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Energy and utilities

Noise Control Engineering

Acoustical engineering firm uses Simcenter Solid Sphere Array to help power plants meet regulatory noise standard

Product

Simcenter

Business challenges

Identify dominant sources of noise

Present noise-control solutions that will protect the hearing of workers

Keys to success

Use Simcenter Solid Sphere Array to develop an optimized noise-control plan

Determine areas of high acoustical energy and sound radiation

Results

Installed countermeasures that lowered noise levels by 8 dB to below the target of 85 dB(A)

Developed optimized solutions for every plant

Displayed results of surveys in a much more compelling way than just numbers or graphs

Enabled comparison of results before and after installation of controls, making it a verification tool

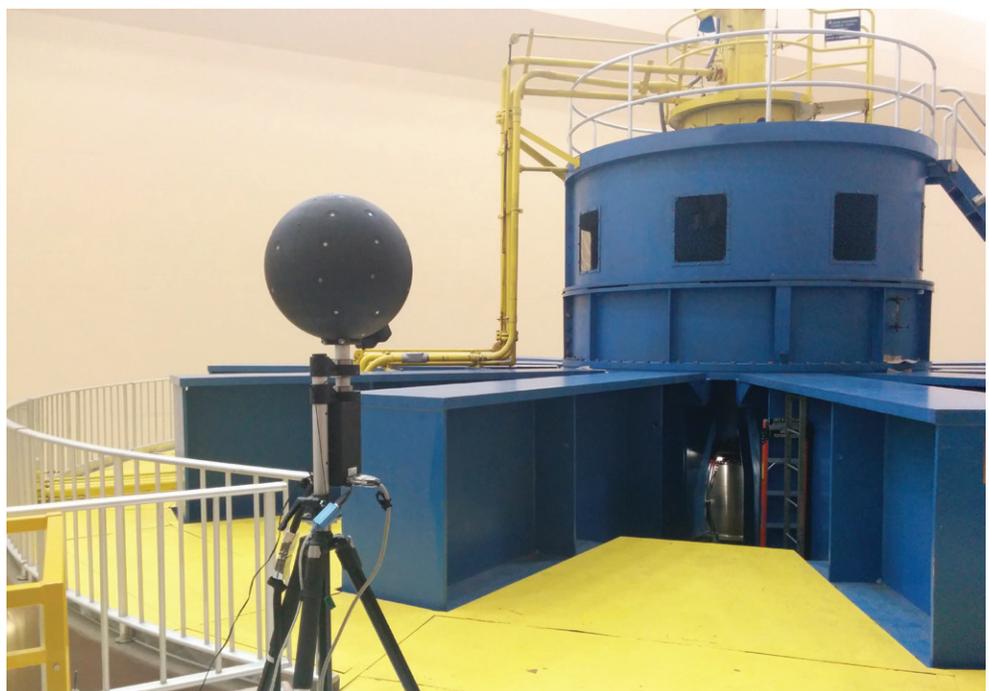
Siemens PLM Software solution enables Noise Control Engineering to reduce noise levels by 8 decibels

Driving down noise levels

Noise Control Engineering LLC (NCE) was founded in 1991 and is a premier acoustical engineering consulting firm that specializes in noise and vibration measurement and control for industrial, commercial and marine applications. NCE has the experience, tools and innovative ideas to develop cost-effective solutions

for all types of acoustical and vibration problems.

NCE previously partnered with product lifecycle management (PLM) specialist Siemens PLM Software to support the United States Navy (USN) in finding the most adapted noise-reduction solutions for its aircraft carriers. This time the company worked with the United States Department of Interior Bureau of Reclamation to detect the noisiest parts of power plants and look for methods to decrease the noise to an acceptable decibel (dB) level.



“Our job is to bring solid solutions to our customers in order to make certain their noise issues can be successfully addressed, and for this, we have to make sure we are as accurate as possible in our analysis.”

Jeffrey Komrower
Senior Engineer
Noise Control Engineering



Power plants may not be as loud as flight decks, but working for long hours close to a giant generator that surpasses the permissible 85 A-weighted decibels (dB(A)) can cause hearing damage in the long run. In fact, noise-induced hearing loss (NIHL) has become the Bureau of Reclamation's number one worker compensation issue.

