside. The use of a cotton inner liner may help.

b. Barrier creams may be used but it must be remembered that these are useful only to enable contaminating materials to be easily washed off the skin.

c. Contaminating materials on the skin should be washed off as quickly as possible. The use of harsh abrasive soaps for this purpose should be minimized. The use of soft disposable paper toweling is often less irritating than the use of an air dryer.

d. Employees should wash and shower carefully and thoroughly at the end of their shift and change into clean street clothes.

e. The use of an emollient cream after washing hands is often helpful to workers exposed to coolants and solvents of the type used in the plant.

f. Subjects who develop dermatitis must be made aware that several months are necessary after dermatitis has apparently resolved for the skin to return to normal. Until this occurs, even minor insults will more likely damage the skin than at other times.

3. Preplacement examinations should be continued to insure that the workers "predisposed to dermatitis" are not placed in the machine shop where they are exposed to coolants or solvents.

4. The occupational medical services made available to the plant must include services directed at prevention and not just individual therapy. Where dermatitis occurs, there must be an investigation to determine the causal agents and circumstances. Following this, advice regarding appropriate preventive measures should be given to the plant management. There should be subsequent monitoring as to the success of these resulting measures. Where possible a determination as to the occupational nature or otherwise of the condition should be made promptly

VI. AUTHORSHIP AND ACKNOWLEDGMENTS

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