CDC
Workplace Safety and Health
National Institute for Occupational Safety and Health
HAZARD CONTROLS

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Dust Protection for Bag Stackers

Bag stackers who use semi-automated palletizing machines and air slides may be exposed to high concentrations of dust. To reduce dust exposure, use an exhaust ventilation system in conjunction with an envelope of clean air over the bagstacker provided by an overhead air supply.

Description of Hazard

Mineral processing plants in the United States and throughout the world process material that is finely ground and placed into bags for shipping to the consumer. These bags normally range from 50 to 100 pounds in weight. Once the material is placed in these bags, a bag stacker loads the bags onto pallets. A bag stacker is exposed to a lot of dust that is mainly released by the force from loading the bag onto the pallet. The two main sources are the dust on the outside of the bag and the dust that escapes from inside the bag as it is loaded. The Mine Safety and Health Administration's (MSHA) records indicate the bag stacker's dust exposure is one of the highest of all workers at mineral processing operations.

Ways to reduce the dust exposure and strain to the bag stacker are in constant development. Recently, automated systems have been built. These systems range from fully automated, which totally remove the worker from the bag-stacking process, to semi-automated systems, in which the bag stacker still performs some of the functions.

This Hazard Control deals with controlling the bag stacker's dust exposure during use of a semi-automated palletizing machine. The worker slides the bags into position on the palletizing machine. Once an entire layer of bags is positioned, the bag stacker operates the controls on the palletizing machine to lower the layer of bags onto the pallet. An air slide is built into the semi-automated palletizing machine so the bags are easier to move. This slide uses a metal table with air jets that exit through small holes at high velocities, similar to an air hockey game. The dust problem occurs because the air slide causes dust to blow up onto the bag stacker, significantly increasing the dust exposure.

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Case Study

NIOSH researchers became aware of this problem while working at a mineral processing operation that was having problems with a bag stacker who was overexposed to dust. The air slide on the semi-automated palletizing unit was determined to be the main cause for the high dust concentrations. The impact of the air slide on the bag stacker's dust exposure was found by using real-time dust monitors. Figure 1 shows the bag stacker's average respirable dust exposure while working with product bags of three different mesh sizes when the air slide was either on or off. The bag stacker's respirable dust exposure was 5 to 11 times higher when the air slide was on compared with when it was off.

This mineral processing operation used an exhaust ventilation system with an exhaust hood at the back of the palletizing unit. The exhaust ventilation system was not powerful enough to immediately capture the dust blown up from the air slide. An overhead air supply island system (OASIS) was also used to provide an envelope of clean air over the bag stacker. The OASIS at this operation brings in outside air through two different filter stages and directs the clean air down over the bag stacker. This envelope of clean air was not powerful enough to overcome the dust that was being blown up into the bag stacker's breathing zone from the air slide.

The key to lowering the bag stacker's dust exposure to MSHA-acceptable concentrations was to make a few simple changes and to slightly modify the bag stacker's work habits. The bag stacker had been leaning out over the air slide table and placing his upper torso in the front part of the exhaust ventilation system capture hood. Therefore, NIOSH researchers suggested that the exhaust hood be modified to make it physically impossible for the bag stacker to place his or her upper torso into the hood (Figure 2). The next modification involved installing plastic stripping around the perimeter of the OASIS. The plastic stripping gave the bag stacker a physical indication of the clean air boundary provided by the OASIS.

Testing was repeated after the changes were made to the semi-automated palletizing system. This time, the testing showed that the changes to the system had minimized the impact of air slide contamination to the bag stacker. Once again, three product sizes of mesh bags were evaluated. No increase was found in the bag stacker's dust exposure with two of the products, and only a very slight increase was found with the other product. The changes made to the bag palletizing process accounted for the reductions of the bag stacker's respirable dust exposure to MSHA-acceptable dust concentrations.

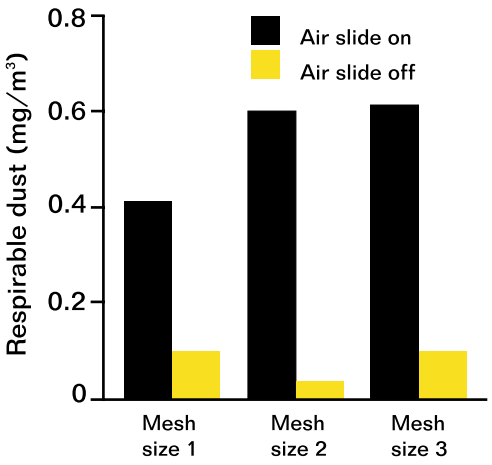

Figure 1. Comparison of bag stacker's respirable dust exposure when air slide was and was not operating on palletizing machine.

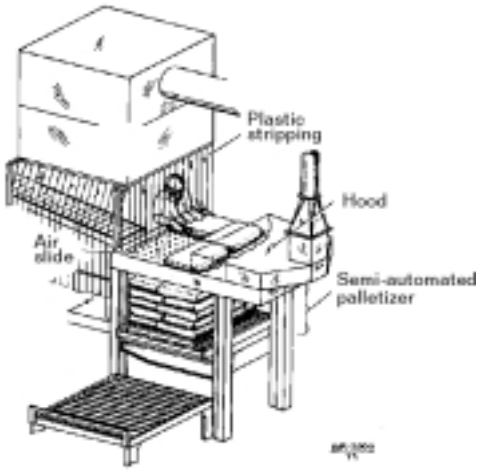

Figure 2. Semi-automated palletizing machine modified to protect bag stacker.

Controls

NIOSH researchers believe that all operators using this type of semi-automated palletizing system need to be aware of the serious dust contamination that can occur to the bag stacker from the air slide. To control high dust exposures from air slides on semi-automated palletizing units (Figure 3), make the following modifications:

- Use an exhaust ventilation system with an effective hood design to capture the dust generated during the bag stacking process.
- Use an OASIS to provide an envelope of clean air over the bag stacker.
- Place plastic stripping around the OASIS to provide a boundary of the clean air from the system.

Figure 3. Photograph of modified semi-automated palletizing machine

- Modify the bag stacker's work practices to have the worker stay within the envelope of clean air provided by the OASIS.

Acknowledgments

The principal contributor to this Hazard Control was Andrew B. Cecala.

For more information

NIOSH research on bag machine operators and bag stackers has recently been published: Cecala A, Zimmer J, Smith B, and Viles S [2000]. Improved dust control for bag handlers. Rock Products (4) 2000:46–49.

NIOSH is the Federal agency responsible for conducting research and making recommendations for preventing work-related illnesses and injuries. All Hazard Controls are based on research studies that show how worker exposures to hazardous agents or activities can be significantly reduced.

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