

## Making Reclamation Powerplants a Quieter Place

*Reducing noise in Reclamation's powerplants by implementing advanced engineering controls*

***"This Voodoo noise control stuff really works!"***

Bob Hotze  
Green Springs Powerplant  
Foreman, Reclamation's Pacific  
Northwest Region

### Bottom Line

Long-term exposure to high noise levels can cause noise-induced hearing loss, worker fatigue, and other problems, thus increasing safety risks. Reducing noise levels through the use of engineering controls significantly mitigates those risk factors.

### Better, Faster, Cheaper

Reducing noise levels in powerplants will result in a significantly reduced incidence of noise-induced hearing loss in Reclamation workers, thus avoiding degradation of their quality of life as well as reducing workers' compensation claims.

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### Problem

Noise is often overlooked as a hazard at powerplants—and everywhere else—because there are no obvious indicators of acute or chronic exposure. Yet repeated exposure to loud noises can cause hearing loss or other noise-related problems, thus significantly affecting a worker's quality of life. Exposure to high noise levels over the course of a workday can also result in worker fatigue and decreased performance and increase the risk of safety incidents.

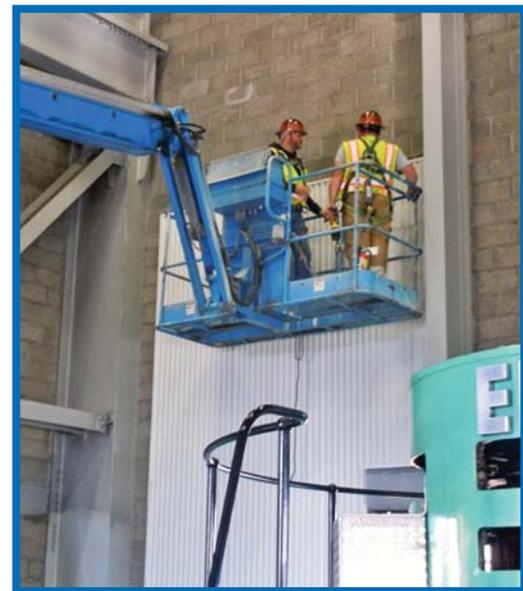
### Solution

This Reclamation Science and Technology Program research project researched and developed a pilot program in three Pacific Northwest (PN) Region powerplants. Reclamation has partnered with the Office of Naval Research (ONR) and their contractor Noise Control Engineering, LLC (NCE) of Billerica, Massachusetts, on this research project. NCE has been involved with ONR for a number of years, working on a major program to reduce hearing loss and other damages for troops on warships.

### Application and Results

Reclamation put the noise-induced hearing loss program's technology to use in the following Reclamation powerplants by determining noise levels with advanced measurement techniques and designing appropriate, cost-effective engineering controls: Green Springs Powerplant in southern Oregon, Roza Hydro Electric Powerplant in the Yakima Valley in eastern Washington, and Chandler Hydro Electric Powerplant, southeast of Prosser, Washington.

Green Springs Powerplant was the first powerplant to complete the installation, with dramatic results. Before this installation, noise levels in the penstock area during powerplant operation were 90.3 A-weighted decibels (dB[A])—about a train whistle at 500 feet. Sound absorption treatment was installed in the turbine pit, high transmission loss panels were hung in the pit opening, and sound absorption panels were mounted on the wall in the penstock area. This reduced levels in the penstock area by 16 dB and in the control room by 10 dB (and, as decibel levels are logarithmic, this basically cut the noise level in half). These engineering controls in the Green Springs Powerplant significantly reduced overall noise levels in the powerplant. Now, except for the turbine pit, all levels in the powerplant area are below 85 dBA—about a telephone dial tone level. For the turbine pit, appropriate hearing protection should be worn.



**Panel installation at the Roza Hydro Electric Powerplant.**

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The table below shows noise levels in Green Springs Powerplant before and after controls.

