



Technology News

From the Bureau of Mines, United States Department of the Interior



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No. 447, March 1995

Dust Collector Discharge Shroud Reduces Dust Exposure to Drill Operators at Surface Coal Mines

Objective

To reduce airborne respirable dust generated from emptying dry dust collectors on small truck-mounted drills used at surface coal mines.

Background

Exposure to crystalline silica dust during rock drilling can cause respiratory disease. The U.S. National Institute for Occupational Safety and Health (NIOSH) recently issued a NIOSH Alert, "Request for Assistance in Preventing Silicosis and Deaths in Rock Drillers" (DHHS (NIOSH) 92-107). In this report, NIOSH documents numerous cases of acute, accelerated, and chronic silicosis in surface mine drill operators. The workers affected are as young as 25 years old, and many are only in their 30's. NIOSH concluded that the disease stems from inadequate dust controls on many small mobile rock drills.

In response to this NIOSH Alert, the U.S. Bureau of Mines (USBM) conducted dust surveys at small surface mine drilling operations. Most of the drills were truck-mounted and used dry dust collection systems. In the immediate drill vicinity, respirable dust concentrations ranged from 0.1 to 133.8 mg/m³ and averaged 21.3 mg/m³. The crystalline quartz content in the respirable dust samples analyzed was found to be significant, usually higher than 10%. A contributing factor to these hazardous dust levels is the cleaning of dry dust collectors after drilling every few holes. The most common dust collection system used on small truck-mounted drills is a

Rotoclone¹ dust collector. Hoppers are used to retain the dust removed by the Rotoclone and must periodically be cleaned by manual emptying. A trap door is opened on the bottom of each hopper, allowing the material to fall to the ground a distance of 0.9 to 1.2 m (3 to 4 ft) (see figure 1). The impact of the material and subsequent dispersion by wind creates significant airborne dust exposure. The drill operator often stands in the dust cloud to bang the side of the hopper with a hammer to loosen the packed cuttings stuck inside the hopper.

Approach

A control measure developed by the USBM to address this dust generation problem is a barrier or shroud placed around the hopper discharge doors extending to the ground. This shroud confines the dust collector fines during dumping to an enclosed space, thus reducing airborne dust entrainment into the surrounding worker environment. Although this dust control technique was developed by the USBM for surface mine rock drills, it can be universally applied to many mobile rock drills operating in the construction industry as well.

Results

Figure 2 shows the temporary installation of a shroud around the hopper doors to measure respirable dust reduction. The shroud consisted of brattice material and was mounted by large magnets for easy installation and removal during testing. Two flaps were cut in the shroud

¹Reference to specific products does not imply endorsement by the U.S. Bureau of Mines.

to allow the operator access to the hopper doors for opening and closing. Average airborne respirable dust concentrations during the dump cycle were lowered around the hopper discharge point from 25.4 mg/m³ to 4.9 mg/m³ when using the shroud, *reflecting a dust reduction of 81%*. Any dust present while using the shroud was attributed primarily to leakage at the open vertical seam in the shroud during testing. A more permanent installation would have a sealed seam and would be expected to provide even better respirable dust control.

For More Information

Further details about these USBM research results may be obtained by contacting the principal investigators, John A. Organiscak (phone: 412/892-6675) or Steven J. Page (phone: 412/892-6669), at the U.S. Bureau of Mines,

Pittsburgh Research Center, Cochrans Mill Rd., P.O. Box 18070, Pittsburgh, PA 15236-0070 (fax: 412/892-4259). Technology News Nos. 286, 308, 338, and 440 provide additional information on techniques to control respirable dust emissions from highwall drills. Single copies may be obtained free of charge from the principal investigators.

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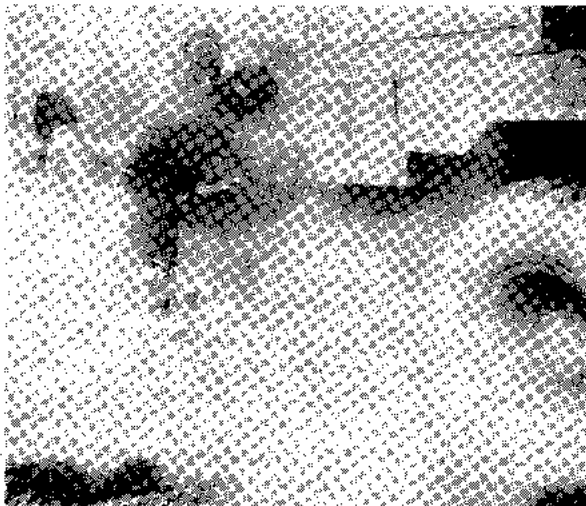


Figure 1.—Dust generated from emptying a dry dust collector on a surface drill.



Figure 2.—Shrouding the dust collector to reduce respirable dust exposure to drill operators.