PRELIMINARY SITE SURVEY REPORT ON FRIT BAGGING OPERATION

AT

Chi-Vit Corporation
Urbana, Ohio

SURVEY CONDUCTED BY:
Thomas C. Cooper
C. K. Wang

DATE OF SURVEY:
June 16, 1982

REPORT WRITTEN BY:
Thomas C. Cooper

DATE OF REPORT:
July 1982

REPORT NO.:
ECTB 112-17a

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 perform a preliminary survey of the Frit Bagging and Materials Handling operations at Chi-Vit Corportation.

PLANT ADDRESS: Chi-Vit Corporation
720 South Edgewood Avenue
Urbana, Ohio 43078

EMPLOYER REPRESENTATIVES CONTACTED: Jim Rinker, General Manager; and David S. Cameron, Director of Environmental Affairs and Safety at Chi-Vit. Earlier contact was made with John B. Wade, Director of Environmental Affairs and Safety, Eagle Picher Industries, Inc. (parent company).

EMPLOYEE REPRESENTATIVES CONTACTED: None

STANDARD INDUSTRIAL CLASSIFICATION CODE: SCI Code 3229, Borosilicate glass in flake form.

ANALYTICAL WORK PERFORMED BY: None.

ABSTRACT

A preliminary survey was conducted at Chi-Vit Frit manufacturing operation near Urbana, Ohio in conjunction with a NIOSH study evaluating measures used to control occupational health hazards associated with the packaging processes used for dry chemicals. A large number of workers in a variety of industries are involved in the packaging process. The company has several engineering controls (bag opening and empty bag disposal practices, ventilation at each batching bin, and location of the dump car tunnel) considered to be exemplary. An in-depth study at this operation is recommended.

I. INTRODUCTION

The Engineering Control Technology Branch of the Division of Physical Sciences and Engineering, NIOSH, is conducting a research study to assess and document the exemplary technology available for the control of airborne dust in dry chemical bagging, filling, and opening operations. The control technology studies will be described in sufficient detail to allow the information to be used to prevent or reduce the generation and transmission of the dust in similar industrial operations. The results of the assessment will be disseminated in a manner that will maximize the application of demonstrated control technologies in the workplace.

A survey of the solids material handling operations was conducted to determine the suitability of this plant for an in-depth study. Engineering control technology observed included: engineering controls, work practices, and personal protective equipment. Chi-Vit has exemplary controls, especially in the bag opening and emptying operations, and is recommended for an in-depth study.

II. PLANT DESCRIPTION

Chi-Vit (Chicago Vitreous) is a subsidary of Eagle Picher (corporate headquarters in Cincinnati, Ohio). The company's Urbana, Ohio operation produces over 100 varieties of frits. (Frit is the basic material for porcelain enamel used in major appliance finishes.) The plant, a medium size operation, is located in a rural farming area near Urbana and has been in production since 1966. The complex consist of two buildings; research and development lab, and manufacturing. The survey was limited to the manufacturing building. This building is a 30 to 50 feet high open structure (steel frame and metal sides) with a concrete floor, no basement, and 66,000 square feet of floor space (26,000 for storage and 40,000 for manufacturing), Figure 1.

Chi-Vit, a non-union plant, operates 3 shifts a day, 5 days a week. All finished product (frit) is shipped in 100 pound bags. The average work force consist of 60 to 65 employees, including salaried. A two man crew, one for bag emptying and one for bag filling, operates each shift. A third man, materials handler, runs the fork lift to move the pallet loads of material to and from storage.

III. PROCESS DESCRIPTION

Soda ash, borax, and silica flour (minus 200 to minus 400 mesh) are the three main ingredients used to produce frit. Small amounts of inorganic metal oxides and/or carbonates (such as cobalt, nickle, manganese, and copper but no lead) are used to give the frit various properties such as hardness and color. A majority of these raw materials arrive by truck and in bags, a lesser amount arriving in fiber drums. At present, only borax is received in bulk (by railroad hopper car) but the company plans on installing bulk receiving systems for silica and soda ash. To move bulk materials within the plant, tote bins, semi-bulk bags, and fiber drums are used.

In the manufacturing area, four basic operations (batching, mixing, smelting, bagging) take place, Figure 2. The batching area consist of seven stations in a straight line, approximately ten feet between stations where the bags are opened and the mixes weighed, Figure 3. Each station consist of a bottom dump bin (2 ft. by 3 ft. by 3 ft. deep) attached to a scale and fitted with exhaust ventilation. Beneath the main floor and under these stations is a tunnel in which a remote control "dump car" travels. Bags of raw material are set on a waist high table at each bin, cut open, and dumped. Other materials are added by shovel to each batch. When the desires batches are weighed out, the "dump car" is postioned under the bin's doors to receive the mix. The "dump car" may go to one or more stations before moving to the mixing area.

