U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45202

HEALTH HAZARD EVALUATION REPORT 72-17
BUCYRUS LAMP PLANT OF GENERAL ELECTRIC
BUCYRUS, OHIO

DECEMBER 1972

I. SUMMARY DETERMINATION

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.

The National Institute for Occupational Safety and Health (NIOSH) received such a request from an authorized representative of employees to evaluate the potential hazard associated with the use of sulfur dioxide during the manufacture of fluorescent lamps at the Bucyrus Lamp Plant of General Electric, South Walnut Street, Bucyrus, Ohio.

Sulfur dioxide is a known mucous-membrane irritant of the eyes and especially of the upper respiratory system. Acute effects include nose, throat and eye irritation. Effects from chronic exposure may include nasopharingitis, a change in the ability to taste and smell, increased fatigability and an increase in the duration of colds.

NIOSH investigators conducted an environmental-medical survey of the facility in April 1972. Based on information obtained by air sampling (using chemical indicator tubes) during the plant survey, the sulfur dioxide air concentration levels did not exceed the established standard of 5 ppm* (Federal Register, Part II, § 1910.93, Table G-1) which protects workers from excessive exposures. Many employees noted that they experienced symptoms of sore throats, hoarseness and coughing spells. Some have gotten acutely short of breath. These symptoms were reportedly most notable when sulfur dioxide leaks would occur at the machine end of the process. However, no employees were found to be symptomatic at the time of our survey. Therefore, it is our determination that a hazard to health of workers did not exist at the time of our survey.

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*ppm--parts of vapor or gas per million parts of contaminated air by volume at 25°C and 760 mm Hg pressure.

Because of the past history of significant symptomatology of workers (consistent with exposure to SO_2) indicating that a hazardous environment might have existed, recommendations in the areas of concern have been made to management to alleviate the potential hazards to the approximately 60 employees in the flare-making and Lehr processes, including maintenance personnel. The use of sulfur dioxide has been eliminated from one portion of the lamp-making process, additional ventilation has been installed in the flare department, and engineering controls are being investigated to reduce the amount of sulfur dioxide being used in other processes.

Copies of this Summary Determination, as well as the Full Report of the evaluation are available to employees upon request from the Hazard Evaluation Services Branch, NIOSH, U.S. Post Office Bldg., Room 508, 5th & Walnut Streets, Cincinnati, Ohio 45202. Copies of both have been sent to:

a) Bucyrus Lamp Plant of General Electric, Bucyrus, Ohio
b) Authorized Representative of Employees
c) U.S. Department of Labor - Region V

For the purposes of informing "affected employees," the employer will "post" the Summary Determination in a prominent place(s) near where affected employees work for a period of 30 calendar days.

II. 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.

The National Institute for Occupational Safety and Health (NIOSH) received such a request from an authorized representative of employees of the Bucyrus Lamp Plant of General Electric on South Walnut Street, Bucyrus, Ohio.

The Bucyrus Lamp Plant manufactures fluorescent lamps. Sulfur dioxide is used as a lubricant to machine glass in one or more processes of the lamp production.

III. BACKGROUND HAZARD INFORMATION

A. Standard

The occupational health standard as promulgated by the U.S. Department of Labor (Federal Register, Part II, §1910.93, Table G-1), applicable to the substance of this evaluation is as follows:

Substance	ppm [a]	mg/M^3 [b]
Sulfur Dioxide	5	13

[a] Parts of vapor or gas per million parts of contaminated air by volume at 25° C and 760 mm Hg pressure.

[b] Approximate milligrams of particulate per cubic meter of air.

An employee's exposure to sulfur dioxide, in any 8-hour shift of a 40-hour work week, shall not exceed the 8-hour time weighted average as stated above.

B. Toxic Effects

Sulfur dioxide is a known mucous membrane irritant of the eyes and especially of the upper respiratory system. Acute effects from 6-12 ppm will cause nose and throat irritation, and larger amounts (greater than 20 ppm) will be irritating to the eyes.[1] Chronic exposure over a two-year period to levels around 30 ppm have been associated with an increase in nasopharingitis, a change in the ability to taste and smell, increased fatigability and an increase in the duration of the common cold. A threshold limit value of 5 ppm should prevent the respiratory tract irritation for most workers.[2]

IV. HEALTH HAZARD EVALUATION

A. Initial Visit - Observational Survey

The hazard evaluation survey of the Bucyrus Lamp Plant of General Electric, South Walnut Street, Bucyrus, Ohio, was made on April 21, 1972, by NIOSH representatives Richard S. Kramkowski, Steven K. Shama, M.D., and James Taylor, M.D. The function of the National Institute for Occupational Safety and Health and its relation to Section 20(a)(6) of the Occupational Safety and Health Act of 1970 and the purpose of the visit was explained to Plant Manager, Supervisor, Manufacturing and Engineering, and Health and Safety Engineer. Part I of the National Surveillance Network questionnaire was completed with their assistance, The Bucyrus Lamp Plant employs approximately 400 employees, and it operates three shifts per day.

employee representative, accompanied us to the flare and Lehr department, and the process was explained.

