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. 75-153-315

National Standard Company
170 Dundaff Street
Carbondale, PA. 18407

JULY 1976

I. TOXICITY DETERMINATION

Based upon the evaluation conducted by the National Institute For Occupational Safety and Health (NIOSH) on September 19, 1975 and February 11 and 12, 1976, it has been determined that certain employees involved in the production of perforated metal products have dermatitis problems resulting from exposure to chemical agents used or found in the workplace. This determination is based upon; 1) medical interview and cutaneous examination of exposed employees, 2) personal observations of the NIOSH investigators, 3) a review of medical records and studies, and 4) a review of available literature concerning the toxicity of the substances under consideration.

II. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this hazard evaluation determination are available upon request from the Division of Technical Services, Information Resources and Dissemination Section, NIOSH, Robert A. Taft Laboratories, 4676 Columbia Parkway, Cincinnati, Ohio 45226. Copies have been sent to:

A. National Standard Company

B. Authorized representative of employees - International Association of Machinists and Aerospace Worker, District 128.

C. U.S. Department of Labor, OSHA, Region III

D. U.S. Department of HEW, NIOSH, Region III

For the purpose of informing approximately 73 "affected employees," the employer shall promptly "post" for a period of 30 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. Code 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) recieved such a request from the authorized representtative of employees of the National Standard Company to evaluate an alleged dermatitis problem associated with cutting oils.

IV. HEALTH HAZARD EVALUATION

A. Plant Process

The National Standard Company is engaged in the production of perforated metal goods. Manufacturing is divided into three main areas: perforating department, tool room, and tool assembly room. In the perforating department there was exposure to Apex (R) and Suncut 913 (R) drawing oils, both of which were diluted 40-60% using either Circo-X-Lite (R) Oil or Circosol 410 Oil (R). The latter oils were reported to be identical in all but their identification. Removal of oils from metal in the production area was accomplished by wiping with kerosene or with a Sunoil solvent. The wash area used by the men in this area were supplied with Boraxo (R) soap. Gloves were sometimes used in this area, occasionally rubber gloves, although frequently cloth gloves, not impervious to the materials used in the plant. The cloths are sent to a commercial laundry for washing. Skin contact with oils and other solutions was variable in the production area, while some production took place in long runs in which there was little oil contact. Contact with cleaning solvents and soaps was greatest when the throat portions of presses were being cleaned of old dried oils. In particular, the helpers tended to have more exposure to cleaning solvents than the production machinists.

In the tool and tool assembly rooms, there was exposure to the Apex Oil(R), Suncut 913 Oil(R), Circo-X-Lite Oil(R) and Circosol 410 Oil(R) on metal parts introduced from the perforating department. In addition, the greatest exposure to coolants from surface grinders appeared to be in the tool assembly area. Until recently, Cimcool Five Star(R) coolant was used. In an attempt to reduce the high incidence of dermatitis, a change was made to Vytron coolant and it was planned to use the latter coolant in the future. At the time of the evaluation, Cimcool was used only as a coolant for certain grinding machines. The coolant solutions had been changed approximately every 6 months, although no precise records had been kept of these changes. Bacteriosatic wafers provided by Cincinnati Milacron were added to the Cimcool coolant (Five Star cutting fluid) and were being used in a dilution greater than recommended by the manufacturer at the time of the evaluation. In addition, Bacteriosatic wafers containing antiseptic solution prepared for Cimcool coolants had been added to Vytron coolant, contrary to the manufacturers directions. The coolant apparently had become heavily contaminated with production oils. Some filtration of the coolant was performed within the machines, however, both the coolant and other oils were

contaminated with significant amounts of metal chips and scrapings. There was some settling out of metal filings from the coolant in a collection tank. Kerosene and machine oils were used to clean oils off metal parts in the tool room and assembly department. A waterless hand cleanser (DL antiseptic hand cleaner) was available in the tool room, however, it was not situated near a sink and it seemed to be rarely used. Boraxo soap was available in the separate washing facilities used by employees in this area. There were no washing facilities within either the tool room or assembly department. Disposable paper towels were used in all wash areas. Gloves were rarely used in the tool area mainly because of the great difficulty in performing intricate manipulations while wearing them. However, in the assembly area, some employees had been able to use gloves for the majority of operations in such a way as to prevent recurrences of previously severe dermatitis. Rubber or latex gloves were thin enough to provide sufficient manipulation although these gloves were rapidly broken or torn under the conditions of use.

