PRELIMINARY CONTROL TECHNOLOGY ASSESSMENT

OF

The Cambridge Tile Manufacturing Company
Cincinnati, Ohio

SURVEY CONDUCTED 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

PURPOSE OF SURVEY:	To become familiar with wall and floor tile manufacturing, investigate the state of the art controls for chemical and physical agents in the processes, and to determine the plant's suitability for an in-depth control technology survey.
DATE OF VISIT:	January 6, 1982
EMPLOYER REPRESENTATIVES CONTACTED:	Darwin C. Yung, President Darwin G. Yung, Plant Engineer
EMPLOYEE REPRESENTATIVES CONTACTED:	None
STANDARD INDUSTRIAL CLASSIFICATION OF PLANT:	3253
ANALYTICAL WORK PERFORMED BY:	None

ABSTRACT

A walk-through control technology survey of a wall and floor tile manufacturing plant was conducted at the Cambridge Tile Manufacturing Company, Cincinnati, Ohio on January 6, 1982. This plant starts with a variety of raw materials; mixes, dries, crushes, grinds, presses them into shape; and then kiln fires to yield a variety of tile products. A preliminary assessment of control technology including engineering controls, monitoring, work practices, and personal protective equipment was made during the visit. Based on the results of this preliminary survey, a detailed survey may be planned of certain operations in this plant.

INTRODUCTION

The Engineering Control Technology Branch of the Division of Physical Sciences and Engineering, NIOSH is conducting a research study to assess and document control methods for minimizing worker exposure in the ceramics products industry. Exposures to various harmful chemical and physical agents including silica, noise, and heat have been documented as a cause of a variety of health problems. The survey was conducted to obtain information on control technology including engineering controls, monitoring, work practices, and protective equipment, and to determine the suitability of this plant for a detailed survey.

PLANT FACILITIES AND PERSONNEL DESCRIPTIONS

The Cambridge Tile Manufacturing Company (Cambridge) owns a complex of buildings having a total floor area in excess of 200,000 sq.ft. When their employment level was between 500 and 600 they occupied it all, but now that business is down they only have need for approximately 65,000 sq.ft. The remainder is leased to various tenants. The buildings they occupy are: one story, no basement, concrete block and brick walls, open bayed, metal trussed, 1965 vintage. The office, production, and warehousing operations are in separate buildings.

There are approximately one hundred employees at this location. Eighty are members of a United Glass and Ceramics Workers of North America (AFL-CIO) local. Mary Bell, Local Union President, was on medical leave at the time of this survey. Approximately 50% of the employees are women. There are approximately 50 bargaining unit employees on the day shift (7:00 to 3:30) and 30 on the afternoon shift (3:30 to 12:00). All production workers are on an incentive pay plan.

The plant is producing 20,000 sq.ft of tile per day, which is approximately 66% of capacity. The product line consists of 10 basic color "non refractory" tiles, which are either 4 1/4" square and flat or specialty "trim" shapes.

The Cambridge president, Darwin, C. Yung, is a mechanical engineer, and has worked in the ceramics industry since 1946. He started with Cambridge as a plant engineer in 1952. His son, Darwin G. Yung, is now plant engineer. Any research and development now conducted is of the applied type, and is done under the supervision of the president.

RAW MATERIALS

The raw materials are received in railroad, bottom dump, hopper cars, bags, and cannisters. Most of the clay comes from Kentucky and Tennessee. The "non-asbestiform talc" is obtained in bulk from New York.* The frits and glazes (heavy metal silicates including some lead monosilicates) are received in bags and/or cannisters. Frits are purchased from the Ferro Corporation and the silicates from Hammond Products, Inc.

PROCESS DESCRIPTION

The plant tour followed the process flow. Following is a step by step description:

1. The basic raw materials (clay and talc), dump by gravity into an underground hopper.

2. The raw materials are transferred by screw conveyor from the underground hopper to a vertical bucket elevator which can discharge into either one of two storage silos.

3. Silo contents are discharged by gravity into surge tanks.

4. From surge tanks raw materials go by enclosed screw conveyor to a rough screen where "tramp" metal is removed. Materials then drop into weigh hoppers.

5. When the amount of material in the weight hopper reaches a predetermined point it is automatically dumped into a mixer.

6. After the dry materials (clay and talc) are homogeneously mixed (mixture is called "bisque") sufficient water is added to achieve a 6% moisture level.

7. The mixed batches of bisque are dumped into a roto-bin feeder which discharges into a hopper from which it is transferred by a closed tube conveyor onto another screen.

8. Screened (sized) material is picked up by another tube conveyor, which discharges to a series of hoppers mounted on the tops of a line of automatic mechanical power presses.

9. Each press (during this tour) was forming 2 green 4 1/4" x 4 1/4" wall tiles per cycle.

10. The green tiles are fed onto a continuous loop, dual wire, conveyor which carries them through air cleaning, glaze spray, infra red glaze drying, and to workers who place them on "setter" or "sagger" tile carriers.