The "dump cars" are hoisted approximately 20 feet from the tunnel to the tops of the mixers. These cars bottom dump into the mixer and the mixer hatch is closed. The batch is mixed for an hour and then discharged through water cooled screw conveyors into a smelter. Each gas fired smelter melts the mixes and discharge the melt as a continuous flow onto water-cooled rollers. The rollers produce a thin (1/16 to 1/8 inch) glass sheet 2 to 3 feet wide. As this hot sheet is dropping vertically below the main floor level, cool water sprays factures it. The particles drop through a minus 3/8 inch vibrating screen onto a vibrating conveyor. The frit is conveyed a short horizontal distance, under a series of exhaust hoods, to a vertical bucket-type conveyor which discharges into the bagging hopper.

There are three manual packaging stations, all similar in design, Figure 4. The packers are gravity flow, spout-type units custom made and assembled by several contractors for the company. The frit drops from the packer hopper, through a slide gate, into the packer spout, and into the bag. The bag sets on a weight activated bag seat which closes the slide gate when the bag is filled. As the bag fills, the operator takes a grab sample of the product stream flowing from the slide gate to the packer spout. He also places the next bag to be filled on the air inflater spout. (Shop air is used to inflate each bag before placing the bag on the packer spout and filling with frit.) He removes the frit filled bag, checks its weight, hand tucks the valve, and palletizes the bag. The bags being filled are 3 ply (paper-plastic-paper) hand tuck valve bags manufactured by International Paper Company on New York, New York.

IV. DESCRIPTION OF PROGRAMS

All new employees are required to have a pre-employment physical. Except for an annual hearing evaluation, no physicals are required during employment or upon termination of employment. Medical facilities are in nearby Urbana and first-aid kits are available at the plant. Also, first-aid training is provided by the company. On-the-job training is provided by the foremen (men who have worked their way up through the ranks). Weekly safety tours (supervisor and one hourly employee from each of the three departments) and meetings are standard practice. Hard hats are the only mandatory personal protective equipment required. Safety glasses, safety shoes, ear protection, and other protective gear are available and employees are encouraged to use them. The company's housekeeping is done on a routine basis. One month each year, the company closes down for complete maintenance.

V. SAMPLE DATA FROM PRELIMINARY PLANT SURVEY

No samples were taken during the survey.

VI. DESCRIPTION OF CONTROL STRATEGY

Ventilation is used throughout the operation. In the Batching Area, each weigh bin is equipped with exhaust ventilation. These covered bins have a small opening, waist high, through which bags or shovel fulls of raw material are added. For the silica flour bin, this opening is half the size (approximately 3 feet wide by 1 foot high) of the other bin openings thereby increasing the capture velocity at the hood face. The operator opens the ventilation blast gates only to the bins being used at the time.

Between the smelter and bagger, the frit is moved by a vibrating conveyor located in an (4 feet wide by 20 feet long by 6 feet deep) open pit. The last half of tnis conveyor passes under three exhaust hoods to remove airborne dust.

At the packer unit, a small (approximately one foot square opening) capture hood is located above the packer spout, Figure 5. This hood removes airborne dust generated as the material falls from the slide gate to the packer spout.

Exemplary bag disposal techniques in the Batching Area were observed. Bags, emptied of their raw materials, were loosely (without compacting) placed into large plastic bags. These plastic bags were hand tied shut and later disposed of by burying.

VIII. CONCLUSIONS AND RECOMMENDATIONS

The company has exemplary controls in the Batching area. These include ventilation at each batching bin, the design of the dump car tunnel, and work practices in bag disposal. Other engineering controls worth noting are ventilation at the packer and along the conveyor between the smelter and packer hopper. The company continues to make improvements to reduce dust exposures in the worker's environment.

It is recommended that an in-depth survey be conducted at this plant.

