

PRELIMINARY SURVLY REPORT:
CONTROL TECHNOLOGY SUPPORT FOR SENSOR

AT

U.S. Silica
Millville Plant
Newport, New Jersey

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NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
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PLANT SURVEYED: Millville Plant
U.S. Silica
A subsidiary of U.S. Borax
700 Railroad Avenue
Newport, New Jersey 08345

SIC CODE: 1446

SURVEY DATE: September 14, 1988

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I. INTRODUCTION

The National Institute for Occupational Safety and Health (NIOSH) is the primary Federal agency engaged in occupational safety and health research. Located in the Department of Health and Human Services (formerly the Department of Health, Education, and Welfare), it was established by the Occupational Safety and Health Act of 1970. This legislation mandated NIOSH to conduct a number of research and education programs separate from the standard setting and enforcement functions conducted by the Occupational Safety and Health Administration (OSHA) in the Department of Labor. An important area of NIOSH research deals with methods for controlling occupational exposure to potential chemical and physical hazards. The Engineering Control Technology Branch (ECTB) of the Division of Physical Sciences and Engineering has been given the lead within NIOSH to study the engineering aspects of hazard control.

Since 1976, ECTB has conducted a number of assessments of health hazard control technology on the basis of industry, common industrial process, or specific control techniques. The objective of each of these studies has been to document and evaluate effective control techniques for potential health hazards in the industry or process of interest, and to create a more general awareness of the need for or availability of an effective system of hazard control measures.

In 1987, NIOSH initiated SENSOR (Sentinel Event Notification System for Occupational Risks), a cooperative state-federal effort designed to develop local capability for the recognition, reporting, follow-up, and prevention of selected occupational disorders. Under this program, the state health department (or other agency) launches three types of actions upon notification of a case of occupational disease: first, disease management guidelines will be made available to the health care provider; second, medical evaluations of co-workers who may be at risk of developing similar disorders will be conducted; finally, action directed to reduce work site exposures will be carried out. To assist the states in developing model intervention plans for exposure reduction, ECTB will conduct a pilot engineering assistance project with selected states participating in SENSOR. This assistance may include specific control recommendations for an individual plant identified and selected by the state; or an entire industry that would be selected based on the state disease records, with the intent of developing guidelines for the elimination of occupational disease in the entire industry. In either case, follow-up studies may be conducted after the intervention plans have been implemented to determine the success of the program through measurement of the exposure reductions achieved.

The New Jersey Department of Health is participating in the SENSOR program for occupational asthma and silicosis. Health Department data indicate the largest number of silicosis cases in the state exists in the sand mining and processing, foundry, and pottery (sanitary ware) industries. ECTB will conduct at least one study in a facility in each of these industries to establish base line exposure data for that plant, to develop specific control recommendations to eliminate future cases of disease, to train state personnel in the application of engineering controls, and to develop a model protocol for the identification and control of exposure sources.

This report describes a walk-through survey conducted as a part of this federal-state effort at the Millville, New Jersey, plant of U.S. Silica. The purpose of this survey was to determine the need for improved engineering controls in a sand mining operation.

II. PLANT AND PROCESS DESCRIPTION

Plant Description:

The U.S. Silica sand plant (formerly Pennsylvania Glass Sand) opened in 1926 and is located near Millville, New Jersey. U.S. Silica is a subsidiary of U.S. Borax. The plant produces foundry sand, glass sand, and 230 mesh ground sand for pigments. Foundry sand is a new product and has been produced only since 1987. Sand is shipped from the plant in bulk via truck or rail. The plant employs 48 workers and operates on three shifts, but is closed on weekends. Operational areas include dredging, wet processing, drying and bulk loading, and maintenance. In addition, the plant has a small milling operation in which we were particularly interested.

Process Description:

Sand is dredged from ponds 5 miles from the processing plant and pumped to holding tanks. The sand is then sent to the wet process area, where it is sized in centrifuges, washed in screw classifiers and scrubbers, cleaned of fines and clays using rake classifiers, and cleaned of iron by chemical flotation. The sand then passes through a hydrocyclone, is dewatered by vacuum filtration, and transferred to the damp storage tanks. The wet operations are performed under roof. The sand is next dried in a rotary kiln, classified by one or more vibrating screens, discharged to an elevator, and bulk loaded into either rail cars or trucks. U.S. Silica employees load only the rail cars, while the truck drivers load the trucks. Both ventilated and unventilated loading spouts are used.

A portion of the sand from the screens is diverted to the milling process. One pebble mill is operational, while the other mills are permanently shut down. One worker is assigned to the mill and he spends most of his time in an isolated control room.