The most sustained contact with both metal coating oils and coolants, appeared to occur in the assembly area. Although little coolant mist was noted, there was some splashing of coolant around the assembly room operations.

The use of barrier creams in the plant had been instituted on the advice of the insurance carrier. The use was attended by little, if any, symptomatic improvement and a dermatological consultant subsequently advised that barrier creams not be used.

A pre-placement examination was performed in which emphasis on the skin was apparently a question as to whether the employee has had skin rashes or eczema.

B. Evaluation Design and Methods

On September 19, 1975, an initial visit was made to the National Sandard Company to review manufacturing conditions associated with a reported dermatitis problem. During the initial visit, it was determined, based on professional judgement, that due to the manner in which oils and coolants were used, that airborne occupational exposures were minimal in the perforating, tool, and tool assembly areas. Information gathered at this time, however, did appear to warrant further medical review. On February 11 and 12, 1976, Edward A. Emmett, M.D. visited National Standard Company accompanied by Mr. Straub. A walk through survey and an interview and examination of a number of employees was performed. A number of diagnoses and certain company medical records, were discussed with Dr. Pettinato, Carbondale, Pa. OSHA records and medical reports concerning a number of workers were reviewed.

Seven employees who worked in the tool room and assembly area and 11 who worked in the production area were interviewed and examined. One previous employee who had developed dermatitis while employed in the assembly area, was interviewed and examined. All employees working in the tool room and assembly area on the day of our visit were included in the evaluation along

with workers from the production area who were currently symptomatic or had been symptomatic in the past.

C. Evaluation Criteria

The source of environmental standards considered during this evaluation, is the American Conference of Governmental Industrial Hygienist's (ACGIH) Threshold Limit Value (TLV) List for 1975. They are as follows:

Oil mist	5.0 milligrams per cubic meter(mg/m^3)
Oil mist vapor	varies depending on aromatic content and additives

D. Medical Evaluation Results

1. Tool and Assembly Area

Seven current employees and one past employee from this area were examined. Two men currently working in this area were not examined, the first was on leave and a second on the night shift. All workers on the day shift were white males, their ages ranged from 27-56, with a mean age of 44. These employees had been working at this plant for between 1½ and 23 years, with a mean of 12 years. Two workers were currently employed as tool assemblers, and the past employee had worked as an assembler. Five men were toolmakers. The diagnoses of current skin conditions, based on the history and physical examinations of the seven present employees, are listed in Table 1. In general, the eruptions had been present for periods ranging from two days in one employee, to over a year in five employees. Dermatitis in all cases involved exposed areas with the exception of a follicular eruption on the thighs of one employee which appeared to be related to contamination of clothing with oils and coolants. The dermatitis in all cases was itchy. There was frequent nail involvement with a history of paronychia. There was a particular tendency to involve either the flexor surfaces of the forearms, the thenar border of the hand and the backs of the fingers. In all but one case the eruption was more severe on the right hand of right handed individuals. The former employee has been seen by two dermatologists for occupational eczematous contact dermatitis. Five of the eight affected employees had seen a physician for dermatitis, two had seen at least two dermatologists. The latter two employees had been awarded Worker's Compensation for occupational contact dermatitis. Both worked as tool assemblers. In two cases of dermatitis amongst tool assemblers, the severity had been reduced significantly by the use of gloves for operations involving contact with oils or coolants. In general, dermatitis was more severe in those who worked in the tool assembly area. One tool maker had developed dermatitis only after working on a machine in the assembly area. A number of employees described burning of their skin whenever there was exposure to Cimcool Five Star(R) coolant.

One employee had undergone patch testing on several occasions, both with undiluted oils and coolants as used in the plant. Some positive reactions were recorded, although the precise allergen in the oils was not determined. The possibility that these reactions could have been irritant and the materials could have produced irritant reactions on normal individuals could not be entirely discounted on the available data. In all employees in whom an adequate determination could be made, the dermatitis appeared to heal more or less promptly on discontinuance of the exposure. As is characteristic for occupational contact dermatitis, following prolonged dermatitis, the improvement was less rapid.

