

PRODUCT EMPHASIS

BRAND NEW TECHNOLOGIES ATTRACT INTERNATIONAL VISITORS

By George W. Smith

The recently upgraded wastewater treatment plant in Peru, Ind., is attracting many visitors who come from as far away as Italy, New Zealand, Austria, the Netherlands and Turkey. Engineers, city officials and university professors come to this city of 13,000 to see a combination of new process treatment technologies and innovations that have resulted in significant operating cost reductions.

Peru, one of the few cities in Indiana with combined sewers, needed to upgrade its old plant to handle storm water flows as high as 26 million gal per day (mgd). The upgrade increased the plant's design rating from 4 to 8 mgd and made it capable of treating a significant amount of flow and minimizing bypassing as well.

"Our old system's technology was acceptable in the 1950s and 1960s," said Mike Dahlquist, Peru's superintendent. "Post-upgrade, our plant is now on the cutting edge of technology."

The master plan

The old, conventional plant had primary clarifiers, fine-bubble aeration tanks and anaerobic digesters. As part of the upgrade, Peru abandoned the primaries, converted the aeration tanks to vertical loop reactors (VLRs), and turned the anaerobic digesters into Cannibal interchange reactors. The city also added two new VLR tanks, three new 80-ft diameter final clarifiers with Tow-Bro suction removal mechanisms and the Cannibal solids reduction process.

Siemens set up two trains of four VLR tanks to operate in a series. A 15-hp disc aerator was installed in each of the six converted VLR tanks, and two 15-hp assemblies were installed in the two new VLR tanks. Each of the VLR tanks uses coarse-bubble diffusers as a supplemental oxygen delivery source.

The Cannibal solids reduction process required placing mixers, coarse-bubble diffusers and decanters into the old anaerobic digester tanks. The system's design consists of a daily interchange of solids between the aeration process and the interchange reactors, which is crucial to reducing the amount of biological solids leaving the plant. Also important to the Cannibal process: a rotary drum screen installed on the return sludge line that extracts trash, grit and inert material that would otherwise accumulate in the system over time.

Cannibalizing the aeration process

An aeration process that operates in accordance with the Cannibal solids reduction process is key to the latter operating properly. At Peru, oxidation reduction potential probes control the oxygen delivery for the VLR tanks. The plant operates with four VLR tanks in a series; the first three operating with zero dissolved oxygen. Each disc aerator, operating with variable speed motors, operates between 4 to 12 hp of oxygen delivery. The entire air delivery for individual tanks is often turned off for several hours.

VLR tanks typically use disc aerators on the surface and coarse-bubble diffusers under the intermediate baffle. The power draw of the disc aerators at Peru typically ranges from 40 to 80 hp. Coarse-bubble diffusers are currently not needed at Peru and, therefore, are seldom used. With a total of 300 hp installed, the blowers associated with the coarse-bubble diffusers were formerly used with the fine-bubble diffusers.

The MLSS (mixed liquor suspended solids), which normally tends to be in the 4,000 to 8,000 mg/L range, has been as high as 10,000 mg/L. Despite the low oxygen input, the plant has not suffered in its effluent performance, with ammonia almost always being non-detectable, while BOD and SS levels are below 5 mg/L. Even effluent nitrates and phosphorous levels are low, being less than 2 and 1 mg/L, respectively.

But the 30 to 60 sludge volume index (SVI) is perhaps the most remarkable performance figure. Sludge settles like a rock at Peru, even with the absence of "trash" material removed in the Cannibal solids separation module. The positive effect that the Cannibal process has on the aeration process is most frequently credited for the low SVI. Some types of filamentous organisms are weeded out in the Cannibal interchange reactors. The organisms that thrive best in the non-aerobic environment of the Cannibal interchange tanks thrive best in the oxygen-deficit conditions of the VLR tanks.

Operating costs

The new Cannibal interchange tanks only use about 10 hours of air delivery per week. Heating the old anaerobic digester units cost \$50,000 per year in natural gas. The low power requirements of the Cannibal interchange tanks represent an overall savings since this cost was eliminated.

Despite the old anaerobic digesters' efficient solids reduction, Peru still used to haul an average of 1,800,000 gal of solids annually away from the plant. With the new Cannibal process in operation for almost two years, the plant has reduced the amount of biological solids wasted out of the system to about 180,000 gal per year.

Reducing both aeration power and solids, while simultaneously improving effluent quality, has put the Peru plant in the spotlight. The plant's exceptional operating performance guarantees the city will have more visitors in the future, which Peru does not seem to mind at all. WWD

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A wastewater plant's facelift reduces aeration power & solids, while improving effluent quality



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