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. 77-88-457

GALION AMCO, INC.
GALION, OHIO

JANUARY 1978

I. TOXICITY DETERMINATION

The following determinations have been made based upon environmental air samples collected on July 22, 1977 and November 10, 1977, confidential employee interviews, observations of work practices and available toxicity information:

1. Employee exposures to airborne concentrations of 1,1,1 trichloroethane, stoddard solvents, sodium hydroxide, hydrochloric acid, cyanide, cadmium, chromic acid, phosphoric, nitric acid, MEK and oil mist did not pose a health hazard at the concentrations measured at the time of this evaluation.

2. A potential health hazard does exist due to employees skin contact with cutting oils and coolants. Numerous cases of oil acne were present and other employees reported histories of oil acne. The problem is compounded by the uncontrolled use of stoddard solvents for removing the cutting oils from the skin which results in additional defatting of the skin. Recommendations are provided in Section V to help eliminate the problem.

II. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this Determination Report are currently available upon request from NIOSH, Division of Technical Service, 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, Publication Office, at the Cincinnati address. Copies of this report have been sent to:

a) Galion Amco, Inc., Galion, Ohio
b) U.S. Department of Labor - Region V
c) NIOSH - Region V

For the purpose of informing the approximately 50 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.

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 the plant manager of Galion Amco in Galion regarding an on-site toxicity evaluation of the screw machine shop operations which included the use of presses, plating machines, vapor degreasers, cutting oils and water soluble cleaners.

IV. HEALTH HAZARD EVALUATION

A. Conditions of Use

Galion Amco is a precision metal parts fabricator. They deal in a variety of products which change upon their customers' demands. Galion Amco mass produces precision machined metal components according to customers' specifications. Regardless of the parts being produced, the same general types of operations are involved. The plant is divided into various machining areas which include the Brown & Scarpe automatic screw machine area, the Davenport spindle automatics, the Acme-Gridley automatic bar machine area and the Conematic area. These various machining processes use cutting oil or coolant. Both synthetic cutting fluids and straight oils are used depending on the particular characteristics required for the job. The plant also contains an automatic plater as well as a plating room. Two 1,1,1- trichloroethane degreasers are located in the plant, one in the press room and one in the shipping and receiving area. There are also two stoddard solvent parts washers located in the Acme Room. In addition, a small automatic spray painting operation is located in the shipping and receiving area.

B. Evaluation Methods

An initial environmental survey was conducted at Galion Amco on July 22, 1977. Air samples were obtained in workers' breathing zones and in selected areas of potential maximum concentration. Oil mist samples were collected for the straight oils on filters at a flow rate of 1.5 liters per minute. The samples were analyzed for particulate oil mist using a non-dispersive infrared oil analyzer. Samples for the synthetic oils were collected on AA filters at 1.5 lpm. The bulk samples for these oils were extracted with carbon tetrachloride and standards were prepared from the extracted oils. The filter samples were extracted in a similiar manner using carbon tetrachloride and the standards and samples were scanned over a spectral range of 3400-2700 cm-1.

The degreasers and parts washing were evaluated by collecting charcoal tube samples for 1,1,1 trichloroethane and stoddard solvents at a flow rate of 50 cc/min. Both personal and area samples were collected. The samples were analyzed by gas chromatographic procedures.

Samples collected at the plating operations were all area samples. Impingers containing hydrochloric acid were operated at a flow rate of 1 lpm to sample for sodium hydroxide. The samples were analyzed by atomic absorption. Samples for hydrochloric acid were taken in impingers containing sodium acetate at 1 lpm. Samples for cyanide were collected in sodium hydroxide at 1 lpm. The hydrochloric acid and cyanide samples were analyzed by specific ion electrodes. Cadmium, chromic acid and phosphoric acid samples were all collected on AA filters at a flow rate of 1.5 lpm. The cadmium samples were analyzed by atomic absorption and the chromic acid and phosphoric acid samples were analyzed colorimetrically. Impingers containing sodium hydroxide were used to sample for nitric acid. The samples were analyzed using the Technicon auto analyzer.