Process Information

The flare department has 27 machines which are hand loaded with glass tubing. An automated process heats the ends of the tubing with a series of natural gas flames (the sulfur dioxide is mixed with the natural gas to lubricate the glass), flares the heated ends and cuts the flares to size. The flares form the ends of the fluorescent lamp and holds the filaments.

The entire flare department is supplied with fresh air at baseboard and overhead levels, which is exhausted through fans in the roof. The sulfur dioxide, which is stored in cylinders in the flare area and piped through a series of tubing to the flare machines (where it is mixed with the gas), does not ignite, and is exhausted into the area over the top of the flare machines.

Another area where sulfur dioxide is used is the Lehr. The Lehr is an enclosed machine which heats the fluorescent tubing prior to sealing, and prepares it for the final process to drive off unwanted material inside the tube. The sulfur dioxide is vented directly to the outside, directly above the Lehr. The sulfur dioxide cylinders are stored adjacent to the Lehr area.

An area of potential sulfur dioxide exposure is the tube-sealing process. The use of sulfur dioxide in the sealer has been eliminated.

B. Environmental Evaluation

Five air samples were taken (using chemical indicator tubes) in the areas of interest. Only one sample taken immediately adjacent to the sulfur dioxide cylinder storage in the flare department indicated any concentration of sulfur dioxide above barely detectable, and its concentration ($\pm$ 50% at the 95% confidence level) was 3 ppm, which is less than the allowable standard.

C. Medical Evaluation

We spoke to fifteen employees in areas of actual or potential sulfur dioxide exposure. Nearly all of the workers with whom we spoke in the departments were, at some time, symptomatic with symptoms consistant with those of sulfur dioxide inhalation. Most workers noted problems with occasional sore throats, hoarseness and coughing spells. The most symptomatic people were those whose job it was to maintain the equipment. These workers were probably exposed to higher than normal amounts of sulfur dioxide when leaks would occur at the machine end of the process. These workers admitted to episodes of breathlessness when repairing the machines.

Symptoms were worse when leaks would occur; much milder symptoms were experienced by workers who had passed through the flare department at the time of the leaks.

Safety glasses with side shields are the only protective devices worn in the flare department. No respirators of any kind are used presently.

the plant physician, was contacted by telephone, and he indicated that he had seen two patients with alleged problems from sulfur dioxide. The plant nurse, , also mentioned that employees had come to the first-aid room complaining of some irritation of their throats and respiratory tracts allegedly due to sulfur dioxide.

V. CONCLUSIONS AND RECOMMENDATIONS

The plant is aware of problems resulting from sulfur dioxide and is attempting to phase out the sulfur dioxide process completely. As it is being phased out, they are attempting to redesign some of the machines which use the sulfur dioxide to reduce the amount of gas used.

Since the air sampling performed on the day of our visit showed all SO_2 concentrations to be below 5 ppm, an established upper limit, it is our opinion that no hazard due to SO2 existed on that day. However, because of the past history of significant symptomatology of workers consistent with effects from SO_2 exposure, indicating that SO_2 concentrations might have exceeded safe limits, we are making the following recommendations:

1. Efforts should be made to decrease the amount of sulfur dioxide used in each machine.

2. When leaks occur, workers who are not immediately involved with repairing the leaks should be told to leave the area. Workers involved with repairing the leaks should wear appropriate respirators, approved for use in a sulfur dioxide atmosphere.

3. Ventilation in the flare department should be improved. Efforts should be made to prevent carryover to other departments.

4. The sulfur dioxide cylinder storage area and the piping distribution system should be checked routinely for leakage, and all fittings maintained in good condition.

VI. REFERENCES

1. Industrial Hygiene and Toxicology, Volume II, Second Revised Edition - Frank Patty, editor, Interscience Publishers, 1963 (pp 894, 895).

2. Documentation of the Threshold Limit Values - American Conference of Governmental Industrial Hygiensits, Third Edition, 1971 (pp 238, 239).