There was no past history of atopy in any of the employees. Two of the seven employees had a family history of atopy, approximately the percentage expected in a random sample of the population. In three cases, employees reported a past history of dermatitis, none of which appeared closely related to the present condition. One employee had a transient episode of itching and mild dermatitis following fiberous glass exposure 12 years previously, a second employee developed dermatitis following exposure to epoxy resins in previous employment and a third had developed transient dermatitis of undetermined nature 2 years ago while working at this plant at his present occupation. No non-occupational factors could be detected in any of the 7 current employees which were making a significant contribution to the dermatitis.

2. Production Area

Eleven employees who worked the majority of the time in the production area, were interviewed and examined. There were four operators, two maintenance men, and five helpers. All examined employees in the production press area were white males whose ages ranged from 23-58 years, with a mean of 44 years. They had been employed in the plant from 2 to 42 years with a mean of 15 years.

a) Operators and Maintenance Personnel

The current dermatologic conditions diagnosed from examination of the skin in these six employees are listed in Table 2. One employee had a mild eczematous dermatitis of the left hand which appeared to be occupational in origin and had been present for a few days following prolonged contact with oils and frequent washing of the left hand. Two other employees in this area gave a history of transient dermatitis two years ago and nine months ago, respectively. Another employee complained of itching and burning following excessive exposure to solvents and soaps, particularly after cleaning operations. Two employees have evidence of non-occupational skin conditions, namely an arterial block of the right arm and a chronic eczematous dermatitis of approximately 2 years duration, whose origin could not be definitively ascertained from this examination, which did not appear to be occupational.

b) Press Helpers

Press helpers in general tended to have heavier exposures to oils and cleaning solutions than the operators. Current dermatologic conditions were diagnosed in four employees after the examination of five press helpers. The diagnoses are given in Table 2. A fifth press helper who had no current evidence of an abnormal skin condition on examination complained of numbness and a tingling sensation in the hands after heavy contact with oils and cleaning materials. Three press helpers had evidence of recurrent dermatitis of mild to moderate severity present for a number of years. One of these employees currently had eczematous contact dermatitis of the forearms, another, eczematous contact dermatitis of the hands and a third, eczematous contact dermatitis of the groin. The latter appeared to be related to contamination of rag aprons and clothing with machine oils. In each of these employees, the dermatitis appeared exacerbated by cleaning operations, in particular, the cleaning of dirty tools or machine parts where there was heavy exposure to kerosene, fuel oil, Boraxo soap and various machine oils. A diagnosis of nummular eczema was made in a fourth press helper. This condition is generally considered non-occupational although it could be exacerbated by occupational exposures. Two of the press helpers had received medical treatment for dermatitis None of the operators in the production area showed evidence of predisposing conditions such as atopy or of a significant past history of dermatitis. No non-occupational exposures could be determined which might be making a significant contribution to the development of dermatitis in these individuals. In addition to skin symptoms, one press operator complained of nausea, cough with white phlegm, a raw throat and chest congestion within 5-10 minutes of exposure to a plastic reducing compound. He had been able to abort these symptoms by avoiding further exposures to that material.

E. Discussion of Results

A number of men in this plant seemed to be currently suffering from occupational contact dermatitis at the time of the evaluation. The severity of the eruptions varied from very severe dermatitis requiring long periods off the job to transient discomfort. The prevalence was higher in the tool and assembly area and assemblers were affected most severely. In the production area, dermatitis appeared to be more prevalent amongst helpers and the prevalence appeared lowest amongst production operators. The occupational contact dermatitis was confined to areas exposed to occupation agents, in general to the hands and forearms with involvement of the groin in a few employees. The areas of the plant with the highest pervalence and degree of severity of dermatitis were those in which there was the greatest exposures to industrial chemicals. The sites of the body affected, reflected a similar relation to chemical exposures with involvement of the groins confined to employees whose clothing was significantly contaminated with various occupational contactants. There was a moderate tendency for the dermatitis to be worse in the winter. The above characteristics

suggest a diagnosis of irritant dermatitis. The results for the survey suggested that any employees sufficiently exposed to the various materials used in the plant might develop dermatitis on exposed areas of the body. In one subject, patch tests with several materials had been positive, which could be interpreted as probably indicating the allergic contact dermatitis apparently occurring to an incompletely identified allergen. However, the patch testing was apparently performed with undiluted materials and it was not clear that sufficient patching had been performed on control subjects to be certain that the reactions were not irritant in nature. In any case, irritant materials could have contributed to the eruption in this man.

