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. 76-9-345

W. R. Case and Sons Cutlery Company
Bradford, Pennsylvania

November, 1976

I. TOXICITY DETERMINATION

It has been determined that employees are exposed to concentrations of dusts (wood, cowhide, and aluminum oxide) at the hafting operation in excess of recommended levels of nuisance dust as determined by the air concentrations measured during the evaluation conducted on June 16, 1976. The suspected relationship of wood and leather dust to excess nasal cancer mandates reduction of exposure to minimal or zero levels.

Exposures to airborne concentrations of trichloroethylene, perchloroethylene, paint solvent, (toluol, isobutyl acetate, and butyl cellosolve), cleaning solvent (toluolisopropanol), and oil mist were also evaluated on June 16-17, 1976. All measurements were found in the non-toxic range, i.e., below the acceptable concentrations. The oils were analyzed qualitatively and sodium nitrite which is a known oxidizer[1] was present. This may account for the past dermatological problems as noted in the Health Hazard Evaluation Request.

Tables of findings and recommendations have been offered in the body of the report for control of environmental exposure of the employees to the potentially toxic substances.

II. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this hazard evaluation determination are 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. W. R. Case and Sons Cutlery Company
B. Authorized representative of employees - International Association of Machinists and Aerospace Workers, Local 638
C. U.S. Department of Labor, OSHA, Region III
D. U.S. Department of HEW, NIOSH, Region III

For the purpose of informing approximately 600 "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 1976, 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) received such a request from the authorized representative of employees' Local 638, International Association of Machinists and Aerospace Workers, of the W. R. Case and Sons Cutlery Company to evaluate alleged health problems associated with the manufacturing processes. The complaints were eye irritation, skin rashes, and fatigue.

IV. HEALTH HAZARD EVALUATION

A. Plant Process

The W. R. Case and Sons Cutlery Company is engaged in the manufacturing of cutlery. The manufacturing is conducted at two locations approximately ten miles apart. These locations are designated as the Owens Way and High Street Plant and the Foster Brook Plant. At both locations the operations are similar. Various types of high carbon steel alloys are purchased in the desired thickness. The steel is blanked, ground, polished, hardened, and fitted with the handle. The handles are leather, wood, bone, or plastic. The plastic handles are purchased while the others are cut and processed on the premise.

The grinding and polishing operations utilize water soluble cutting oils with sodium nitrite as a rust inhibitor and a non-phenolic bactericide. All dry grinding operations are supplied with local exhaust ventilation systems, although during the initial survey on February 25, 1976, all the local ventilation systems were not connected at the Owens Way and High Street Plant.

A carpenter shop is located at the Foster Brook Plant, where display cases are made and painted.

B. Evaluation Design and Methods

On February 25, 1976, an initial visit was made by NIOSH Industrial Hygienist to the W. R. Case and Sons Cutlery Company to conduct a walk-through survey. Due to the lack of specificity of the health hazard

evaluation request, the areas where there was a potential for exposure or where the controls were felt to be inadequate were selected as sites where the environmental studies should be conducted. During this visit, 15 non-directed medical questionnaires were administered by the Industrial Hygienist and the plant's OSHA Form 102 was reviewed.

Personal air samples for perchloroethylene, trichloroethylene, paint solvent, and cleaning solvent were collected on charcoal tubes at a sampling rate of 50 cubic centimeters per minute. These samples were subsequently analyzed by gas chromatography.

Oil mist and dust samples were collected on tarred PVC filters at a rate of 1.5-1.8 liters per minute. The samples were analyzed fluorometrically and colorimetrically for oil mist and nitrites. The dust samples were analyzed gravimetrically.

C. Evaluation Criteria

The OSHA standards, relevant to this evaluation as promulgated in the Federal Register (29 CFR 1010.100(2)), are as follows:

Substance	8-Hour Time Weighted Average
Perchloroethylene (Tetrachloroethylene)	670 mg/M^3
Trichloroethylene	530 mg/M^3
Isopropanol	980 mg/M^3
Oil Mist	5 mg/M^3
Isobutyl Acetate	700 mg/M^3

In case of a mixture of air contaminants, an employer shall compute the equivalent exposure as follows:

$$Em = \frac{C_1}{L_1} + \frac{C_2}{L_2} + \cdots \frac{C_n}{L_n}$$

Where:

Em is the equivalent exposure for the mixture.

