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Acoustic Enclosure to Reduce Noise From Vibrating Screen Mechanism Housings

Objective

To reduce operator exposure to noise from vibrating screens at coal preparation plants.

Background

Hearing loss is one of the most common occupational illnesses in the United States. In the U.S. mining industry, hearing loss is 2.5 to 3 times greater than what is expected for the average population that is not exposed to occupational noise. Furthermore, studies by the National Institute for Occupational Safety and Health (NIOSH) showed that by age 50, 90% of coal miners have a hearing impairment versus only 10% of the population that is not exposed to occupational noise. A NIOSH cross-sectional survey of coal preparation plants showed that 43.5% of employees were overexposed to noise. The study also found that vibrating screens were one of the top five loudest types of equipment at these plants—as well as the most numerous—making them a key noise source to address.

Approach

A team of NIOSH researchers, in partnership with Conn-Weld Industries, Inc., conducted noise source identification studies on a Conn-Weld G-Master 1000 dewatering vibrating screen. They determined that, above 1 kHz, the mechanism housings are the main noise sources. A common technique to control noise from a source to a receiver—in this case, the operator's ear—is to block the noise from the source with an acoustic enclosure. NIOSH has developed such an enclosure to surround the mechanism housings, thereby reducing the noise that reaches the operator's ear.

The enclosure is a modular design with components that can be hand-carried and installed on any Conn-Weld G-Master 1000 vibrating screen, including retrofits. This design can also be modified to adapt to other sizes or types of vibrating screens. It consists of a steel frame (Figure 1), which provides a stiff structure, and panels that enclose the noise source. The panels act as a barrier to block the noise from reaching the operator. A layer of acoustic foam lining the panels on the inside of the enclosure absorb a portion of the noise. In addition, the frame-and-panel design allows easy access to service ports on the mechanism housings or removal of a mechanism altogether, without disassembling the entire enclosure (Figures 2–3).

Figure 1.—Steel frame for the acoustic enclosure installed on a Conn-Weld G-Master 1000 vibrating screen.

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Figure 2.—Panels can be easily removed for mechanism housing maintenance.

Figure 3.—Completed mechanism enclosure.

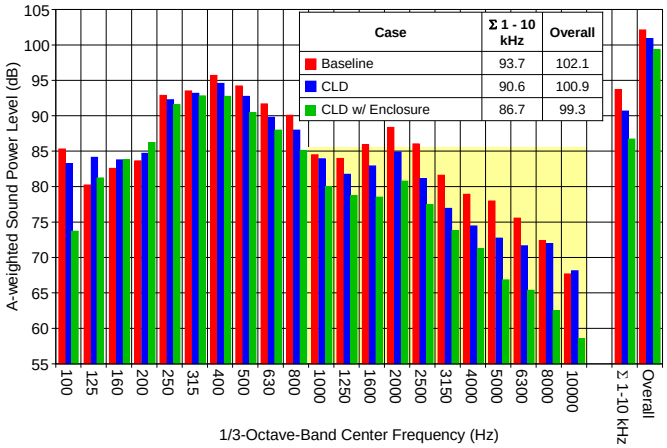

Figure 4.—Sound power level data show an improvement over the CLD configuration of up to 4 dB in the 1- to 10-kHz frequency range with a damped steel-paneled enclosure.

Results

Four different panel materials were tested with the steel enclosure frame. The best results were achieved with an enclosure made with damped steel panels. Laboratory testing in the NIOSH hemi-anechoic chamber showed that the enclosure with damped steel panels reduces the sound power transmitted by the vibrating screen by up to 2 dB(A), per ISO 3744. In the frequency range for which the enclosure was designed (1.0–10 kHz), the damped steel panels reduce levels by 4 dB (Figure 4) compared to the baseline configuration with constrained layer damping (CLD) treatments on the mechanism housings.

For More Information

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