A number of factors appear to have contributed to the development of irritant dermatitis in this plant. There appeared to be a number of chemical exposures capable of damaging the skin. These included exposures to the various machine oils and coolants. In particular, the Circo-X-Lite(R) and Circosol(R) oils used to dilute either the drawing oils were moderately strong irritants on the basis of animal toxicity testing, according to data supplied by the manufacturers. Exposure to cutting oils such as Cimcool(R) and Vytron(R) can be irritating and was prominent in the areas in which the highest prevalance of dermatitis was noted. In particular, a number of employees described burning of their skin on contact with Cimcool 5 Star Coolant(R). Solvents used for cleaning include kerosene and other cleaning oils. The only soap available to workers in the plant area is a heavy duty cleaner capable of irritating the skin on prolonged or repeated exposure. All of the above materials could be skin irritants under appropriate industrial conditions. Although a waterless cleaner was available in the tool and assembly areas it was little used. Gloves were generally not used in the operations. In particular, where they were used they were often not impervious to the various oils and solvents against which they should protect. The cloth aprons fashioned by cleaning rags are not impervious to the oils and coolants used and may actually exacerbate contact between the various agents and the thighs and groin. In addition, suspended metallic particles in cutting fluids may have an abrasive action causing minute cuts or scratches which may weaken the resistance of the skin to other extraneous irritating materials.

Data supplied by the manufacturers of a number of the oils and coolants used in the plant suggested on the basis of irritancy testing in rabbits that these materials are not irritating to human skin. It must be understood that these tests are performed by a single application of material for 24 hours on rabbit skin. It is difficult to extrapolate from such tests to the effects of cumulative and multiple exposures such as those occurring in an industrial situation. Consequently, any such manufacturers recommendations that such a material is not irritating and/or that gloves and other protective clothing are unnecessary, when that product is used, may lead to a false sense of security which may contribute to the failure to control dermatitis in an industrial setting.

The incidence of dermatitis appears to have increased in the plant within the last 2-3 years. This appears to have been associated with a change in the types of machine oils, coolants, and cutting oils used. It is possible, although it could not be substantiated, that the newer materials were more irritating to the skin than those used previously.

V. RECOMMENDATIONS

1. Worker Education

a) Workers should be informed of the various contributing factors which may have led to an increased incidence of dermatitis with this plant and the measures necessary to reduce this incidence of dermatitis.

2. Hygienic Measures

a) Use of gloves. Gloves should be used whenever possible to reduce exposure to oils, coolants and cleaning materials, such as kerosene, within the plant. It is particularly necessary that gloves be used when strong cleansing agents are being used as exposures to these may be particularly damaging to the skin. In some operations, gloves may not be able to be used during normal operations because they impede manual dexterity and pose a safety hazard. Gloves should be as thin as possible in order to allow sufficient dexterity and must be impervious to the oil or solvent being used. The use of heavily contaminated or saturated cloth gloves should be prohibited. Where possible, gloves should have either a cotton inner lining or the employee should use a cotton inner glove under the impervious outer glove. Gloves which have become broken and damaged should be discarded. Gloves should be removed if those inside have become wet with materials used in the plant or as a result of sweating. A glove which has become wet through sweating should be dried before being reapplied.

b) Aprons. Aprons should be provided which are impervious to the oils and solvents being used. The use of cloth rags as aprons which can become saturated with oils and solvents should be discontinued.

c) Contaminated clothing. Frequent changes of work clothing should be provided. In particular, clothing contaminated with oils and solvents should be changed frequently and should be cleansed before reuse.

d) Cleaning facilities. A mild soap should be provided at all cleaning facilities. Mild soap and water would be an effective cleansing agent in the majority of operations in the plant. The use of strong cleansers, such as Boraxo, should be reserved for those instances where soap and water cleansing is not sufficient. Such strong cleansers should not be used routinely. Soft paper

towels should be used for drying after washing. The use of an emolient skin preparation, such as Vaseline for application to the skin after washing, should be continued. The use of such a skin application is particularly important if dryness or chapping of the skin is occurring. If a waterless hand cleanser is used, it should be available at the washing facilities.

e) Showering. Employees should shower or otherwise wash carefully each day after the shift. This should be followed by a complete change to clean street clothing.