C is the concentration of a particular contaminant.

L is the exposure limit for that contaminant, from Table Z-1, Z-2, or Z-3.

The value of Em shall not exceed unity.(1)

The American Conference of Governmental Industrial Hygienists (ACGIH)(3) lists perchloroethylene as having cutaneous absorption properties. ACGIH has adopted the following Occupational Health Standard:

Substance	8-Hour Time Weighted Average
Nuisance particulate (wood, cowhide, aluminum oxide) (less than 1% quartz)	10 mg/M3

NIOSH in their criteria for a recommended standard "Occupational Exposure to Toluol" has proposed the following:(4)

Substance	8-Hour Time Weighted Average
Toluol	375 mg/M3

mg/M3 - Denotes approximate milligrams of substance per cubic meter of air.

D. Evaluation Results and Discussion

Industrial Hygiene

A bulk sample of the polishing compound was collected and analyzed for quartz content at the handle finishing operation. The quartz content of this material was less than one percent. Subsequently, personal air samples for total airborne particulate were collected. Two samples at the hafting operation (Table I) exceeded permissible limits for nuisance dusts. Air ventilation measurements taken with an Alnor Jr. velometer indicated the velocity to be 50 to 60 feet per minute. Although the hoods are properly designed, they are not properly utilized. Upon adjusting the hood, ventilation velocities increased to 125 to 150 feet per minute; however, employees complained that they could not work as efficiently. Other employees questioned did not have this complaint.

Two employees were evaluated for exposure to cleaning solvent (Table II). The major components of this solvent are toluol, isopropanol, and butyl cellosolve. The lower limit of detection for butyl cellosolve was less than 0.01 milligram per sample. The samples collected also did not exceed the respective permissible values or that for a mixture. As noted in Table II, the air concentrations at the station which had down-draft ventilation on two sides exceeded that station where ventilation was on three sides.

Two degreasing operations were evaluated for perchloroethylene and trichloroethylene (Table III). Both samples did not exceed the permissible levels. During the initial walk-through on February 25, 1976, it was noted that the controls on the knife degreasing were malfunctioning. It was recommended that this unit be shut off. Subsequently, it was determined that a thermostat was malfunctioning and was repaired.

The paint sprayer's exposure to solvent was evaluated (Table IV). The major components of the solvent were toluol, xylol, and isobutyl acetate. The concentrations measured did not exceed the individual or mixture permissible levels. During the walk-through it was noted that the filters were coated with paint. During the evaluation it was noted that these filters were replaced and the air velocity at the face of the booth was 100 to 125 feet per minute.

Eight personal air samples were collected for oil mist at the cutting, grinding, and drilling operations (Table V). Air concentrations did not exceed the permissible levels. Analysis by colorimetric methods showed that nitrites were present. No permissible levels have been extablished for nitrites; however, an alert has been issued that cutting oils may form (cancer-causing) nitrosoamine.

Medical

A total of fiteeen workers were interviewed by the NIOSH Industrial Hygienist during the evaluation. Two of 15 (13%) experienced accumulation of black dust in their nostrils without accompanying symptoms. Three of 15 (20%) complained of periodic nose and throat irritation. Two of 15 (13%) reported dizziness. Two of 15 (13%) reported past skin rashes, and 1 of 15 (6%) reported occasional headache. No additional symptoms were discovered.

E. Discussion and Conclusion

The enclosures on all the dry grinding operations appear to be of a good design. The problem is that the gates are kept open and the working (grinding) area is not kept as small as practical. The increase in air velocity was demonstrated during the evaluation by proper utilization of enclosures.

Air movement by proper ventilation and use of enclosures is mandatory for two reasons. First, one component of the nuisance dust measured during this visit was wood. Studies from England[5,6,7,8] and elsewhere indicate excessive exposure to wood dust results in an increased incidence of nasal cancer. Second, leather dust was present in the total dust sample and this also has been implicated as a causitive agent of nasal cancer. It is likely that exposures in this plant are lower than those in the studies quoted because of the types of industries involved. However, no safe levels have been determined for wood dust and therefore exposures should be as close to zero as possible.