To evaluate the spray painting operation charcoal tube samples for methyl ethyl ketone(MEK) were taken at a flow rate of 50 cc/min. and were analyzed by gas chromatographic procedures.

A follow-up survey was conducted on November 10, 1977, to do additional oil-mist sampling. Both straight oil and synthetic oil mist samples were collected on VM-1 filters at a flow rate of 1.5 lpm. The samples were analyzed as described above.

In addition, non-directed medical interviews were conducted with seventeen employees who worked with the cutting oils or coolants.

C. Evaluation Criteria

1. Environmental Standards

To assess the concentrations of air contaminants found in the place of employment, three primary sources of criteria were used: (1) NIOSH criteria for recommended standards for occupational exposure to substances (criteria documents); (2) recommended and proposed threshold limit values (TLV's) and their supporting documentation as set forth by the American Conference of Governmental Industrial Hygienist (ACGIH)(1976); and (3) occupational health standards as promulgated by the U. S. Department of Labor (29 CFR Part 1910.1000).

In the following tabulation of criteria, appropriate values are presented.

Substance	NIOSH Recommended Criteria	ACGIH TLV	OSHA Standard
Oil Mist	-	5 mg/M^3	5 mg/M^3
1,1,1 Trichloroethane	350 ppm *	350 ppm	350 ppm
Stoddard Solvents	350 mg/M^3	575 mg/M^3	500 ppm
Sodium Hydroxide	2 mg/M^3 *	2 mg/M^3	2 mg/M^3
Hydrochloric Acid	-	7 mg/M^3	7 mg/M^3
Cyanide	5 mg/M^3	5 mg/M^3	5 mg/M^3
Cadmium	0.04 mg/M^3	0.05 mg/M^3	0.1 mg/M^3
Chromic Acid	0.01 mg/M^3	0.1 mg/M^3	0.1 mg/M^3
Phosphoric Acid	-	1 mg/M^3	1 mg/M^3
Nitric Acid	5 mg/M^3	5 mg/M^3	5 mg/M^3
MEK	200 ppm	200 ppm	200 ppm

* Ceiling value - the concentration that should not be exceeded even instantaneously.

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2. Physiological Effects

Effects of Oil on the Skin

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 oil such as light oils (motor spirits), paraffin (kerosene), gas oils, heavier burning oils, diesel oils, lubricating and coolant oils. These oils produce "oil acne," which is an inflammatory skin condition characterized by the presence of blackheads, pimples and pustules due to oil blocking and irritating the pores of the skin which is followed by septic infection from germs entering from the skin surface. More rarely an acute inflammatory condition occurs, generally on the hands and forearms, such as might be produced by any powerful skin irritant with redness, much 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.

Cutting oils also damage the skin by de-greasing it. Where the natural protective fat is constantly being removed from the skin (de-greased) it will become dry, cracked and sore.

Slight injuries to the skin, such as those caused by metallic particles and abrasive fragments removed by cutting or grinding tools which are in the oil, make the occurrence of rashes more likely. Neglect of a cut or injury may also lead to a rapid local multiplication of the germs causing infection of the skin.

Long exposure to mineral oil can result in warts and ulcers which may become cancerous. This may particularly occur on the scrotum.

D. Evaluation Results and Discussion.

The results of the charcoal tubes collected for stoddard solvents used in washing operations are given in Table 1. The concentrations ranged from 41-140 mg/M^3. All concentrations were below the recommended level of 350 mg/M^3.

The results of the samples taken to evaluate the degreaser operations are given in Table 2. Levels of 1,1,1 trichloroethane ranged from 5.2 ppm to 8.2 ppm. All levels were well below the 350 ppm OSHA standard.

Samples were collected for several substances used in the plating operations. The substances and their corresponding measured concentrations are listed in Table 3. The measured levels, in all cases, were below levels believed to cause adverse health effects.

Table 4 shows that the MEK concentration measured at the spray painting operation was only 2 ppm. The standard for MEK is 200 ppm.

