

Reducing Noise Exposure in Powerplants

Providing engineering solutions to reduce noise to help ensure employee health and safety

Bottom Line

Reclamation's powerplants can be noisy places. This study explores sources of noise and possible engineering solutions.

Better, Faster, Cheaper

Engineering solutions to reduce noise can help protect employees from hearing losses.

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Collaborators

Reclamation:
Pacific Northwest Region and
Great Plains Region Powerplant
Employees

External Partners:

- Office of Naval Research (ONR)
- U.S. Army Corps of Engineers (USACE)
- U.S. Department of the Interior (DOI)

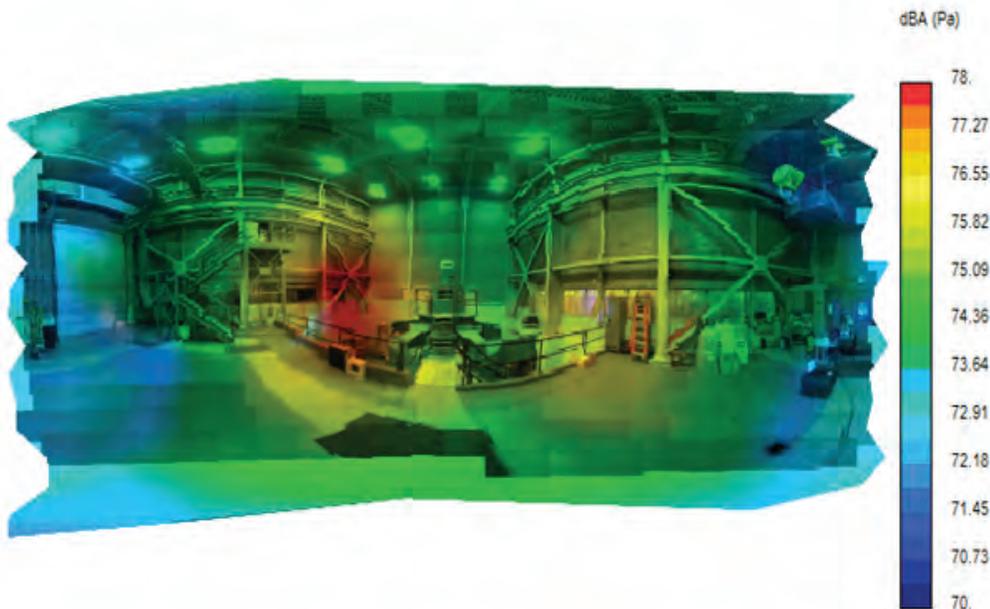
Problem

Noise is often overlooked as a hazard because there are no obvious indicators of acute or chronic exposure. However, noise-induced hearing loss is one of the highest worker's compensation expenses that agencies have for non-traumatic injuries. The noise standard for hazardous noise exposure is 85 decibels over a day (about the same sound level as a bulldozer idling). The Occupational Safety and Health Administration requires eliminating or reducing a hazard through engineering controls, if feasible, as the first priority, before relying on administrative and personal protective equipment strategies. Hearing loss from noise is preventable by reducing noise at the source, treating the path of noise transmission, limiting the frequency and duration of employee exposure, and providing effective hearing protectors.

Most of Reclamation's powerplants are over 40 years old and were constructed before many modern noise control technologies were developed. We can now incorporate noise reduction technologies when we replace and refurbish equipment, or modernize powerplants.

Solution

This Science and Technology Program research project seeks to understand the common sources and characteristics (such as frequency and intensity) of noise in Reclamation's hydroelectric powerplants. We can then evaluate the range of cost effective engineering solutions that can be implemented to eliminate the noise or reduce it to levels below the industrial standard for hazardous noise.



Acoustic array plot showing hot spot from cooling fan at Roza Powerplant, Washington.

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Reclamation contracted with an Office of Naval Research's (ONR) contractor, Noise Control Engineering, Inc., to identify noise sources and propose engineering controls at Reclamation and U.S. Army Corps of Engineers' (USACE) hydroelectric powerplants. The ONR applied its insights from research designed to protect warfighters from noise-induced hearing loss in the navy. The research team:

- Identified the most significant noise sources at nine Reclamation and USACE powerplants.
- Developed and evaluated engineering controls to reduce noise in the powerplants.
- Researched the technical and economical feasibility of implementing the engineering controls and compared this to the potential benefit.

Applications

We evaluated a wide range of powerplants to identify noise sources and consider possible engineering solutions:

- Green Springs, Oregon (small, Reclamation)
- Mary's Lake, Colorado (small, Reclamation)
- Roza, Washington (medium-small, Reclamation)
- Chandler, Washington (medium-small, Reclamation)
- Dalles, Oregon (large, USACE)
- Chief Joseph, Washington (large, USACE)
- Estes, Colorado (medium-large, Reclamation)
- Flatiron, Colorado (medium-large, Reclamation)
- Grand Coulee, Washington (very-large, Reclamation)

The field measurements included acoustic octave band analysis and vibration analysis surveys. The ONR contractor also used an acoustic array to help verify the acoustic "hot spots" and provide insights into possible treatment methodologies. Suggested engineering controls included:

- Fan silencers
- Tuned resonance sound absorbers for hard surfaces, such as in turbine pits
- Redesigned turbine pit access door with fan
- Damping treatment on the ventilation ducts, generator housing, and/or electrical cabinet
- Space closure or sound absorption treatment under pumps

This study can be used as the basis for further noise reduction studies in Reclamation, USACE, and throughout the hydropower industry.

“Of our worker’s compensation costs, about 20 - 25 percent is due to hearing loss compensation. Dollar-wise, it’s the largest single component of claims that we have. This project is an opportunity to protect our employees. Changing the infrastructure protects this and future generations of powerplant employees.”

James Meredith,
Safety and Occupational Health
Program Manager, Reclamation

More Information

Noise Control Engineering Inc.,
2012. Engineering Controls for
Hydroelectric Powerplants:
Preliminary Recommendations.
Technical Memo 2012-44.

Future Plans

The next steps at these powerplants are to:

- Determine the feasibility of the recommended engineering controls and the impact on employees hearing loss prevention
- Recommend designing, purchasing, and installing engineering controls that are determined to be cost effective and feasible
- Verify the effectiveness of any control measures that were installed