Sodium nitrite (nitrous acid, sodium salt) is a strong oxidizing agent. On some of the machines, it was noted that there was excessive splattering of water soluble oil, and in some cases cloth was used to prevent the splattering. The nitrites present may have been responsible for the sore eyes and skin rashes. Sodium nitrite is also a vasodialator which can lower the blood pressure and causes fatigue. These symptoms were among those elicited from the workers and were stated in the health hazard evaluation request.

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Exposures to the toluol-isopropanol-butyl cellosolve mixture were not excessive; however, exposure to the solvent at the station where the down-draft ventilation was present on only two sides was higher than where three sides are ventilated. As a good industrial hygiene practice, exposure to air contaminants should be kept to a minimum. Extension of the ventilation to the third side will reduce exposures to air contaminants.

During the environmental evaluation, information was received that during one week three hand infections were reported at the bone cutting operation. During this period, the disinfectant which is added, had been the causative agent for these infections because there is no history of these maladies.

Establishment of a periodic maintenance program and operating the degreasing units according to manufacturer's instruction will prevent unnecessary exposure to air contaminants.

Medical

The results from the non-directed questionnaires indicate nose and throat irritation most likely due to exposure to dust. Past history of dermatitis probably from cutting oils. The other symptoms of headache and dizziness could not be related to a single source.

V. RECOMMENDATIONS

1. Adequate ventilatory changes must be made to insure dust exposure control. Keep all enclosures on the grinding and hafting machines shut during the normal operations. The working area point of operation should be kept as small as is feasible. A periodic clean-out, expecially on the down-draft ducts, should be instituted

2. Establish a periodic atmospheric testing and maintenance program on degreasing and paint-spraying operations.

3. Worker Education

Workers should be informed of the various contributing factors which may cause dermatitis and the measures necessary to reduce incidence of dermatitis, as well as the other symptoms due to nitrites.

4. Hygienic Measures

a. Use of gloves. Gloves should be used whenever possible to reduce exposure to oils, coolants, and cleaning materials. 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 slovents 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 cleaned before reuse.

5. Medical Management

a. Preemployment examination should be performed on new employees. Persons with a history of atopic dermatitis, recurrent exzema 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 resolved.

REFERENCES

1. Condensed Chemical Dictionary, Eighth Edition, Revised by Gessner G. Hawley, Van Nostrand Rheinold Company.

2. U.S. Department of Labor, Occupational Safety and Health Standards, Federal Register, Title 29, Part 1910.1000.

3. American Conference of Governmental Industrial Hygienists, Threshold Limit Values for Chemical Substances in the Workroom Environment for 1975.

4. NIOSH Recommended Standard for Occupational Exposure to Toluene.

5. Acheson, Et Al, Nasal Cancer in Wood Workers in the Furniture Industry Brit Med Journal 2, 507, 597 1968.

6. Acheson, Et Al, Nasal Cancer in the North Amptonshire Boot and Shoe Industry BMJ 1,385 - 393 Feb 1970.

7. Reported by Anders England, M.D. at 1976 Confernece on Occupational Carcinogenesis, New York Academy of Sciences.

8. Milhana, S. Mortality experience of the AFL-CIO United Brotherhood of Carpenters and Joiners of America, 1969-1970, HEW Publication No. (NIOSH) 74-129, 1974.

VII. AUTHORSHIP AND ACKNOWLEDGEMENTS

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W.R. CASE & SONS CUTLERY COMPANY
BRADFORD, PENNSYLVANIA
REPORT NO. 76-9
TABLE I
Inert Dust Air Concentrations
June 16-17, 1976
Owens Way & High Street Plant

Job Description	Time	Air Concentrations mg/M^3*	Remarks
Surface Grinder	7:58-15:04	0.95	Operator's Exposure
Spinner	8:48-15:15	1.39	Operator's Exposure
Cutting Graph (Die Shop)	7:25-15:10	2.07	Operator's Exposure
Glaze Finishing	7:29-15:07	0.15	Operator's Exposure
Double Headed Grinder	7:32-15:06	0.34	Operator's Exposure
Hand Grinder	7:37-15:07	0.60	Operator's Exposure
	Foster Brook Plant		
	8:05-15:15	13.65	Operator's Exposure
Hafter	8:06-15:15	57.42	Operator's Exposure
Floor Finisher	8:08-15:14	1.94	Operator's Exposure
Double Headed Grinder	8:32-15:14	0.76	Operator's Exposure

*mg/M^3 - denotes milligrams of atmospheric contaminant per cubic meter of air sampled.

