

Los Alamos WWTP Gains Turndown Capability And Saves Energy With Hybrid Blowers

Los Alamos, NM, the former site of top-secret laboratories where government scientists developed the atomic bomb during World War II, is once again a town at the forefront of new technology.

Nestled in the Jemez Mountains of northern New Mexico in a canyon 6,530 feet above sea level, the Los Alamos Wastewater Treatment Plant (WWTP) serves a community of about 12,000 residents. The plant has a design capacity of 1.4 million gallons per day (MGD) with a peak of 2.8 MGD, but actual demand falls well below those limits.

Over-Aerated And Overheated

Faced with aging, chronically overheating equipment and inefficient blower operation, plant superintendent Jeffery Ayers was in search of a better alternative. The plant's existing 11-stage centrifugal blowers produced a much larger volume of air than the process required, and the blowers' limited turndown capability meant that operators could never run them at less than 80 percent of full power. Even with that small reduction, which operators achieved by closing back the inlet valve, and despite the plant's evaporative cooler, the blowers would overheat, forcing the municipality to purchase and run large external fans to cool the outer case of the machines.

"Like many municipalities, we see a big surge in the morning, a small surge after lunch, and a larger one after work, with a big drop-off after midnight," Ayers said. "Unlike a larger plant with multiple shifts, we only work one eight-hour shift, so we don't have anyone there to turn down



New Aerzen Delta Hybrid unit installed in "slot" previously occupied by a similar blower, shown in foreground

the air at night."

While the over-aeration led to wasted energy and low operational efficiency, the continual overheating took a toll on the equipment, leading two of the three multistage blowers to break down.

New Hybrid Technology Offers Ideal Solution

Los Alamos officials initially considered replacing their old multistage equipment with an energy-efficient turbo blower. However, at the suggestion of Henry Herbol of Advanced Process Technologies, the authorized Aerzen representative for the state of New Mexico, the municipality turned its attention to new hybrid technology. An independent analysis by Aqua Engineering, Inc. of Bountiful, Utah, confirmed that a hybrid blower was indeed the best choice for the Los Alamos plant. After providing their design criteria

and conditions to three manufacturers through a standard RFP process, Los Alamos selected the Aerzen Delta Hybrid.

"Aerzen came out on top in terms of horsepower, turndown, price, and maintenance requirements, all of which equal cost savings for our utility," Ayers said.

Unlike standard positive displacement blowers, which convey air with no internal compression, the Delta Hybrid blower uses screw compressor technology to compress the air within the machine. Aerzen describes the Delta Hybrid as a rotary lobe compressor or a low-pressure screw compressor. The profile of the rotors is similar to that of higher-pressure screw compressors, but the hybrid achieves higher efficiency by adapting the profile of the rotors for a lower compression ratio to meet the low-pressure requirements of aeration systems.



Front panel of new Aerzen Delta Hybrid unit showing ease of access for monitoring and O&M



New Aerzen Delta Hybrid unit installed in "slot" previously occupied by a similar blower, shown in foreground

The Delta Hybrid offers superior turn-down and achieves power savings comparable to turbo blowers; yet, because it uses positive displacement rather than centrifugal technology, it is better at handling the extreme high-altitude conditions and thinner air of the Los Alamos plant.

"We're enthused about hybrid technology because often with these facilities, the range can be 16-1 between the full build-out peak daytime demand and initial plant start-up overnight demand," Hervol said. "Hybrids create almost a straight-line combination of air feed mix to oxygen production, when applied in the right combinations, so the operators never expend more energy than they need for process conditions. Especially out here in the mountain conditions, it's a new tool that gives us a chance to really save energy."

Improved Turndown Delivers Immediate Results

One Delta Hybrid D 62S was placed into service in December 2013, and to the delight of the early adopters at the

Los Alamos plant, the energy savings and operational benefits have been both immediate and significant. The 125-horsepower blower has a design capacity of 1440 standard cubic feet per minute (SCFM) at 11 pounds per square inch gage (PSIG), with turndown as low as 424 SCFM. (The old centrifugal blowers operated at 1210 SCFM at 10.7 PSIG, with virtually no turndown available). "The Los Alamos plant was Aerzen's first hybrid blower installation in New Mexico," Hervol said. "It's a marvel with regard to energy savings. The difference in power draw truly stands out from the old technology, which they couldn't turn down to meet their process needs."