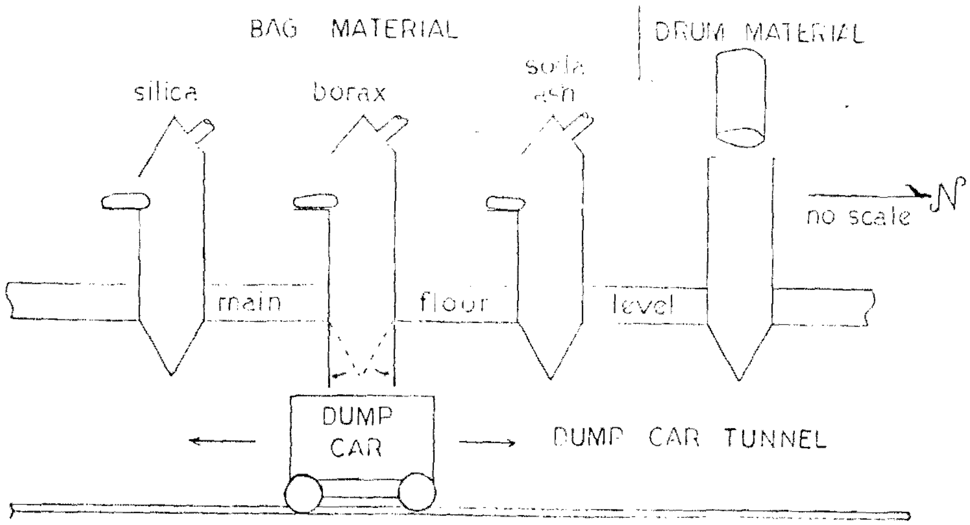

FIGURE 3. BATCHING AREA

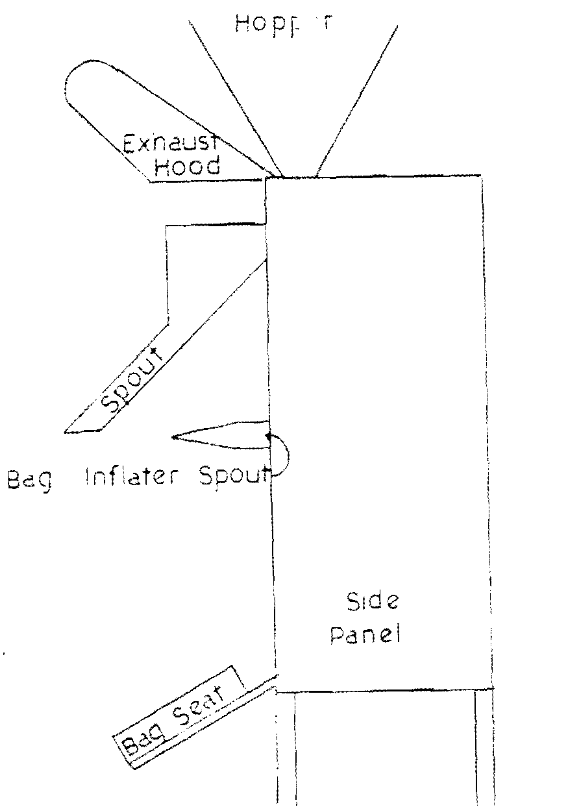

FIGURE 4. PACKER

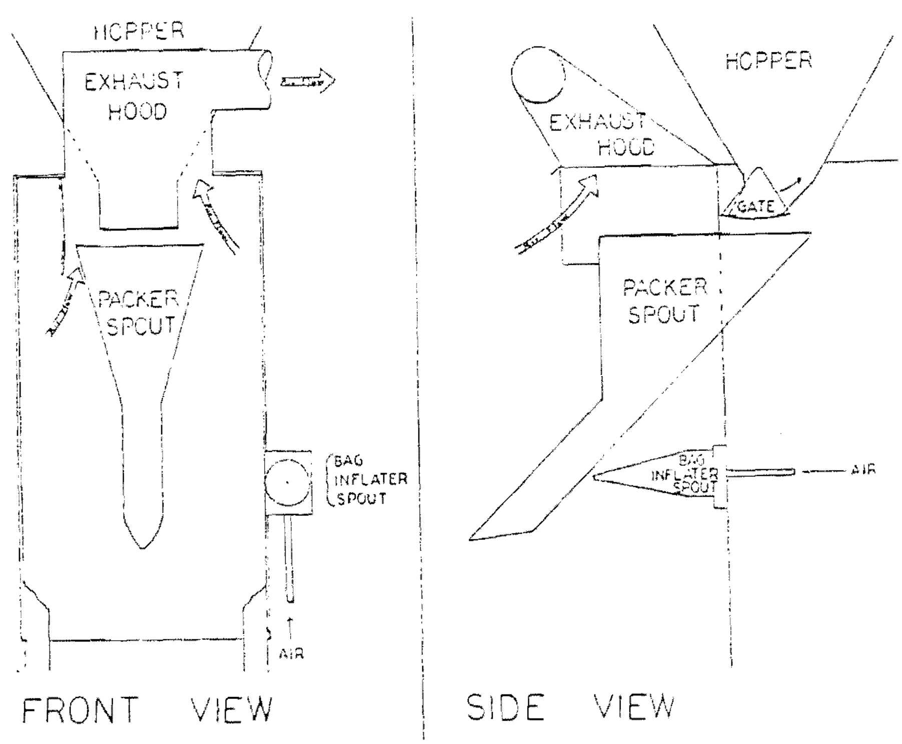