11. The formulation of the approximately 30 different glazes involves these operations:

    a. The bags and/or cannisters of frits and glaze materials are manually loaded by one employee into ball mills.

*This "non-asbestiform talc" may, in fact, contain asbestos, and, therefore, may be a significant health hazard.

b. A predetermined number of ceramic balls are added to each ball mill load. Each load is ground for approximately 10 hours.

c. The glazing materials are color coded and stored in 55 gal. drums.

d. Prior to usage 3, 4, or 5 of the 55 gal. drums of glaze are mixed together, taken to the spray machine and applied to the green tiles.

12. The tile carriers are manually loaded on kiln cars.

13. The kiln cars pass through a 230 ft. long, continuous feed, positive pressure, tunnel kiln.

14. AT this production level the kiln maximum. temperature is approximately 2,000°F, with an 8 hour pass-thru time.

15. After tiles cool they are visually and audiably inspected. If passed they are either packed for storage or shipment.

In addition to the above process floor operations we observed quality control, maintenance, and waste disposal areas and operations.

ENGINEERING CONTROLS, MONITORING, WORK PRACTICES, AND PERSONAL PROTECTIVE EQUIPMENT

The following control technology observations were noted that may warrant in-depth evaluation and documentation:

1. Potential fugitive emissions during bulk unloading are controlled by the use of a fabric stocking type sleeve between railroad car and underground hopper.

2. Cambridge uses two(2) bag type dust collectors. They are equipped with self cleaning mechanisms. Materials emitted from the process are collected and recycled. Some ductwork leakage from wear and tear was noted.

3. Air driven ball vibrators made by the Cleveland Vibrator Corporation are used on the surge tanks. When operating they apparently do not exceed the permissible noise levels.

4. The closed tube conveyors are made by the Hapman Conveyor System Co., Kalamazoo, Michigan. The carrier consists of polyethylene flights mounted on a stainless steel chain. Major wear occurs at enclosure turns and on flight surfaces. However, the system is tight, occupies little space, and is very versatile.

5. The Dubois automatic mechanical power presses are equipped with shuttle transfers and each has a local exhaust system with blast gates.

6. The impact noise levels generated by the "squeeze" and "hit" cycles of the Dubois automatic presses apparently do not exceed permissible levels.

7. The employee formulating the glazes wears a 3M-W2940 "air hat" respirator. He receives a pulmonary function test as do other regular respirator wearers.

8. The blood lead level of the employee formulating the glazes is checked every three months, or oftener, if the company physician feels it's necessary.

9. There is a local exhaust system with adjustable pick up available for use by operator when he is loading the ball mills.

10. The glaze spray hoods have a downdraft local exhaust system. There are baffles in the plenum.

11. The workers handling the fired tiles wear hand pads and/or gloves to protect against lacerations and abrasions.

12. L.P. gas-powered fork trucks are used to lift and carry heavy loads.

13. Safety glasses and shoes are worn by the workers.

14. The management is alert for less toxic materials that can be substituted and/or process modifications that will made the operations less hazardous.

15. Employees are given six minutes at the end of the shift to clean up their work area.

MAJOR POTENTIAL HEALTH HAZARDS

The persons working with glazes and frits may be exposed to some lead and other heavy metals. Although the percentage of free silica present in the clays and talc is not known, there may be exposure to harmful silicious and/or nuisance dust levels. In addition to the above chemical agents, the physical agents - noise, temperature extremes, and non ionizing radiation, may warrant consideration.

HEALTH AND SAFETY PROGRAMS

Cambridge has a contract with a medical center and a part-time physician. All employees receive a chest x-ray every two years. All employees wearing respirators are given pulmonary function tests. As noted above, certain employees have their blood lead levels monitored. In general it appears that the lead standard medical requirements are being met.

Industrial hygiene surveys have been made by the Industrial Commission of Ohio, Division of Safety and Hygiene and the Federal Occupationasl Safety and Health Administration personnel. There was no indication that the company was not in compliance with applicable rules and regulations.

CONCLUSIONS/RECOMMENDATIONS

Cambridge seems to be well aware of the potential safety and health hazards common to their operations. They have taken measures to employ engineering, monitoring, work practice, and personal protective equipment controls throughout their facilities and operations. In a more favorable economic environment they would probably direct more resources towards better controls. They would probably cooperate, if it is decided that an in-depth evaluation is desired of some of the controls they now have in place.

Unless better examples are identified during subsequent surveys the following Cambridge controls warrant in-depth evaluation:

1. Downdraft local exhaust systems at glaze application stations.

2. Closed tube conveyor system.

3. "Air Hat" respirator.

4. Air driven ball vibrator.

5. Substitution and use of less toxic talc and glaze silicates.

6. Medical program.