PRELIMINARY SURVEY REPORT:

CONTROL TECHNOLOGY SUPPORT FOR SENSOR

AT

Unimin Corporation
Dividing Creek Sand Plant
Millville, New Jersey

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PLANT SURVEYED:	Unimin Corporation Dividing Creek Sand Plant P.O. Box 145 Millville, New Jersey 08332
SIC CODE:	1446
SURVEY DATE:	August 16, 1988
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Mention of company names or products does not constitute endorsement by the National Institute for Occupational Safety and Health.

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 the SENSOR program (Sentinel Event Notification System for Occupational Risks), a cooperative federal-state effort designed to develop local capability for the recognition, 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 worksite exposures will be carried out. To assist the states in developing these exposure reduction intervention plans for worksites, 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 for 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 (NJDH) 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. This disease is caused by exposure to crystalline silica in these 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 Dividing Creek Sand Plant of the Unimin Corporation, located in Millville, New Jersey. 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:

Unimin supplies washed sand for the glass industry. At this location, sand is dredged, sized, washed, iron-containing impurities are removed; then the sand is dried, and loaded into rail cars or trucks. The site consists of several dredging ponds (two operating dredges), a processing plant, wet sand storage, a drying and loading operation, and maintenance and office buildings. This site was formerly mined by the Whitehead Brothers Company. The site was purchased by Unimin in 1980 and a new processing plant was built at that time. The dryer and sand silos were built in the 1940's, but the loading facilities have been modified by Unimin by the addition of ventilated loading spouts.

The plant employs 24 hourly and 9 salaried workers. The plant operates on three shifts (midnight to 8:00 a.m., 8:00 a.m. to 4:00 p.m., and 4:00 p.m. tomidnight), except for the dredges which operate on two shifts (6:00 p.m. to 2:00 a.m. and 6:00 a.m. to 2:00 p.m.).

Process Description:

An outside contractor removes trees and topsoil from the area to be mined. Since the site is only a few feet above sea level, once sand is uncovered, it rapidly floods with ground water. Two dredges are used to mine sand from the flooded area, typically reaching depths of 50 feet. Two operators work the dredges. The sand/water slurry is pumped to scalper, which removes rocks and slime from the slurry, then it is pumped to a holding tank outside the process building. In the process building, the sand is sized by settling (coarse fraction removed), dewatered (and clay removed) by two parallel screws, passed through an attrition scrubber, again dewatered by two parallel screws, and iron-containing impurities are floated and removed. A ball milling step can be added to the process for size reduction, a step that has not been performed for some time. One operator and one helper work in the processing building.

After processing, the wet sand is stockpiled. Sand is transported as required by front-end loader to a belt conveyor, which transports the sand to the dryer plant. At the dryer plant, the sand is dumped into a bucket elevator, which loads the fluidized bed dryer, screened, then transported via a screw conveyor to one of three concrete silos. Sand can be dumped directly from the sides of all three silos to a rail car (covered hopper) or directly from the last silo

to a truck (open dump or tank). Alternately, sand can be discharged from the bottom of the three silos via screw conveyors to a bucket elevator which load elevated hoppers located above the railroad car and truck scales. These hoppers are equipped with ventilated loading spouts. Typically, the direct discharge is used for prefilling railroad cars (when less operator attention is required) and the loading spouts used for the final fill. One worker operates the dryer and a second worker performs loading operations on each shift. Railroad and truck shipments represent approximately equal tonnage.

Potential Hazards:

As mentioned earlier, the major hazard associated with this operation is crystalline silica. Overexposure to 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.(1) Since the dredging and processing operations in the sand mines are performed wet, the greatest silica exposure hazard would appear 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 used in the dry processes at this facility.

Engineering Controls:

In the processing plant, the operator works in an air-conditioned control room; and in the drying and loading areas workers spend considerable time in air-conditioned sheds.

Roof fans provide dilution ventilation in the processing plant. No local exhaust was utilized.

In the drying plant, air from the fluidized bed dryer is exhausted through a wet scrubber. This scrubber also exhausts the first bucket elevator housing. Since the supply fan for the dryer is not connected via a control system to the scrubber fan, the dryer operator is required to monitor a pressure gauge to keep the dryer under a negative gauge pressure and set the fan dampers accordingly. A bag house sitting atop one silo provides bin venting for the silos and exhaust for the final bucket elevator and the loading spouts. The loading spout exhaust is not connected directly to the bag house, but to the elevator housing, the elevator housing serving as an exhaust plenum.

The loading spouts consist of a central flexible hose, approximately 12 inches in diameter, which serves as a conduit for the sand. It is surrounded by a larger hose which terminates in a funnel. The funnel can be lowered into a rail car or tank truck hatch, and provides a source of exhaust for air entrained/displaced by the loading process. For open truck loading, the funnel could function as a capture hood, although its effectiveness would diminish.

Work Practices:

Spilled sand in plant areas and along haulage ways can dry and become airborne dust. Processing plant areas appeared to be remarkably free of spilled sand. The plant has a tank truck with water sprayers available for dust control along haulage ways.

Personal Protection:

Safety shoes, glasses, and hard hats are required in all areas of the plant. Respirators are required in designated areas. A safety brochure outlining essential safety and health requirements is mandatory reading for all plant personnel and visitors.

Monitoring:

Routine monitoring of silica exposure is performed twice yearly by the Mining Safety and Health Administration (MSHA). The corporate safety and health manager has a MIE Real-Time Aerosol Monitor available for spot surveys.

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. 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 use of ventilated loading spouts is not common for this industry. Since this plant uses some nonventilated spouts for preloading (when close operator attention is not necessary), a comparison of the two techniques of loading could be conducted in this plant. Eventually, the plant could redesign the sand transport system to convey the sand directly from the dryer to the hoppers above loading spouts to completely eliminate the unventilated filling operations.

V. REFERENCE

1. National Institute for Occupational Safety and Health. Criteria for a recommended standard: occupational exposure to crystalline silica. National Institute for Occupational Safety and Health. DHEW Publication No. (NIOSH) 75-120. Cincinnati, Ohio. 1975.