

Columbus, Ohio Wastewater Treatment Plant improves working conditions with Eckel acoustic panels

It's a fact of life in every industrial facility: Heavy machinery and a cavernous room are a bad combination. The noise generated in such an environment quickly becomes intolerable, not to mention dangerous for those working there. Facility managers and operators at the Southerly and Jackson Pike Wastewater Treatment Plants in Columbus, Ohio, as well as officials in the City's Division of Sewerage and Drainage, are on alert for those conditions and the associated risks.

Since 2007, the City and plant managers have worked diligently to rectify noise and reverberation issues. They enlisted help from DH Kaiser Co., an acoustical engineering firm based in Canton, OH. The firm's President and Chief Consultant Bill Hannon has worked on multiple noise control projects for them ever since. In each case, his analysis led him to specify the installation of Eckoustic Functional Panels (EFPs) from Eckel Noise Control Technologies, and that was true again for the most recent projects at Jackson Pike in the spring of 2016 and Southerly in winter 2015.

In the West Aeration Control (WAC) Building Blower Room at the Southerly plant, the existing drop-ceiling tiles had become severely corroded and deteriorated, making them useless for mitigating noise. Even brand new, such tiles simply can't reduce reverberation enough to fully protect operator hearing and improve verbal communication. According to Monica Powell, the City of Columbus Project Manager who oversaw the project and Burt Otani, Senior Project Engineer with the lead design firm Chester Engineers, Eckel EFPs were specified because of the positive results achieved in other areas of the facility. Thus, the decision was made to remove the existing ceiling tile system and install Eckel EFPs.

The WAC blower room contains five 900hp DeLaval blowers, each with a diameter of 24 in., speed of 3,500 rpm and CFM of 20,000. The blowers provide excess air to the continuous activated sludge/nitrification process, which removes ammonia from the wastewater treatment stream. Depending how much additional air is needed to support that process—related to both the flow and nitrogen content of the stream—more than one blower at a time may be engaged.

The WAC blower room is approximately 208 ft. long by 40 ft. wide and 20 ft. high. It has walls made of concrete masonry units (CMUs), glass and drywall; terrazzo floors; and a concrete ceiling. Those reflective surfaces are incredibly unforgiving in terms of reverberation, especially in a space that large.

Hannon performed onsite acoustic analysis of the conditions in the room. Using a spectrum analyzer setup, he made sound measurements to determine the average reverberation time and noise level at specific frequencies. At 500 Hz, Hannon determined an average reverb time of 7.5 seconds and an average noise



level of 93.6 db. Understanding these data and knowing the success of prior installations of Eckel Type II EFPs at the Southerly plant, he believed that same type of panel would do the job.

Eckel Type II EFPs are installed on the surface of walls and ceilings. They are designed so that the distance between the back of panel and the reflective surface (i.e., the mounting distance) can be adjusted. The panels can be mounted directly on the surface or up to 8 inches from it, with the difference in distance determining the panel's peak frequency of absorption. For example, if mounted directly on the reflective surface (the panel itself is 2 $\frac{3}{4}$ in. thick), the peak is 1,000 Hz; at 4 in. away, the peak is 500 Hz.

Chester Engineers provided CAD drawings to Hannon, which he used in combination with his onsite testing data to design a panel layout that would reduce the reverb time to just 1.2 seconds at 500 Hz. That design had to accommodate installation around lighting fixtures, sprinkler systems, electrical conduits, roof drains and other equipment. Achieving that target reverb time required about 13.5% of the walls and 30% of the ceiling to be covered with the Eckel panels at a mounting distance of 4 inches. In total, 226 EFPs were installed in sizes including 2.5 x 5 ft., 2.5 x 6 ft., 2.5 x 8 ft. and 2.5 x 10 ft. Kenmore Construction performed the installation with minimal impact to plant operations.

It's easy to get lost in the science and math of acoustic design, but there's clear and powerful evidence of the marked difference that the Eckel EFPs made in the Southerly's WAC Building Blower Room. "Before the installation, our operators were required to wear hearing protection at all times. After the job was done, that was no longer the case," said Jeff Bartoe, Southerly Wastewater Treatment Plant Maintenance Manager. "Our operators can not only safely withstand the acoustic conditions without protection, they can communicate far more easily, and that makes a big difference in safety, too."