Many power plants were constructed before modern noise-control technologies were developed. In recent years, there has been a significant increase in successful hearing loss disability claims being filed by workers in facilities that emit more than the Occupational Safety and Health Administration (OSHA) requirement of 85 dB(A). With this alarming increase in the number of personnel suffering from NIHL and tinnitus, it has become NCE's mission to assess the situation and present noise-control options.

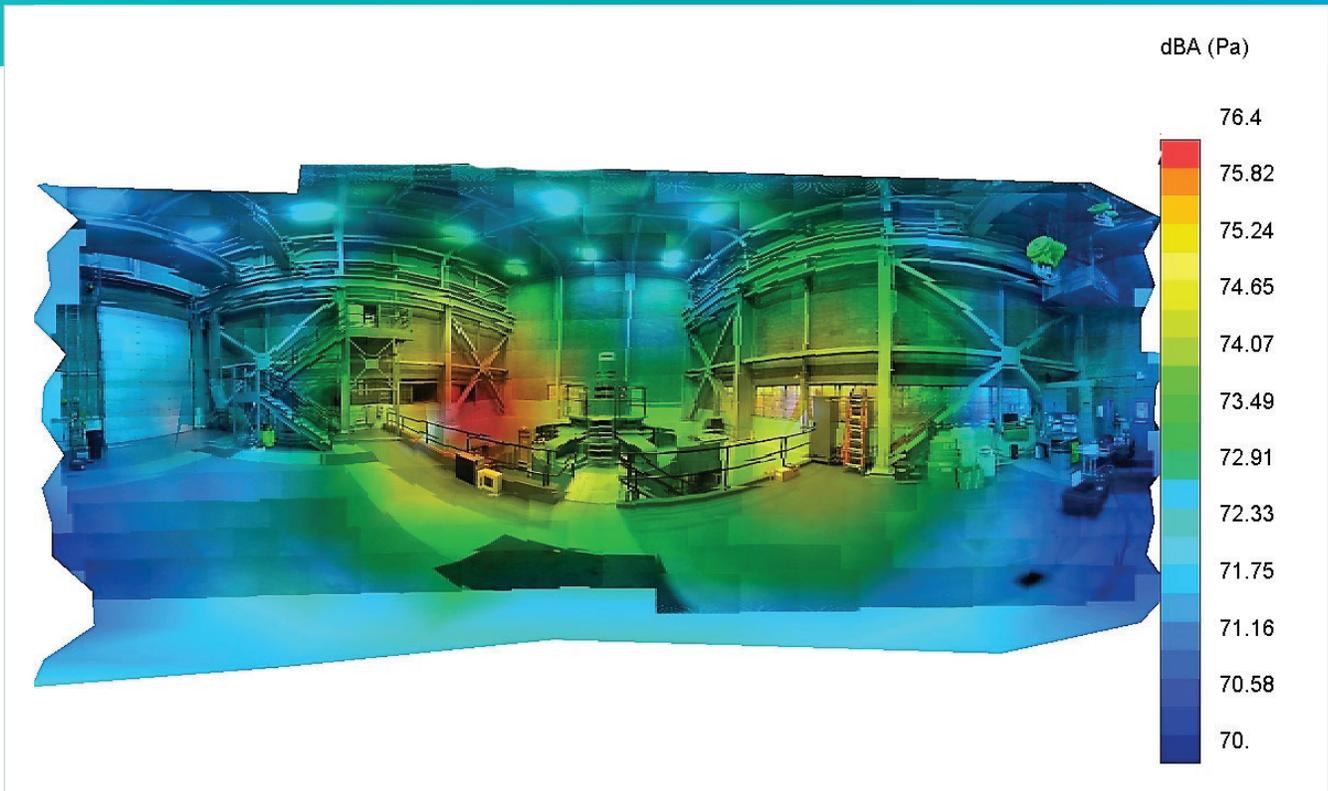
The good news is hearing loss is preventable, and noise-control technologies exist that can drive down noise levels. The first step in this project was to conduct noise surveys in the power plants and identify the areas with high levels. In the last three years, NCE has surveyed over 30 plants in the United States, and traditional measure-

ment techniques were augmented by Simcenter™ Solid Sphere Array hardware, part of the Simcenter™ portfolio, in 15 of these plants. NCE used the spherical array data to help develop an optimized noise-control plan.