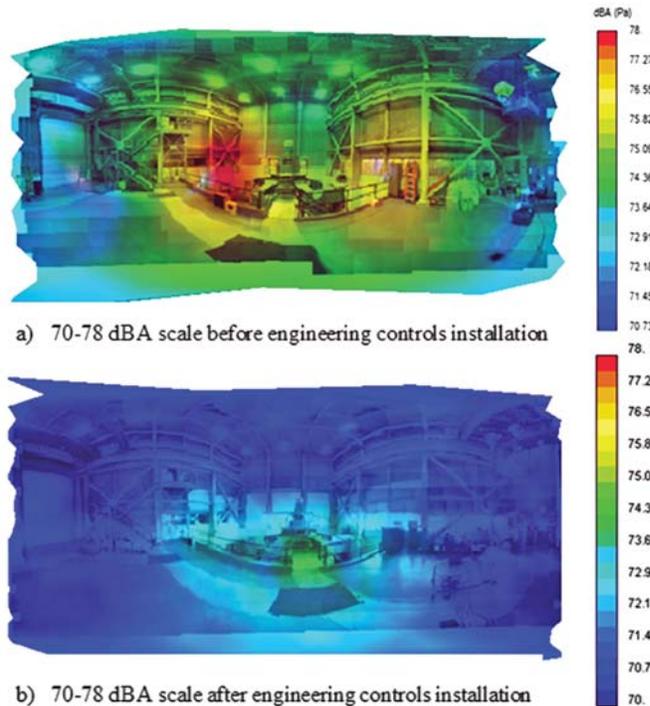
| Location             | Noise levels before controls were installed (dBA) | Noise levels after controls were installed (dBA) |
|----------------------|---|--|
| Turbine pit          | 101.4<br>(a jack hammer at 32 feet)               | 98.7<br>(a circular handsaw at 3 feet)           |
| Penstock area        | 90.3<br>(an angle grinder outside at 3 feet)      | 74.5<br>(a passing car at 25 feet)               |
| Control room         | 80.6<br>(very loud traffic noise at 25 feet)      | 70.6<br>(close to a main road by day)            |
| Cooling water levels | 86.6<br>(2-stroke chainsaw at 2 feet)             | 78.4<br>(un-silenced wood shredder at 2 feet)    |

Each powerplant is a little different, and thus it is important to tailor the type of controls to the type of noise sources. At the Roza Hydro Electric Powerplant, two large cooling fans that blew air directly through openings in one of the walls were found to be a major source of high noise levels. This was verified through the use of an advanced measurement technology called an acoustic array, which takes a three-dimensional picture of a room and then overlays the sound sources on top of the picture to verify the source of the noise. To reduce the noise from these cooling fans, silencers were designed and installed. The figure below shows the acoustic array results before and after the installation. Note the acoustic “hot spot” in the top figure that disappears after the installation. Sound absorption panels and a special spray-on material on the cooling ducts were also installed, which reduces the vibration of the ducts and keeps energy from this vibration from radiating as noise into the powerplant. Noise levels were reduced by 5 to 7 dB, and now all areas on this level fall below the 85 dBA target.

Installing controls at the Chandler Hydro Electric Powerplant also reduced noise levels by 3 to 5 dBA, to get below the target 85 dB(A). Because much of the noise was due to a direct path of energy from generator cooling slots, in addition to damping material on the ducts and absorption panels on the walls, it was necessary to install sound absorption barriers that block this direct path.

### Future Plans

Because of the success of this pilot program, a number of other plants are being targeted for installation of these noise reduction engineering controls. Measurements have already been taken at seven other Reclamation powerplants and appropriate engineering controls, where necessary, are being considered for installation. This new research helps Reclamation take the steps necessary to assure that noise does not harm its workers.



## Collaborators

### Reclamation:

- Safety and Health Office
- PN Region, Yakima Field Office
- Green Springs Powerplant
- Roza Hydro Electric Powerplant
- Chandler Hydro Electric Powerplant

### Office of Naval Research:

- Noise Control Engineering, LLC

## More information

[www.usbr.gov/research/projects/detail.cfm?id=6433](http://www.usbr.gov/research/projects/detail.cfm?id=6433)

### Previous Research Update at:

[www.usbr.gov/research/docs/updates/2012-28-noise-exposure-powerplants.pdf](http://www.usbr.gov/research/docs/updates/2012-28-noise-exposure-powerplants.pdf)



Thomas (Tom) Glover is a Power Systems Supervisor for the Yakima Field Office in Reclamation's Pacific Northwest Region. Prior to working for Reclamation, Tom oversaw maintenance and rehabilitation projects at the U.S. Army Corps of Engineers' hydropower facilities. Since Tom has been at Reclamation, he has overseen Roza, Chandler, and Green Springs Powerplants projects. Tom was instrumental in the testing of these engineering noise control technologies.