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WATER ENVIRONMENT & TECHNOLOGY

New Aeration System Also Provides Biological Nutrient Removal

Problem: Facility needed to upgrade but had little room available.
Solution: Converting existing aeration tanks to final clarifiers and adding a new aeration system.

Population growth was straining the resources of the East Richland County Public Service District (Columbia, S.C.). Its Gill's Creek Wastewater Treatment Plant now had processing problems and wanted to increase capacity from 30,000 to 60,000 m^3/d (8 to 16 mgd), but had little room to grow onsite. Building a new plant elsewhere wasn't a practical option, so district staff investigated compact upgrade alternatives.

Fortunately, the plant had deep aeration tanks, which could be doubled in size. These enabled U.S Filter Envirex (Waukesha, Wis.) to suggest a useful upgrade that involved converting the existing tanks into final clarifiers and building a new aeration system. When complete, the new system would be able to provide biological nutrient removal (BNR) as well as more efficient aeration.

The new system included Vertical Loop oxidation ditches with mechanical aerators followed by plug-flow cells with membrane fine-bubble diffusers. Both ditches and cells were designed to hold liquid 7.2 m deep (23 ft deep) and handle organic loads of 56 kg/100 m^3 (35 lb/1000 ft^3), so their footprints are smaller than normal. The Vertical Loop tanks are designed to be aerated anoxic reactors that operate with zero or near-zero dissolved oxygen (DO) levels, which enables a high degree of simultaneous nitrification-denitrification and promotes biological phosphorus removal. Meanwhile, the location of the mechanical aerators and fine-bubble diffusers maximizes the alpha factor for both, thereby improving the system's overall aeration efficiency.

The entire plant cost $25 million to construct, and at press time, was expected to start up in summer 2005. Operating costs are expected to be about $4 million/yr for power. A major advantage of this hybrid mixture of tanks and aerators is power savings; a conventional fine-bubble system would require 40% more power. And its effluent nutrient levels are projected to be less than 10mg/L of both biochemical oxygen demand (BOD) and total suspended solids (TSS).

The aerators and fine-bubble diffusers require routine maintenance, which will include weekly greasing of aeration shaft bearings and semi-annual changing of oil in drive units. However, the diffusers' fouling potential is less because they are in the second half of the process.

Hybrid aeration systems like this one typically are most cost-effective for treatment plants that are 19,000 m^3/d (5 mgd) or larger. For more information, contact George Smith, director of product development for biological processes at USFilter, at (262) 521-8275 or smithgw@usfilter.com.

Have a Solution?
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