Images speak louder than words

The 36-microphone array, which employs spherical beamforming techniques, enabled NCE to identify the dominant noise sources, thus helping to determine the areas of significant acoustical energy and the specific spots where high levels of sound radiation were occurring. This has proven to be an excellent solution for NCE in bringing clarity to those situations in which there were multiple sources in highly reverberant spaces. The use of the array in determining the source that controlled the overall noise levels was critical in prescribing the correct noise-control solutions.

“In certain plants, it is not possible to switch off devices without interrupting the normal activity, which would cause important financial losses,” says Jeffrey Komrower, senior engineer at NCE. “The array comes in handy when you are trying to identify what the primary source of



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The Roza power plant in the state of Washington was one of the sites where the NCE team deployed the Simcenter Solid Sphere Array from Siemens PLM Software to investigate the source of high noise levels. Roza has one generator and several noise sources, including the turbine pit access (where the door had to be open because of cooling issues), large cooling fans located on the wall and cooling ducts.

Because the environment was highly reverberant, it was difficult to precisely determine the location of the dominant noise source. This spherical microphone array is a closed sphere, which uses the principle of spherical beamforming for measurements in reverberant conditions.

Because the array allows visualization of the acoustic hot spot, the largest source was easily located; in this case, it came from one of the fans. The visual offers clarity because it overlays the sound



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sources on a picture of the test environment in 3D. The results convinced NCE engineers the primary source of noise was coming from the fans. Since NCE was able to spot the source while the fans were in operation and didn't have to perform two measures – one with the fans on and the other with the fans off – it saved measurement time and enabled the engineers to come to a conclusion faster.

In another plant under scrutiny in Chandler, Washington, the dominant noise sources were determined to be cooling slots positioned around the shell of the generator. Although sound absorption panels were placed in the room in order to reduce the high reverberation in this space, the acoustic array picture clearly showed that cooling slots were the primary noise source. Thanks to this information, NCE was able to install additional countermeasures in the area in the form of high transmission loss barriers around the generator's duct opening. This lowered the noise levels by 8 dB to below the target of 85 dB(A).

The Simcenter Solid Sphere Array, combined with the Simcenter Testlab™ 3D Acoustic Camera Advanced software, was not only used for the measurement, but also as a tool to compare results before and after installation of the noise-controlling solutions. Thanks to the visuals it offers, this type of comparison was easy to do and makes the results indisputably clear and self-explanatory. The images show exactly how much progress has been made. The array can thus be employed as a verification tool.

The Simcenter Testlab 3D Acoustic Camera Advanced software was also praised for being a visual tool for reporting, a good show-and-tell for customers and decision makers. NCE was happy to use the tool even when they didn't necessarily need it because the images it generates speak for themselves and make for fast, convincing and factual decisions.

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Solutions/Services

Simcenter Solid Sphere Array
<https://www.plm.automation.siemens.com/global/en/products/simulation-test/sound-source-localization-systems.html>

Customer's primary business

Noise Control Engineering (NCE) is a premier acoustical engineering consulting firm that specializes in noise and vibration measurement and control for marine, industrial and commercial applications. Founded in 1991 by Raymond Fischer, NCE has the experience, tools and innovative ideas to provide cost-effective solutions for all types of acoustical problems.

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Lower noise equals better working environment

Thanks to the results obtained with Simcenter Solid Sphere Array, NCE helped create quieter work environments. They were able to find optimized solutions for every plant. Some required absorption panels, while others needed barriers around the generator, fan silencers or noise-damping material.

A healthier working environment will result in a lower incidence of hearing loss among employees as well as better quality of work, less worker anxiety and increased productivity. Additionally, the solutions put in place can lead to large, measurable cost savings since the direct result would

be a decrease in hearing-related compensation claims and less employees enrolled in hearing conservation programs.

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