PRELIMINARY SURVEY REPORT:

CONTROL TECHNOLOGY FOR FILLING OF CONTAINERS

AT

Central Soya
Marion, Ohio

REPORT WRITTEN BY:
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REPORT DATE:
March 1986

REPORT NO.:
155-14a

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:	Central Soya 751 East Farming Marion, Ohio 43302 (614) 383-1181
SIC CODE:	2075
SURVEY DATE:	December 17, 1985
SURVEY CONDUCTED BY:	Thomas C. Cooper
EMPLOYER REPRESENTATIVES CONTACTED:	Dave McPherson, Maintenance Supervisor Dewey Fittro, Personnel Manager
EMPLOYEE REPRESENTATIVES CONTACTED:	Donal Shields, Union Steward (Not contacted during the survey due to the shortness of the visit.)*

* Report to be sent to Donald Shields, Union Steward, 1939 Weiss Avenue, Marion, Ohio.

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 plant was visited as part of a study of dust control during the loading of bulk dry materials into open and closed containers including trucks and railroad cars. The study will evaluate the effectiveness of various control technologies designed to reduce dust exposures to personnel in the bulk loading area. Ultimately, this project will result in a proposed journal article describing the effectiveness of such controls.

II. PLANT AND PROCESS DESCRIPTION

PLANT DESCRIPTION

The Central Soya facility is located on a 25-acre site in the suburbs of Marion, Ohio. Corporate headquarters are in Fort Wayne, Indiana. The main products at Marion operation are bean oil and meal, and lecithin processed from soybeans. Also at this location, animal feeds are manufactured and corn is merchandised. This union plant (Teamsters Union Local 957) of 96 employees has operated in Marion since the 1800's.

The bulk loading station is a three-sided metal building which can house a railroad hopper car or truck. The operator controls the loading station from an enclosed room located 20 feet above the ground and in the middle of the north side of the station. The loading spout is located in the center of the building and is designed to fill open and closed trucks or railroad hopper cars at a rate of 3-1/2 to 4 tons per minute. During the site visit, both open and closed trucks were being filled.

PROCESS DESCRIPTION

The processing of soybeans consists of drying to 12% of moisture content, cracking to separate the hulls from the meat, and steam cooking the hulls for eventual use as an animal-feed ingredient. The meat is passed through a set of rollers, producing a flake. The flake then enters a vessel, called an extractor, in which hexane is used to remove the oil from the flake. The flake is then dried to yield a protein ingredient (meal) for use in livestock feed. The hexane gas is recovered from the oil and reused in the process. The soybean oil is sold in bulk form.

The primary purpose of the preliminary trip was to observe the company's bulk loading spout during the loading of hulls (millfeed) and meal into a truck. The loading procedure for trucks follows: The truck passes through the east doors and stops beneath the loading spout. From his control booth, the operator closes the east doors, lowers the spout into position, and starts filling the truck. The truck driver usually remains in the cab of the truck during filling. The operator signals the driver of the truck to pull forward a few feet at a time until the truck is filled. For hopper trucks, the operator fills a compartment, raises the spout, signals the truck to move forward, repositions the spout into the next comparment, and resumes filling. Closed van trucks are loaded through hatches in the top of the trailers. The loaded truck exits the open west end of the building. The entire loading operation is automated, controlled by one operator from the enclosed booth.

POTENTIAL HAZARDS

The potential hazards are the hexane solvent (used in processing of the meat of soybeans) and nuisance dust from the meal and millfeed.

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 are discussed below.

ENGINEERING CONTROLS

The engineering controls at the bulk fiber loading station includes DCL's (Dust Control and Loading System) Model 24-10 loading spout equipped with ten feet of vertical travel, north-south travel, and exhaust ventilation. The loading spout system is completely automated and is controlled by one operator from an enclosed control booth. This enclosed booth reduces the operator's exposure to airborne dust generated during loading operations, especially of open trucks. The bulk loading building is enclosed on three sides, two walls and doors at the east end. With these doors closed during loading operations, most of the airborne dust generated is contained within the building thereby reducing dust emissions to the outside environment.

WORK PRACTICES

During loading operations, the east doors to the bulk loading station are normally closed. The truck drivers usually remain in the cabs of their truck, moving it forward on a signal from the loading operator.

MONITORING

Gas sensors are used for hexane gas in the soybean processing area.

PERSONAL PROTECTION

Personal protective gear required are safety glasses with side shields, hard hats, and safety shoes. Disposable respirators, 3M's 8500 and 8710, are required in certain areas and are available to any employee wanting one. In areas having excessive noise levels, a variety of hearing protectors are available, such as Air Soft Plug AS-1, EAR disposable plug, Qui-it disposable plugs, and Wilson Sound Band Model 10.

OTHER UNIQUE PRACTICES

The company has an extensive safety program including regular safety tours, training programs, and annual noise level checks throughout the plant. They believe in involving the employee to make him safety conscious.

OTHER OBSERVATIONS

Two types of trucks were being loaded; open container and closed hopper with square hatches. The loading spout was designed to load closed containers, railcars and trucks with round hatches. During the loading of the open trucks, the product initially free falls 3 to 5 feet from the spout to the truck bed. As the truck fills, it moves forward a few feet with the spout dropping the product approximately a foot onto product in the truck thus reducing dust emissions. Visible dust emissions are noticeably greater during the filling of open trucks than that for closed trucks.

During the loading of enclosed hopper trucks, even though the hatches were square and 50% greater in cross section than the round spout, the exhaust ventilation was sufficient to contain most of the airborne dust generated during loading. This was possible because the spout extended a few inches into the open hatch.

Central Soya recently installed this DCL loading system which was an improvement over their old system. The old system consisted of a screw conveyor discharging into a nonventilated spout which had to be manually lowered into position. The new loading system, completely automated by remote control and having a greater loading rate, resulted in a reduction of airborne dust escaping during loading operations. As a result, housekeeping was reduced, less finished product was lost during loading, and the work area was much cleaner.

IV. CONCLUSIONS AND RECOMMENDATIONS

The company reports that DCL's Model 24-10 loading spout system did reduce dust emissions over their older loading system. The system was also observed to be somewhat effective in controlling dust for other applications such as loading open trucks. DCL does have available a skirt that fits around the spout and is suppose to further reduce dust emissions during the filling of open trucks. However, such a skirt may interfere during the filling of closed hopper trucks and railroad cars. The company reports the system to be relatively maintenance free and reliable. An in-depth study at this operation would provide useful information on the loading spout as it is used to fill open and closed trucks and railroad cars.