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. 78-114-572

GARDNER-DENVER COMPANY
COMMERCE CITY, COLORADO

MARCH 1979

I. TOXICITY DETERMINATION

A health hazard evaluation was conducted by the National Institute for Occupational Safety and Health (NIOSH) at the Gardner-Denver Company, Plant Number 9, Commerce City, Colorado, on October 17-18, 1978. At the time of this evaluation, breathing zone air samples were taken on workers for oil mist, iron oxide, 1,1,1,-Trichloroethane, and nitrite (nitrosamine). Concentrations exceeded the most recent evaluation criteria for oil mist on workers in the drop forge. All other worker exposures were well within the most recent evaluation criteria.

II. DISTRIBUTION AND AVAILABILITY

Copies of this determination report are currently available upon request from NIOSH, Division of Technical Services, Information Resources 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:

1. Gardner-Denver Company
2. United Steelworkers of America - Pittsburgh
3. United Steelworkers of America - Denver
4. U.S. Department of Labor/OSHA - Region VIII
5. NIOSH - Region VIII

For the purpose of informing approximately 200 affected employees, a copy of this report shall be posted in a prominent place accessible to the employees for a period of 30 calendar days.

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 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.

NIOSH received such a request from the United Steelworkers of America in Denver, Colorado, to evaluate potential exposures associated with the milling, machining, and grinding of steel for the production of drilling equipment.

IV. HEALTH HAZARD EVALUATION

A. Process Evaluated

The drop forge, welding, and various milling machine shops were all evaluated during this survey. This plant produces parts used in the manufacture of drilling machines. These are used for jobs such as roof bolts in coal mines and drilling holes in hard rock. This plant has a typical drop forge with many grinding, milling, and cutting machines.

B. Evaluation Design

During this survey there were four drop forge operators. All these workers were monitored for oil mist. There were approximately 50 men operating milling, grinding, and cutting machines. A representative sample of all operations were monitored. A large number of the workers were interviewed, with questions directed at their work history and respiratory problems.

C. Evaluation Methods

Oil mist samples were collected on 37 mm filters using vacuum pumps operated at 1.5 liters per minute. Oil mist samples were analyzed by fluorescent spectrophotometry using NIOSH Method No. P&CAM 5272. Bulk nitrosamine samples were first tested qualitatively for the presence of nitrite/nitrosamine by Greiss test. All the samples showed the absence of nitrite/nitrosamine by this test. The sensitivity for the Greiss Test is 0.01 mg per sample. The samples were soluble in ethyl acetate. Because of negative Greiss test, no further analysis was attempted on the remainder of the samples. All iron oxide dust samples were collected on 37 mm filters using vacuum pumps operated at 1.5 liters per minute. These samples were analyzed by atomic

absorption spectroscopy according to NIOSH analytical procedure No. 173. Total particulate samples were taken on 37 mm pre-weighed filters using vacuum pumps operated at 1.5 liters per minute. These were weighed to an accuracy of 0.01 milligrams per sample.

D. Criteria for Assessing Workroom Concentrations of Air Contaminants

Three sources of criteria are generally used to assess workroom concentrations of air contaminants: (1) NIOSH criteria for recommended standards; (2) recommended Threshold Limit Values (TLVs) and their supporting documentation as set forth by the American Conference of Governmental Industrial Hygienists (ACGIH), 1977; and (3) Occupational Safety and Health Administration (OSHA) standards (29 CFR 1910.1000), January 1976. NIOSH criteria and ACGIH TLVs represent the most recent and relevant recommendations and are given prominence in this evaluation.

	Permissible Exposures 8-Hour Time-Weighted Exposure Basis (mg/m^3)		
Substances	NIOSH Criteria for Recommended Standard	TLV	Current OSHA Standard
Oil Mist	---	5.0	5.0
Iron Oxide Dust	---	10.0	10.0
1,1,1,-Trichloroethane	---	1900	1900

mg/m^3 = milligrams of substance per cubic meter of air

Occupational health standards are established at levels designed to protect individuals occupationally exposed to toxic substances on an 8-hour per day, 40-hour per week basis over a normal working lifetime.