The results of the oil mist samples collected on the initial and follow-up surveys are given in Table 5. A review of the data indicates only low oil mist concentrations (Range 0.03 mg/M to 0.80 mg/M. However, the problem with cutting oils and coolants at Galion Amco is not one of inhalation, but rather a contact problem.

On the follow-up survey brief medical interviews were conducted with seventeen employees whose work involves the use of cutting oils and coolants. Of those interviewed, twelve workers presently had or reported histories of skin problems which they felt were related to their exposures to oils. Most reported the problem greatly improved during vacations or temporary removal from jobs were oils were used. Of the seventeen workers, ten had active cases of oil acne. The workers' arms were the most affected but several reported that their legs were also affected. Most of those reporting the problem used GM-24 oil. Workers indicated fewer problems resulted when synthetic coolants were used.

Oil dermatitis is more easily prevented than cured. If oil dermatitis does develop, early treatment will provide a cure and more important, delay in treatment is dangerous and serious disease of the skin may result.

Prevention of oil dermatitis is mainly related to work practices. Many employees at Galion Amco spend the greater portion of the work shift with their hands and arms in oil. Several workers were observed removing metal shavings from the bottom of their machines. Such a procedure required the individual to place their arm in oil to above the elbow. This practice was either followed by wiping the hands and arms with an already oily rag or washing the hands and arms in stoddard solvent and then wiping with a rag. Washing with stoddard solvents only compounds the problem by additionally defatting the skin. Work clothes were also observed to be very oily.

Listed below are several recommendations for both the employer and employees to follow to help eliminate the oil acne problem.

V. RECOMMENDATIONS

A. Recommendations for Employees

1. Workers clothes should be changed and washed frequently.
2. Care should be taken to prevent street clothes, especially underwear from becoming oily because the time of exposure is lengthened and serious disease of the skin may result.
3. Light-weight, impervious aprons should be provided and worn.

Before Work

Wash and thoroughly dry all exposed skin; and then apply a bland barrier cream, such as one consisting of equal parts of anhydrous lanolin and vegetable oil. This practice provides a barrier against the oil and facilitates its removal after work. Repeat when work is resumed, after a break and wash off thoroughly at the end of the shift.

At Work

Do not wipe the oil off the skin with oily cloths as abrasions may be caused by metal particles and result in infection.

Do not use stoddard solvents or other types of solvents to remove oil from the skin. Solvents defat the skin making it dry, cracked and sore.

Disposable paper towels should be used.

Have first-aid treatment at once for any injury, however slight and keep covered until healed.

After Work

Wash thoroughly with soap and water. Rinse repeatedly with water until the exposed skin is clean. Dry carefully, and rub in the barrier cream to counter defatting of the skin.

Self examination of the skin, especially of the scrotum is recommended daily. Report any rash, wart or sore on any part of the body, particularly the scrotum, and seek medical advice.

B. Recommendations for Employer

1. Provide adequate washing facilities with a plentiful supply of paper towels.
2. Remove the 5 gallon cans of stoddard solvents employees wash in from the workarea.
3. Provide a bland ointment or barrier cream.
4. Provide light impervious aprons.
5. Educate employees on the possible serious skin problems that may result from contact with oils.
6. Provide a system for removal of metal particles from the oil which does not require the employees to use their hands and submerge their arms in the oil.
7. Severely affected workers should be removed from all oil exposure and kept under medical surveillance.

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Table 1

Galion Amco, Inc.
Galion, Ohio

July 22, 1977

Sample Location	Sample Number	Sampling Period	Sample Volume (liters)	Stoddard Solvents (mg/M^3)
area beside washer (acme room)	CT-3	6:50-13:25	18.2	41
washer operator	CT-7	7:21-13:30	19.8	132
area washer beside grinders (acme room)	CT-6	7:02-13:30	19.5	140
above stoddard solvent tanks (plating room)	CT-10	8:00-13:20	16.3	131
Recommended criteria				350