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TABLE II
Toluol Isopropanol Air Concentrations
June 16-17, 1976
Foster Brook Plant

Job Description	Time	Air Concentration mg/M³ Toluol*	Isopropanol**	Remarks
Cleaning & Stripping	8:25-12:39	36.2	18.1	Operator's Exposure
	12:39-15:08	88.0	49.8	Operator's Exposure
Cleaning & Stripping	8:25-12:40	4.7	7.8	Operator's Exposure
	12:40-15:09	5.7	10.5	Operator's Exposure

Acceptable 8-hour time weighted average atmospheric concentrations.

* Toluol - 375 milligrams per cubic meter of air
** Isopropanol - 980 milligrams per cubic meter of air

Acceptable 8-hour time weighted average concentration for toluol - isopropanol mixture as calculated from the formula.

$$Em = \frac{C_1}{L_1} + \frac{C_2}{L_2} + \cdots \frac{C_n}{L_n} \quad (1)$$

Where:
Em is the equivalent exposure for the mixture.
C is the concentration of a particular contaminant.
L is the exposure limit for that contaminant.

The value of Em shall not exceed unity (1).

W.R. CASE & SONS CUTLERY COMPANY
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TABLE III
Trichloroethylene* Air Concentrations
June 17, 1976
Owens Way and High Street Plant

Job Description	Time	Air Concentrations mg/M^3	Remarks
Knife Degreaser	7:44-12:00	203	Operator's Exposure
	12:30-15:10	189	Operator's Exposure
	Perchloroethylene** Air Concentrations		
Blade Degreasing	7:34-11:22	104	Operator's Exposure
	11:22-15:05	126	Operator's Exposure

Acceptable 8-hour time weighted average atmospheric concentrations

* Trichloroethylene - 535 milligrams per cubic meter of air
** Perchloroethylene - 670 milligrams per cubic meter of air

W.R. CASE & SONS CUTLERY COMPANY
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TABLE IV
Paint Solvent Air Concentrations
June 17, 1976
Foster Brook Plant

Job Description	Time	Air Concentrations mg/M^3 Toluol*	Isobutyl Acetate**	Xylol***	Remarks
Paint Spraying	10:02-14:58	47	34	20	Operator's Exposure

Acceptable 8-hour time weighted average atmospheric concentrations

* Toluol - 375 milligrams per cubic meter of air
** Isobutyl Acetate - 700 milligrams per cubic meter of air
*** Xylol - 435 milligrams per cubic meter of air

Acceptable 8-hour time weighted average concentration for paint solvent mixture as calculated from the formula

$$Em = \frac{C_1}{L_1} + \frac{C_2}{L_2} + \cdots \frac{C_n}{L_n} \quad (1)$$

Where:

Em is the equivalent exposure for the mixture.

C is the concentration of a particular contaminant.

L is the exposure limit for that contaminant

The value of Em shall not exceed unity (1).

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TABLE V
Oil Mist Air Concentrations
June 16-17, 1976
Foster Brook Plant

Job Description	Time	Air Concentrations mg/M^3	Remarks
Bone Cutting	9:03-15:16	<.001	Operator's Exposure
Hand Grinding	7:56-15:06	0.01	Operator's Exposure
Hand Grinding	8:58-15:06	0.07	Operator's Exposure
Surface Grinding	7:58-15:06	0.38	Operator's Exposure
Hand Grinding	7:50-15:08	<.001	Operator's Exposure
Machine Grinding	7:52-15:08	<.001	Operator's Exposure
Machine Grinding	7:54-15:11	<.001	Operator's Exposure
Owens Way and High Street Plant			
Drilling	8:03-15:04	0.26	Operator's Exposure

<.001 - denotes less than .001 milligrams per cubic meter of air sampled.