Potential Hazards:

The major hazard associated with this operation is crystalline silica. Overexposure to the crystalline forms of silica causes the lung disease silicosis; symptoms include cough, shortness of breath, chest pain, weakness, and wheezing. Silicosis usually occurs after years of exposure, but may appear in a shorter time if exposure concentrations are very high. This latter form is referred to as rapidly-developing silicosis, and its etiology and pathology are not as well understood. Silicosis is usually diagnosed through chest X-rays, occupational exposure histories, and pulmonary function tests. The manner in which silica affects pulmonary tissue is not fully understood, and theories have been proposed based on the physical shape of the crystals, their solubility, toxicity to macrophages in the lungs, or their crystalline structure.⁽¹⁾ Since the dredging and processing operations are performed

wet, the greatest silica exposure hazard appears to occur in drying and loading.

III. EXPOSURE CONTROLS

Occupational exposures can be controlled by the application of a number of well-known principles, including engineering measures, ventilation, work practices, personal protection, and monitoring. Operations up to and including the processing plant generally cause low dust exposures because they are performed wet. Our survey, therefore, concentrated on dust control measures in use during dry processing at this facility. These controls included primarily local exhaust ventilation, isolation of operators in control rooms, and housekeeping.

Engineering Controls:

The screens and conveyor belts in the dry processing area at this plant are covered and equipped with local exhaust ventilation. A central exhaust duct is fed by individual ducts from each of the screens. In general, the ventilation systems in the plant appeared to be well designed, following standard ventilation design practice, and appeared to be well maintained.

Some of the loading spouts for truck loading are equipped with 12-inch diameter concentric ventilated ducts. These ventilated spouts are similar to those we observed at another sand plant, however, the exhaust air volumes of 800 to 1,600 cfm, given to us by U.S. Silica personnel, are much higher than the air volumes we measured at the other plant. Also, U.S. Silica will not accept trucks for loading sand with the ribs up. (We observed during an in-depth survey at another facility that pouring sand over the ribs was a source of dust emissions.) For trucks with manhole openings, the spout must extend into the truck and a second truck lid must be open to provide makeup air during loading. The company has almost completed installation of a fully-automated unloading system with ventilated spouts for foundry sand.

Medical:

Production workers are given biennial physicals including pulmonary function tests.

Industrial Hygiene:

The plant has a detailed health and safety program including worker training, a written respirator program, biennial worker physicals, well designed and operating ventilation systems, periodic testing of ventilation systems, and regular personal monitoring for respirable dust and quartz. Air samples are always analyzed for weight and sometimes for quartz. The company samples all jobs and keeps a log of employee activities during the sample period. MSHA regularly conducts monitoring at the plant to determine compliance with the silica quartz PEL of $0.1 \mu\text{g}/\text{m}^3$. According to the company, there is no major difference between MSHA and U.S. Silica's personal air sampling results.

The ventilation system is checked by taking pitot tube measurements; however, this is not done on a scheduled basis. Spills of sand are cleaned up with shovels, front-end loaders, and hoses. Sweeping and HEPA filter-equipped vacuums are used for housekeeping in the mill; no compressed air cleaning is performed. To help keep dust down, the company plans to blacktop the entire process area; this will also require proper sloping and drainage boxes.

The company provides approximately 14 hours of health and safety training for new employees. This training includes a video on the causes, pathology, symptoms, and preventive measures for silicosis.

Respiratory Protection:

Respirators are required in restricted areas. Workers are provided half-mask Dustfo 66 dust and mist filter (#TC21C156) respirators, which are approved by NIOSH and MSHA. The company has a written respirator program that includes annual fit tests conducted using saccharine, smoke, and banana oil. No facial hair is permitted where the respirator forms a seal with the face.

IV. CONCLUSIONS AND RECOMMENDATIONS

Cases of silicosis have been noted by the New Jersey Health Department in the sand mining and processing industry in New Jersey. Although dust exposure is unlikely in the wet processing areas in this plant, the drying and loading areas are areas of potential overexposure in this and other plants within the industry.

The company is completing installation of a fully-automated unloading system with ventilated spouts for foundry sand which may be of interest, but since we have already evaluated ventilated spouts at another sand mine in New Jersey, an additional survey of ventilated spouts may be redundant. The milling operation, which had not been seen at other sand mines, is at low production and the potential for worker exposure in the mill at this plant is slight.

V. REFERENCES

1. National Institute for Occupational Safety and Health. Criteria for a Recommended Standard: Occupational Exposure to Crystalline Silica. Cincinnati, Ohio: National Institute for Occupational Safety and Health, 1975. (DHEW publication no. (NIOSH) 75-120).