3. Medical Management

a) Preemployment examination should be performed on new employees. Persons with a history or atopic dermatitis, recurrent eczema or who currently have active dermatitis should not work in areas where they are heavily exposed to coolants, cutting oils, or solvents.

b) Any employee who develops dermatitis should have a prompt examination and suitable treatment. If the dermatitis appears to be work related, the work exposures should be evaluated carefully to determine the nature of the contact which may have been responsible and what additional hygienic measures, if any, are necessary.

c) For some months after the development of dermatitis the tolerance to injurious substances is reduced even though the skin may appear normal. Thus, the skin will be more susceptible to damage from strong detergents, solvents or other irritating substances. Because of this affected employees should be particularly careful to avoid skin damage for several months after their dermatitis is apparently cured.

4. Management of Coolant Solutions

a) Coolants should be used according to the manufacturers recommendations. They should be regularly monitored for acidity, bacterial and fungal concentrations and appearance. They should be changed regularly according to a predetermined schedule and the results of monitoring. Any changes or additives should be recorded in a permanent register. Suspended particles, such as metal chips and scrapings, should be removed as far as possible from the coolant. Pollution of the coolants with waste matter should be avoided.

b) Appropriate shielding to further reduce the coolant spray from the grinding machine in the assembly area should be installed.

5. Relative Irritancy of Materials Used in the Workplace

Prior toxicity testing may give some indication of the relative irritancy of various oils and coolants. It should, however, be

borne in mind that testing procedures between different manufacturers do not necessarily produce comparable results. Based on irritation scores obtained in rabbits and humans and other data, substitution of less irritating oils and coolants may be possible. In particular, according to the data supplied by manufacturers, the most irritative oils appear to be Circo-X-Lite(R) oil and Circosol(R) 410, although later data supplied by the manufacturer suggested that these oils were not irritating during intermittent short application near skin. Cimcool Five Star(R) coolant was described by the manufacturer as being non-irritating. However it appeared to contribute to the development of irritant dermatitis under the circumstances of its use in the plant.

6. Labeling

Circo-X-Lite(R) and Circosol(R) 410 used as blending oils are irritants to the skin according to the criteria for labeling under the Federal Hazardous Substance Labeling Act regulations. They should be labeled as such. It should be recognized that any oil containing a significant proportion of these oils is also likely to be irritating to the skin in the circumstances under which they are used in the plant.

VI. AUTHORSHIP AND ACKNOWLEDGEMENTS

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TABLE I

DERMATOLOGIC PROBLEMS SEEN IN
TOOLMAKERS & TOOL ASSEMBLERS

National Standard Company
170 Dundaff Street
Carbondale, PA. 18407

February 11-12, 1976

Employee No.	Diagnosis
1	Eczematous Contact Dermatitis Both Hands
2	Eczematous Contact Dermatitis Both Hands
3	Eczematous Contact Dermatitis Right Hand Follicular Contact Dermatitis Thighs
4	Eczematous Contact Dermatitis Right Forearm
5	Eczematous Contact Dermatitis Left Hand
6	Eczematous Contact Dermatitis Both Forearms
7	Eczematous Contact Dermatitis Right Hand and Wrist

TABLE 2

DERMATOLOGIC PROBLEMS SEEN IN PRODUCTION AREA EMPLOYEES

National Standard Company
170 Dundaff Street
Carbondale, PA. 18407

February 11-12, 1976

OPERATORS AND MAINTENANCE EMPLOYEES

Employee No.	Diagnosis
1	Mild Eczematous Contact Dermatitis Left Hand
2	Chronic Eczematous Dermatitis of Undetermined Origin probably non-occupational
3	Arterial Block Right Arm

PRESS HELPERS

1	Eczematous Contact Dermatitis Forearms
2	Eczematous Contact Dermatitis Hands
3	Eczematous Contact Dermatitis Groin Dishydrotic Dermatitis Palms
4	Nummular Eczema