Table 2

Galion Amco, Inc.
Galion, Ohio

July 22, 1977

Sample Location	Sample Number	Sampling Period	Sample Volume (liters)	1,1,1,-trichloro-ethane (ppm)
press room degreaser area	CT-1	6:26-13:25	16.6	5.2
shipping & receiving degreaser area	CT-4	6:54-13:25	21.1	8.2
shipping & receiving degreaser operator	CT-5	6:54-13:30	19.9	7.9
press room degreaser operator	CT-8	10:10-13:30	10.3	7.4
Recommended criteria				350

Table 3

Plating Operations
Galion Amco, Inc.
Galion, Ohio

July 22, 1977

Sample Location	Sample Number	Sampling Period	Sample Volume (liters)	Substance	Concentration
automatic plater	NaOH-3	8:20-13:23	303	Sodium Hydroxide	0.6 mg/M^3
" "	HCL-3	8:15-13:20	305	Hydrochloric Acid	0.3 mg/M^3
" "	CN-2	8:20-13:25	305	Cyanide	0.0 mg/M^3
cadmium plating line	NaOH-1	7:45-13:05	320	Sodium Hydroxide	0.4 mg/M^3
" " "	HCL-1	7:45-13:07	322	Hydrochloric Acid	N.D.
" " "	CN-1	7:50-13:05	315	Cyanide	1.7 mg/M^3
" " "	AA-4	7:50-13:06	474	Cadmium	N.D.
" " "	NaOH-2	7:50-13:05	315	Sodium Hydroxide	0.4 mg/M^3
" " "	AA-3	7:52-13:03	466	Chromic Acid	N.D.
phosphate plating line	AA-5	7:55-13:10	472	Phosphoric Acid	N.D.
" " "	AA-6	7:58-13:12	471	Chromic Acid	N.D.
diversey tank	HCL-2	8:03-13:15	312	Hydrochloric Acid	5.5 mg/M^3
" "	HNO_3-1	8:10-13:15	305	Nitric Acid	0.3 mg/M^3

Table 4

Galion Amco, Inc.
Galion, Ohio

July 22, 1977

Sample Location	Sample Number	Sampling Period	Sample Volume (liters)	MEK (ppm)
Spray painting	CT-9	9:07-13:25	16.5	2
Reccmmended criteria				200

Table 5

Galion Amco, Inc.
Galion, Ohio

July 22, 1977

Sample Location	Sample Number	Sampling Period	Sample Volume (Liters)	Oil Mist (mg/M^3)
Rivet Davenport Operator	GF-1	6:18-13:37	658	0.3
Davenport 2012 Operator	GF-2	6:22-13:37	652	0.2
Davenport Ettco Machine Operator	GF-3	6:25-13:35	645	0.8
Acme 123 Operator	GF-4	6:40-13:00	570	N.D.
Davenport 1 and 2 Operator	AA-1	6:30-13:35	637	0.03
Grinder (Acme Room) Operator	AA-2	6:47-13:30	604	0.09
	October 3, 1977			
Acme 108-109 Operator	V3124	6:15-14:50	772	0.52
Acme 111-112-113 Operator	V3096	6:16-14:47	766	0.59
Acme 114-103 Operator	V3086	6:17-14:48	766	0.60
Tapper & Driller Operator	V3180	6:45-14:45	720	0.66
Conomatic Operator A	V3179	6:21-14:45	756	0.69
Conomatic Operator B	V3175	6:45-14:46	721	0.74
Conomatic Operator C	V3174	6:47-14:46	718	0.56
Acme Chucker Operator	V2321	6:50-14:45	712	0.58
Brown & Scarpe 1-2-3-5-6 Oper.	V1631	6:27-14:51	756	0.52
Brown & Scarpe 310-325-324 Oper.	V2904	6:33-14:52	748	0.80
Brown & Scarpe 303-309 Operator	V2344	6:35-14:52	745	0.40
Centerless Grinder	V3178	6:55-14:49	711	0.70
Davenport Operator A	V1366	7:05-14:50	697	0.53
Davenport Operator B	V2349	7:07-14:50	694	0.54
Recommended Criteria				5