WALK-THROUGH SURVEY REPORT:

CONTROL TECHNOLOGY FOR THE CERAMIC INDUSTRY

AT

American Olean Tile Company
Jackson, Tennessee

REPORT WRITTEN BY:

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REPORT DATE:

April, 1983

REPORT NO.:
110-25a

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
Division of Physical Sciences and Engineering
Engineering Control Technology Branch
4676 Columbia Parkway
Cincinnati, Ohio 45226

PLANT SURVEYED:	American Olean Tile Company American Drive, P.O. Drawer 2768 Jackson, Tennessee 38301
SIC CODE:	3253 - Ceramic Floor and Wall Tile
SURVEY DATE:	March 22, 1983

EMPLOYER REPRESENTATIVES CONTACTED:

G. E. Fullerton, Jr. - Plant Manager - 901-424-1314
Stanley Stump - Plant Superintendent - 901-424-1314
William Pope - Ceramic Engineer - 901-424-1314
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EMPLOYEE REPRESENTATIVES CONTACTED:

William Evans - President, Aluminum, Brick, and Glass Workers Union - Local 440

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 DHEW), 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 carried out 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 health hazard prevention and 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. Examples of these completed studies include the foundry industry; various chemical manufacturing or processing operations; spray painting; and the recirculation of exhaust air. 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.

These studies involve a number of steps or phases. Initially, a series of walk-through surveys is conducted to select plants or processes with effective and potentially transferable control concepts or techniques. Next, in-depth surveys are conducted to determine both the control parameters and the effectiveness of these controls. The reports from these in-depth surveys are then used as a basis for preparing technical reports and journal articles on effective hazard control measures. Ultimately, the information from these research activities builds the data base of publicly available information on hazard control techniques for use by health professionals who are responsible for preventing occupational illness and injury.

This study of the ceramics industry is being undertaken because there are approximately 100,000 employees potentially exposed to various chemical and physical agents. Other NIOSH studies have indicated that the handling of dry material, such as pesticides and silica flour is an important source of airborne dust generation in the workplace. The latter, silica flour, study revealed that as much as one-half of the environmental silica dust problems may be effectively controlled by good work practices and effective housekeeping practices. The problem of dust dispersion during material handling spans many industries and can be a major source of chemical exposure. Although several industries may have devised successful methods of dust control, our literature review revealed that there is presently no centralized information base making the solutions universally available. The results of this study will help overcome this shortcoming.

Potential Hazards:

The only raw material involved in the crushing and grinding operation in this plant is pyrophyllite, a material resembling tile. Instead of being a magnesium silicate it is an aluminum silicate, $H_2Al_2\ (SiO_3)_4$. This plant's source of pyrophyllite is Newfoundland where the deposits are known to be contaminated with quartz, a crystalline form of silica.

Exposure to silica can produce silicosis, a debilitating respiratory disease, caused by inhalation of fine crystalline silica dust that is retained in the lungs. The amount of dust inhaled, the percentage of free or uncombined silica in the dust, the size of the dust particles, and the length of exposure all affect the onset and severity of silicosis. The inhaled dust, deposited in the bronchioles and alveoli, reacts within the lung tissue to form silicotic nodules.

The OSHA standard, or Permissible Exposure Limit (PEL), for respirable crystalline silica (quartz) is determined by the equation:

$$\text{PEL} = \frac{10}{\%\ \text{silica} + 2} \quad \text{milligrams per cubic meter of air. } (\text{mg/m}^3)$$

For 100% silica dust (respirable), this calculated PEL is approximately equivalent to 0.1 mg/m^3 or 100 ug/m^3. Although the PEL pertains specifically to the 8-hour time weighted average (TWA) exposure to employees, in this research, it will be used as an environmental criterion to evaluate the effectiveness of the control technology used to control dust emissions from approximately 16 material transfer points.

II. CONTROLS

PRINCIPLES OF CONTROL

Occupational exposures can be controlled by the application of a number of well-known principles, including engineering measures, work practices, personal protection, and monitoring. These principles may be applied at or near the hazard source, to the general workplace environment, or at the point of occupational exposure to individuals. Controls applied at the source of the hazard, including engineering measures (material substitution, process/equipment modification, isolation or automation, local ventilation) and work practices, are generally the preferred and most effective means of control both in terms of occupational and environmental concerns. Controls which may be applied to hazards that have escaped into the workplace environment include dilution ventilation, dust suppression, and housekeeping. Control measures may also be applied near individual workers, including the use of remote control rooms, isolation booths, supplied-air cabs, work practices, and personal protective equipment.

In general, a system comprised of the above control measures is required to provide worker protection under normal operating conditions as well as under conditions of process upset, failure and/or maintenance. Process and workplace monitoring devices, personal exposure monitoring, and medical monitoring are important mechanisms for providing feedback concerning effectiveness of the controls in use. Ongoing monitoring and maintenance of controls to insure proper use and operating conditions, and the education and commitment of both workers and management to occupational health are also important ingredients of a complete, effective, and durable control system.

These principles of control apply to all situations, but their optimum application varies from case-to-case. The application of these principles at the crushing and grinding operation in this plant is discussed below.

The entire material particle size reduction process is completely automated from the time the pyrophyllite is dumped into the grizzly feeder until it is received in the main building storage bin. The grinding plant and pyrophyllite storage building is isolated from the main production building by about 200 feet and uses only three workers to perform the entire operation. The bulk storage area is separated from the grinding plant by a floor-to-ceiling wall with the exception of a small opening in one corner through which the coarse-crushed material passes. All material conveying systems are either trough or enclosed design to minimize potential dust emission. All 16 material transfer points are equipped with local exhaust ventilation hoods. Makeup air is provided by lowered openings which open automatically when necessary.

Work Practices:

The grinding plant is equipped with a large permanently-mounted vacuum cleaning system, with hose receptacles strategically located throughout the building, for use in maintaining good housekeeping.

Monitoring:

The Division industrial hygienist conducts annual atmospheric dust sampling in the pyrophyllite storage and grinding plant. Results indicate good control of dust emissions.

Conclusions and Recommendations:

The local exhaust ventilation system in the grinding plant appears to be effective as indicated by the absence of dust accumulation on horizontal surfaces and the company's industrial hygiene sampling results. The good housekeeping and personal protective equipment programs appear to be effective. This plant is recommended for an in-depth study of the effectiveness of these controls.