E. Toxicology

Oil Mist -- Inhalation of mineral oil mist in high concentrations may cause pulmonary effects, although this has rarely been reported. A single case of lipoid pneumonitis suspected as caused by exposure to very high concentrations of oil mist was reported in 1950. Animal experimentation showed no effects at 5 parts per million (ppm) for a year duration. One

hundred ppm for one year showed changes in some animals but not others. No significant histologic changes were noted in some animals.

Studies of oil mist exposures in machine shops at 3.7 to 110 mg/m^3 showed no increase or decrease in pulmonary function among men employed for many years. There is no evidence to suggest any relation between inhalation of oil mist and lung cancer. On the other hand, there are some reported cases of skin cancer from contact with certain oils. Contact with liquid oils may cause dermatitis. (Reference 1)

Iron Oxide -- Maintaining exposures below 10 mg/m^3 should prevent any occupational disease which could be attributed to iron oxide dust. Chronic exposures to high concentrations of this dust may produce a disease called siderosis. The main complication of this disease is that it prevents getting a good x-ray of the lungs should another lung disease occur. Siderosis does not decrease pulmonary function or cause any other metabolic disturbances.

1,1,1,-Trichloroethane -- 1,1,1,-Trichloroethane vapors may produce narcosis. A five-minute exposure to 5000 ppm can be expected to produce marked incoordination and anesthesia. Exposure to concentrations in excess of 1000 ppm for 15 minutes, or 2000 ppm for 5 minutes, can be expected to produce a disturbance of equilibrium in the majority of adults. Above 1700 ppm minor disturbances of equilibrium have been observed, with complaints of headache and lassitude. In controlled human exposures to 500 ppm no effects other than slight transient eye irritation were noted; at 1000 ppm and above, mild eye irritation and some dizziness were noted. Following exposure, most of the compound is eliminated unchanged via the lungs, chiefly within 48 hours. Dermatitis may result from repeated skin contact with the liquid. Cardiac arrhythmias have been reported following ingestion. (Reference 2)

Nitrosamines -- Historically, nitrosamines have been regarded as one of the most potent families of animal carcinogens. Although nitrosamines are suspected to be human carcinogens, their carcinogenic potential in man has not been proven.

Nitrosamines were not present in the cutting oils used during the time of this survey. It should be noted that various proprietary cutting fluids are produced by over 1000 companies in the United States. NIOSH estimates that 780,000 workers are occupationally exposed in the manufacture and use of cutting fluids. (Reference 3)

F. Environmental Results and Discussion

Results of environmental samples showed that worker exposure to oil mist in the drop forge exceeded recommended limits.

Breathing zone air samples taken in all other areas of the plant were well within the most recent evaluation criteria for other potentially toxic substances.

G. Conclusions

Results of environmental data illustrate that a potential health hazard existed during this evaluation to workers in the drop forge area. Until adequate ventilation can be installed, a respirator program which meets OSHA specifications should be instituted and enforced.

