WALK-THROUGH SURVEY REPORT:

CONTROL TECHNOLOGY FOR THE CERAMIC INDUSTRY

AT

Can-Clay Corporation
Cannelton, Indiana

REPORT WRITTEN BY:

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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:	Can-Clay Corporation 4th and Washington Streets Cannelton, Indiana 47520
SIC CODE:	3259
SURVEY DATE:	March 23, 1983
SURVEY CONDUCTED BY:	Frank W. Godbey
EMPLOYER REPRESENTATIVES CONTACTED:	Joseph L. Hagedorn, Plant Superintendent - 812-547-6280
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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 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.

Health hazard evaluations (HHE's) of ceramics industry workplaces have shown the importance of effective engineering controls. Three Health Hazard

Evaluations attribute the existence of unhealthful conditions at the time of the surveys to inadequate ventilation. In all of these studies where high workroom-air contamination and adverse health effects were documented or suspected, inadequate ventilation was identified as a contributing factor. In addition to improved local exhaust ventilation, other control measures recommended in the reports include modified work practices, better worker education about occupational hazards, and the appropriate use of personal protective equipment. In total, these studies show a need for continuing activity in control technology development.

During the period July, 1974 through June, 1979 the Occupational Safety and Health Administration (OSHA) reported that 83% of the silica tests they conducted in the ceramics industry exceeded the permissible exposure limit (PEL). Our preliminary surveys and contacts with industry personnel seem to indicate that there are now controls in place that prevent these excesses. This study will document the existence and usage of these controls.

NIOSH's major goal in undertaking this study is to identify and promote the use of cost effective health hazard control technology strategies in the ceramics industry. The primary focus is on the control of airborne dust concentrations during the raw materials crushing and grinding operations. The control methods assessed will be documented in sufficient detail so that the information can be used in similar industrial situations.

II. PLANT AND PROCESS DESCRIPTION

Plant Description:

The Can-Clay Corporation, formerly owned by Harsco, produces vitreous sewer pipes, flue linings, water plant filter blocks and a variety of other miscellaneous ceramic products from Kentucky ball clays. The Company employs approximately 66 workers and operates one shift a day, five days a week. The Company started operations in 1909 and occupies approximately 36 acres of land and five acres of floor space. The two main buildings, production and grinding, are separate and are constructed of sheet metal.

Process Description:

Ball clays from surface mines in Kentucky are brought to the plant by truck in 22-24 ton batches and dumped directly into storage hoppers. The clay is gravity-fed from the storage hopper into the primary jaw crusher where it is crushed to egg size. The coarse-crushed clay is transported by conveyor to one of seven stockpile storage bins. The material is gravity-fed from the storage bins in blended lots into an air-conditioned, enclosed frontend loader for transport to the maximuller (dry pan) grinding unit for fine grinding (4-200 mesh). The fine ground material is transported by conveyor belt to vibrating screens where the finely ground material passes through the screens to fine grind storage bins. The oversize material is returned by gravity to the maximuller where the cycle is repeated. Barium carbonate, to parcipitate naturally-occurring salts, is fed from an automatic vibrating feeder into the maximuller at the rate of 50 pounds per day. The blended production size material is transported from the storage bins by an enclosed overhead conveyor to the production building across the street. This raw material progresses through a series of production operations to completion of the finished product. This study does not involve the evaluation of these production operations.

Potential Hazards:

The primary raw material involved in the crushing and grinding operation in this plant is locally-mined ball clays. These clays are known to contain approximately 20 per cent quartz, a crystalline form of silica, (based on sampling data obtained from an in-depth study at a nearby quarry tile plant).

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:

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

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 material transfer points.

III. 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 coarse-ground clay is placed in the stockpile storage bins until it is received in the production building across the street. The crushing and grinding building is isolated from the production building by a distance of about 60-feet and uses only two workers to perform the entire operation. All material transfer points, primary crusher, maximuller, and (4) vibrating screens are equipped with local exhaust ventilation hoods to minimize potential dust emissions. The overhead (across-the-street) conveyor is enclosed. Makeup air is provided by overhead fans.

Conclusions and Recommendations:

The local exhaust ventilation system and good housekeeping program does not appear to be sufficiently effective to control worker exposure to potentially harmful particulate levels. Therefore, this plant is not recommended for an in-depth study of the effectiveness of these controls.