PB84-180983

WALK-THROUGH SURVEY REPORT:

CONTROL TECHNOLOGY FOR SOLID MATERIALS HANDLING

AT

Bethlehem Steel Corporation
Steelton Plant
Steelton, Pennsylvania

REPORT WRITTEN BY:

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REPORT DATE:

April 15, 1983

REPORT NO.:

144-12

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
Division of Physical Sciences and Engineering
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Cincinnati, Ohio 45226

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

REPORT DOCUMENTATION PAGE	1. REPORT NO. PB84 180983	2.	3. Recipient's Accession No. 00133549

4. Title and Subtitle
Walk-Through Survey Report, Control Technology for Solid Materials Handling, Bethlehem Steel Corp., Steelton Plant, Steelton, Pennsylvania

5. Report Date

6.

7. Author(s)
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8. Performing Organization Rept. No.

9. Performing Organization Name and Address
Division of Physical Sciences and Engineering, NIOSH, Cincinnati, Ohio

10. Project/Task/Work Unit No.
CT 144-12

11. Contract(C) or Grant(G) No.
(C)
(G)

12. Sponsoring Organization Name and Address

13. Type of Report & Period Covered

14.

15. Supplementary Notes

16. Abstract (Limit: 200 words)

A control technology survey was conducted at Bethlehem Steel Corporation's Steelton facility (SIC-3295) in Steelton, Pennsylvania, on April 15, 1983. The facility's dust control operations during bag opening, dumping, and disposal were examined. The facility employed 125 workers. An automatic bag opener with separate bag compacter was used to empty bags of silica (14808607), flour, fine clay, bentonite (1302789), and cereal binders in various molding sand formulations. Bag opening, emptying, and disposal involved potential respiratory and dermal exposures to settled dust and the contents of the bags. After the bags entered the bag opening machine, the workers were isolated from dust generation. The opening and compacting operations were conducted in a completely enclosed area and a small bag house air cleaner was mounted on top of the bag opener's inlet. Workers opened the bags carefully. Periodic air sampling was performed with an average respirable dust concentration of about 0.5 milligrams per cubic meter. Workers received safety training before beginning operation of the bag opener and personal protection items were required including safety glasses and shoes.

17. Document Analysis a. Descriptors

b. Identifiers/Open-Ended Terms
NIOSH-Publication, NIOSH-Author, Control-technology, Steel-industry, Occupational-hazards, Industrial-hazards, Skin-irritants, Lung-irritants, Safety-education, Safety-practices

c. COSATI Field/Group

18. Availability Statement:	19. Security Class (This Report)	21. No. of Pages 7
	20. Security Class (This Page)	22. Price

(See ANSI-Z39.18) See Instructions on Reverse OPTIONAL FORM 272 (4-77) (Formerly NTIS-35) Department of Commerce

PLANT SURVEYED:	Bethlehem Steel Foundry Steelton Plant Front and Swatara Streets Steelton, Pennsylvania 17113
SIC CODE:	3324
SURVEY DATE:	April 6-7, 1983
SURVEY CONDUCTED BY:	William A. Heitbrink William N. McKinnery, Jr.
EMPLOYER REPRESENTATIVES CONTACTED:	Mr. James Litrides, Environmental Health Engineer Phone - 717/986-2398 Mr. E. H. Kauffman, Steel Foundry Superintendent
EMPLOYEE REPRESENTATIVES CONTACTED:	Mr. Anthony Kelly Mr. James Roberts, Shop Stewards; United Steel Workers of America Local 1688

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 bag opening, dumping, and disposal. Significant dust exposures can occur during these operations. Although dust can be controlled during bag opening and dumping, bag disposal is a significant source of worker exposure. Ultimately this project will result in a concise 10-15 page report describing dust control techniques during bag opening, emptying, and disposal. This report should provide valuable information for those who are responsible for controlling the workers' dust exposure.

II. PLANT AND PROCESS DESCRIPTION

Plant Description:

This foundry is part of Bethlehem Steel Company's Steelton Plant. Typically, this foundry employs 200 workers. Because of reduced production, only 125 workers are now employed. This plant produces a variety of steel castings for the railroad industry and for Bethlehem's own industrial operations. The plant first operated in the late 1800's and made the first steel railroad rails produced in the United States.

A Taunton automatic bag opener was reviewed. This Taunton Engineering Co. Model RTS 100 automatic bag opener with separate bag compactor was used to empty bags of silica flour, fine clay, bentonite, and cereal binders into various molding sand formulations. The opener is located on a separate mezzannine above the floor of the foundry, near the mullers used to mix the ingredients for the molds.

The operation of the equipment is as follows:

1. The worker sets the bag on the conveyor.

2. The conveyor takes the bag up a conveyor to the opener's mouth.

3. A conveyor in the opener transports the bag under a set of circular blades which open the bags.

4. The conveyor dumps the slit bags into a rotating cylindrical screen which separates the bags from the powdered material.

5 The powdered material is fed into a pneumatic transportation system which feeds the muller.

6. The empty bags drop into a compactor which stuffs the bags into lengths of plastic tubing which are periodically tied-off.

Potential Hazards:

Bag opening, emptying and disposal involves respiratory and dermal exposures to settled dust and the contents of the bags. The potential dermal exposure occurs when the worker places bags on the conveyor and shovels material into the "chute" for the muller.

There are several potential respiratory exposures to dust during this operation:

1. Handling full bags outside of the enclosure. These bags are frequently coated with settled dust. Placing the bags on the conveyor belt creates puffs of dust which have the potential of entering the workers breathing zone.

2. Shovelling powdered material into the chute below the mixer.

3. Accidental bag breakage outside the enclosure.

4. Bag opening, dumping and disposal. This creates dust which the RTS 100 was designed to control by partial enclosure and local exhaust ventilation. As a partial enclosure, the device is very close to a complete enclosure. The plastic tube could potentially rupture. However, this does not appear to be a problem.

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 RTS 100 and its compactor are an example of equipment selection which minimize worker dust exposure. After the bags enter the bag opening machine, the workers are isolated from dust generation. The RTS 100 and its compactor perform bag opening, emptying and disposal in an almost complete enclosure.

A small bag-house air cleaner was mounted on top of the bag opener's inlet. It had a design air flow of 500 cfm and it discharges the air back into the workplace.

Work Practices:

The worker handles the bags carefully.

Monitoring:

Periodically, air sampling is performed on the worker by the environmental engineer. He typically finds that the total dust concentration is 1-2 mg/M^3, and the respirable dust concentration is about 0.5 mg/M^3. This appears to be consistent with background dust concentrations.

Personal Protection:

All personnel in the plant are required to wear hard hats, safety glasses with side shields, and safety shoes with metatarsal protection. Respiratory protection is available upon employee request.

Other Unique Practices:

The workers receive an initial job safety training upon entering the plant. They receive additional training for each job that they perform.

Other Observations:

The company found that the bag opener's entry, as supplied by the manufacturer, was inadequate. It leaked some dust ladden air. Therefore, they added an entry enclosure which was a 2.5 feet long by 2.5 feet wide and 3 feet high. The entry consists of a hinged door which covers the top 18 inches of the entry. Rubber strips are suspended from this door to the top of the conveyor.

Conclusion:

The Taunton Engineering Company's RTS 100 bag opener appears to be a very effective dust control. Because this is based solely on observations, this equipment should be studied further.