FIGURE 5. SPOUT DETAIL

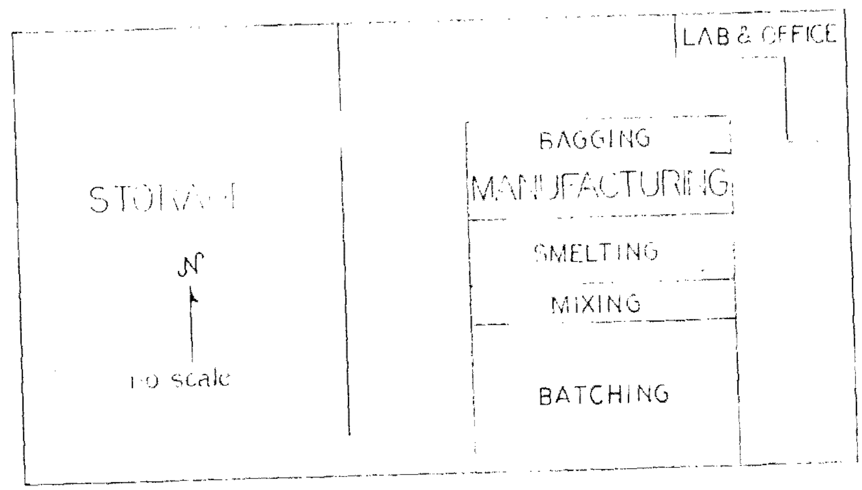

FIGURE 1. GENERAL PLANT AREA

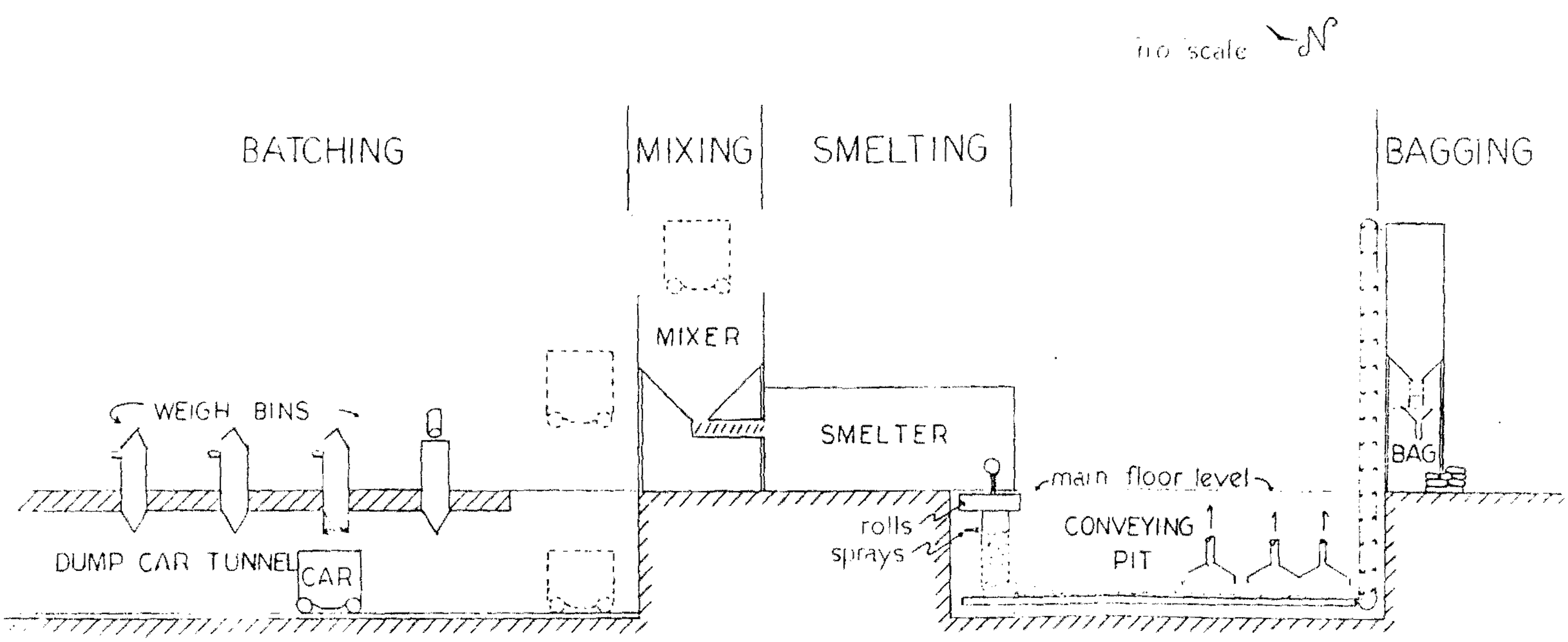

FIGURE 2. MANUFACTURING AREA