Noise Reduction Project at a Silica Sand Mine Processing Facility

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What is Noise
Noise Induced Hearing Loss

- What is it?
- Prevalence
- Why should you care?

Source: https://www.cdc.gov/vitalsigns/hearingloss/infographic.html
30 CFR part 62 Occupational Noise Exposure

- Noise Exposure Assessments (62.110)
  - Action Level (62.120)
  - Permissible Exposure Level (62.130)
  - Hearing Conservation Program (62.150)
  - Hearing Protectors (62.160)
  - Audiometric Testing (62.170)
  - Training (62.180)
  - Record Keeping (62.190)
### TABLE 16.3
Comparison of U.S. hearing conservation regulations, interpretations, and recommendations.

The table is provided to permit a quick comparison of the hearing conservation requirements of U.S. general industry (OSHA, 1983a), mining (MSHA, 1999), and recommendations of the NIOSH (1998) Criteria for a Recommended Standard: Occupational Noise Exposure. The OSHA regulation appears in its entirety in Appendix I of this text. The MSHA regulation is not included because it is so new (as of this printing) that it may yet be challenged in court. Please note following conditions for use of this table.

1. The MSHA regulation was published September 13, 1999 with an effective date of September 13, 2000. This table is current as of spring 2000 but litigation could cause changes before implementation. Check with MSHA (see web address below) for latest status.
2. The Criteria Document is a NIOSH recommendation, not a compliance document, but can be construed as a "best practices" guide.
3. Recordable or reportable hearing loss is addressed under OSHA in 29 CFR 1904, and directly in the MSHA rule.

This analysis is not intended to be all-inclusive; please check with the applicable agency for updates and current status. OSHA information is available at <http://www.osha.gov>; MSHA at <http://www.msha.gov>; and NIOSH at <http://www.cdc.gov/niosh>.

<table>
<thead>
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</thead>
<tbody>
<tr>
<td>Action Level (AL)</td>
<td>The time-weighted average (TWA) exposure which requires program inclusion, hearing tests, training, and optional hearing protection.</td>
<td>AL = 85 dBA TWA. AL is exceeded when TWA ≥ 85 dBA, integrating all sounds from 80–130 dBA.</td>
<td>Similar to OSHA, except integration is for all sounds from 80 to at least 130 dBA.</td>
<td>Does not have AL; rather has a single Recommended Exposure Limit (REL, see next row) for hearing loss prevention, noise controls and HPDs.</td>
</tr>
<tr>
<td>Permissible Exposure Limit (PEL)</td>
<td>The TWA, which when exceeded, requires feasible engineering and (MSHA) or (OSHA) administrative controls, and mandatory hearing protection.</td>
<td>PEL = 90 dBA TWA. PEL is exceeded when TWA &gt; 90 dBA, integrating all sounds from 90–140 dBA, as inferred from Table G-16 of 1910.95(b).</td>
<td>Similar to OSHA, except integration range is explicit in the reg. (62.101, Definitions), and is for all sounds from 90 to at least 140 dBA.</td>
<td>REL = 85 dBA TWA. REL is exceeded when TWA ≥ 85 dBA, integrating all sounds from 80–140 dBA.</td>
</tr>
<tr>
<td>Exchange Rate</td>
<td>The rate at which exposure accumulates; the change in dBA TWA for halving/doubling of allowable exposure time.</td>
<td>5 dB.</td>
<td>Same as OSHA.</td>
<td>3 dB.</td>
</tr>
</tbody>
</table>
Our study

- **Background**
  - Map facility to ensure proper signage and hearing protections were in place as well as identify areas for noise reduction

- **Preliminary assessment**
  - Identified high noise area, and then did octave band analysis to identify the high noise frequencies of equipment

- **Results**
  - Noise levels exceeding the 90db PEL were found along the walkway leading to loadout control room

- **Conclusion**
Noise Mapping

Preliminary Assessment

Canopy #2

Wet Scrubber 203

Pedestrian Walkway

Loadout Control Room
Identified High Noise Areas– Ground Level

Before – 92.2 dB

Ground level exposure
Identified Area – Walkway

Before – 92.7 dB

Canopy #2 Walkway
Octave Band Analysis
- Identified the frequencies that were loudest

Noise abatement sound blankets
- Effective at identified frequencies
- Have been used indoors at plants as a noise barrier
- Wanted to see if the application could be taken outside and still hold up in the weather

Source: acoustical solutions
**Transmission Loss**

- Barrier materials are described by their transmission loss
  - The **transmission loss** is the measure of the amount of sound insulation or reduction provided by a sealed partition between the source and the receiver.

<table>
<thead>
<tr>
<th>Octave Band Frequency (Hz)</th>
<th>31.5 Hz</th>
<th>63 Hz</th>
<th>125 Hz</th>
<th>250 Hz</th>
<th>500 Hz</th>
<th>1000 Hz</th>
<th>2000 Hz</th>
<th>4000 Hz</th>
<th>8000 Hz</th>
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</thead>
<tbody>
<tr>
<td>Source: acoustical solutions</td>
<td>N/A</td>
<td>N/A</td>
<td>15</td>
<td>17</td>
<td>28</td>
<td>40</td>
<td>45</td>
<td>52</td>
<td>N/A</td>
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</tbody>
</table>
Results – Ground Level

After – 84.5 dB

Noise Matting
Results – Walkway

After – 87.4 dB

Hanging Noise Matts
<table>
<thead>
<tr>
<th>Location</th>
<th>Baseline</th>
<th>Post Engineering Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entrance to Canopy 2</td>
<td>88.4</td>
<td>84.3</td>
</tr>
<tr>
<td>Ground Level Wet Scrubber</td>
<td>92.2</td>
<td>84.5</td>
</tr>
<tr>
<td>Head Pulley Belt Conveyor</td>
<td>89.6</td>
<td>82.1</td>
</tr>
<tr>
<td>Catwalk above Wet Scrubber</td>
<td>92.7</td>
<td>87.4</td>
</tr>
</tbody>
</table>
**Discussion**

- Although the results don’t seem overly impressive, noise reduction is slightly different than other exposures
  - With an exchange rate of 5 decibels the exposure time gets doubled with every 5 dB reduction
- The blankets we purchased have held up well through the winter but have excessive ice build-up
- Plant is going to purchase additional panels to continue reducing sound levels on the catwalk