Currently, the Aerzen blower operates in rotation with one of the old centrifugal blowers, one month on and one month off. Even on this half-time schedule, the plant has achieved energy savings of \$5,000 to \$10,000 per year, and Ayers noted that energy costs during the months running the hybrid are cut nearly in half as compared with months that the old blower is used. The Aerzen delivers nearly three times the turndown capa-

bility of the old blowers, and with the help of a variable frequency drive (VFD), plant operators are able to easily turn the blower down, regularly running it at 30 to 50 percent of its capacity with no heating problems or complications.

Ayers anticipates even greater energy savings once the system is tied into the plant's programmable logic controller (PLC), which will allow operators to control the blower based on dissolved oxygen (DO) levels, influent flow, hertz, or time and hertz, rather than waiting for manual changes.

In addition to saving power, the hybrid blower has eliminated the need for external fans and improved conditions in the blower room, producing less heat and far less noise than the old centrifugal unit. The operators have been so pleased with the operation of the Delta Hybrid that they plan to purchase a second identical blower to replace the remaining multi-stage, allowing the Los Alamos WWTP to achieve full-time energy savings.



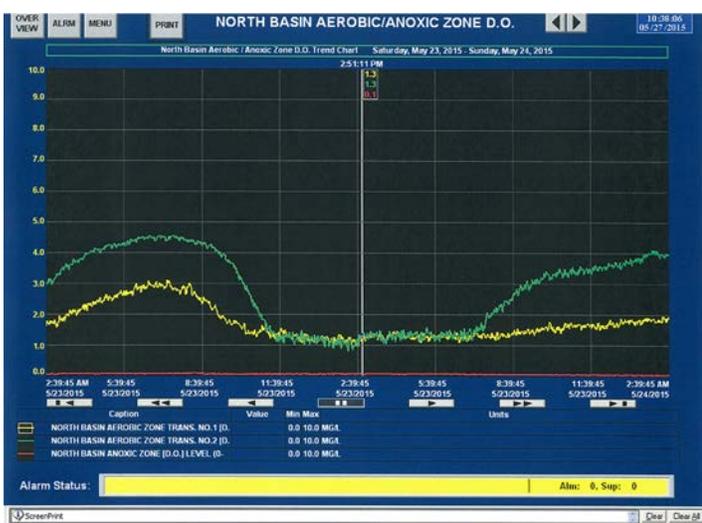
Inside the blower room at the Los Alamos WWTW



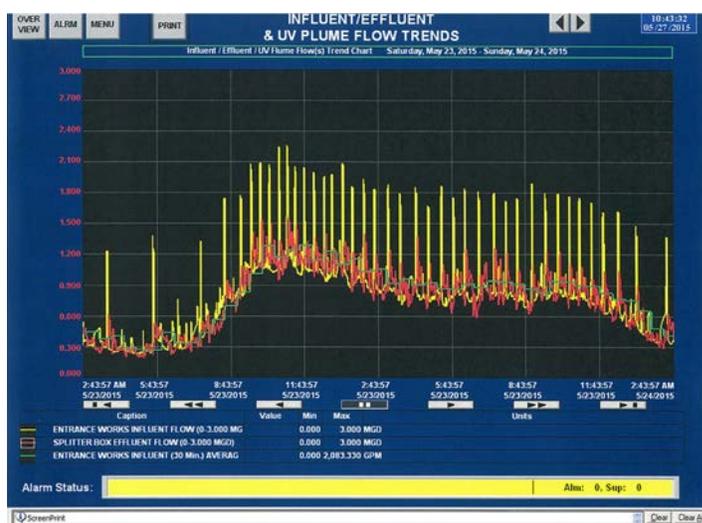
Typical blower air discharge piping



Another view – new Aerzen Delta Hybrid Blower discharge air piping



24-Hour dissolved oxygen monitoring at the plant



24-Hour flow monitoring at the plant