V. RECOMMENDATIONS

1. NIOSH-approved respirators which comply with OSHA Standards 1910.134 should be used.

2. Workers should be provided with a clean place to eat, and eating should be prohibited in the work area.

3. Workers in the drop forge should always wear their hearing protection since impact noise levels reach 120 dBA.

4. The drop forge area should have local exhaust ventilation installed that would exhaust the oil mist generated.

VI. REFERENCES

1. NIOSH - Oil Mist Standards Completion Project.

2. NIOSH - 1,1,1,-Trichloroethane Standards Completion Project.

3. NIOSH Current Intelligence Bulletin No. 15: Nitrosamines in Cutting Fluids, October 6, 1976.

VII. AUTHORSHIP AND ACKNOWLEDGMENTS

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TABLE I

Breathing Zone Air Concentrations of Oil Mist

Gardner-Denver Company
Commerce City, Colorado

October 17-18, 1978

Sample Number	Location	Job Classification	Time of Sampling	mg/m^3 Oil Mist
42	Drop Forge	Forge Operator	7:30 AM - 1:45 PM	12.0
47	Drop Forge	Forge Operator	7:32 AM - 2:50 PM	6.0
14	Drop Forge	Forge Operator	7:30 AM - 2:08 PM	5.0
9	Drop Forge	Forge Operator	7:30 AM - 2:08 PM	6.0
10	Broach	Broach Operator	7:47 AM - 2:22 PM	0.3
6	Dept. 56	Gun Drill Operator	7:50 AM - 2:23 PM	0.2
46	Dept. 45	B-Machine	7:46 AM - 11:25 AM	1.8
41	Dept. 23	Gearhob Operator	7:58 AM - 3:01 PM	0.6
40	Dept. 56	Gun Drill Operator	8:05 AM - 3:05 PM	0.8
48	Dept. 22	Gun Drill Operator	8:10 AM - 3:03 PM	0.5
1	Dept. 45	Lathe Operator	7:40 AM - 2:14 PM	0.3
13	Dept. 45	Lathe Operator	7:41 AM - 2:16 PM	0.5
12	Dept. 62	NC Lathe Operator	7:43 AM - 2:20 PM	0.5
7	Dept. 23	Mill Operator	7:45 AM - 11:25 AM	0.5
8	Dept. 22	Radial Drill Operator	7:48 AM - 2:20 PM	2.9
4	Dept. 56	Borematic	7:55 AM - 2:25 PM	0.6
3	Dept. 22	Radial Drill Operator	7:57 AM - 2:22 PM	2.1
36	Dept. 45	Auto Chucker Operator	7:43 AM - 2:59 PM	0.4
50	Dept. 45	Auto Chucker Operator	7:45 AM - 3:00 PM	1.3
37	Dept. 62	NC Lathe Operator	7:53 AM - 3:00 PM	0.3
45	Dept. 62	NC Lathe Operator	7:55 AM - 3:00 PM	0.6
11	Dept. 40	Die Grinder	8:00 AM - 2:12 PM	0.3
44	All Depts.	Oil House Attendant	8:00 AM - 3:04 PM	0.4
39	Dept. 23	Machine Operator	8:01 AM - 3:05 PM	0.2

EVALUATION CRITERIA (TLV)	5.0
OSHA STANDARD	5.0
LABORATORY LIMIT OF DETECTION mg/sample	0.05

TABLE II

Breathing Zone Air Concentrations of Iron Oxide

Gardner-Denver Company
Commerce City, Colorado

October 17-18, 1979

Sample Number	Location	Job Classification	Time of Sampling	mg/m^3 Iron Oxide
5	Dept. 40	Tracer Operator	7:31 AM - 2:08 PM	0.05
49	Oil Submerging	EDM Operator	7:34 AM - 2:52 PM	0.99
38	Maintenance	Welder	7:40 AM - 2:52 PM	0.42
2	Maintenance	Welder	7:34 AM - 2:13 PM	0.32
		EVALUATION CRITERIA (TLV)		5.0
		OSHA STANDARD		10.0
		LABORATORY LIMIT OF DETECTION mg/sample		0.005

TABLE III

General Room Air Concentrations of 1,1,1,-Trichloroethane

Gardner-Denver Company
Commerce City, Colorado

October 17-18, 1978

Sample Number	Location	Time of Sampling	mg/m^3 1,1,1,-Trichloroethane
CT-1	Maintenance Shop	8:28 AM - 10:30 AM	0.83
CT-2	Maintenance Shop	8:28 AM - 10:30 AM	0.58

EVALUATION CRITERIA (TLV)	1900
OSHA STANDARD	1900
LABORATORY LIMIT OF DETECTION mg/sample	0.01

TABLE IV

Analysis of Cutting Oil for Nitrites

Gardner-Denver Company
Commerce City, Colorado

October 17-18, 1978

Sample Number	Nitrite (Greiss Test)	Solubility in Ethyl Acetate
1	(-)	Soluble
2	(-)	Soluble
3	(-)	Soluble
4	(-)	Soluble

These samples were first tested for the presence of nitrite-nitrosamine by Greiss Test. All samples showed the absence of nitrite-nitrosamine by this test.

LABORATORY LIMIT OF DETECTION 0.01 mg/sample