

## EDITOR'S FOCUS

# Wastewater Plant Upgrade Achieves Biological Nutrient Removal

By Kevin Bunting

*The city of Fruitland, Md., needed to expand the capacity of its wastewater treatment plant (WWTP) from 0.5 to 1 million gal per day (mgd) and upgrade the level of treatment to include biological nutrient removal (BNR). The existing wastewater treatment facility, in operation for 28 years, uses a high-rate, single-stage trickling filter preceded by primary sedimentation and anaerobic digestion of raw and secondary settling tank solids.*

Effluent is discharged to the Wicomico River, which is one half mile from the treatment plant. The city is centrally located on Maryland's lower eastern shore, about 30 minutes from the Atlantic Ocean and Chesapeake Bay. Population growth, coupled with the need to protect the Chesapeake Bay Watershed, prompted this plant expansion.

The facility was also unable to meet the biochemical oxygen demand (BOD) removal requirements stipulated by its National Pollutant Discharge Elimination System (NPDES) permit on a consistent basis. The permit called for 30 mg/L BOD and 30 mg/L total suspended solids (TSS). High BOD in the effluent also reduced the efficiency of the chlorine disinfection process.

## The solution

To help protect the Chesapeake Bay Watershed, the city of Fruitland entered into an agreement with the Maryland Department of the Environment to install a new facility that would reduce nitrogen levels to 8 mg/L and phosphorus levels to 2 mg/L on a monthly basis.

City officials chose a sequencing batch reactor (SBR) process to treat the wastewater because the system has a compact footprint and supplies BNR in a two-tank, compact layout. The system is a fill-and-draw, nonsteady-state, activated sludge treatment process in which one or more reactor basins are filled with wastewater during a discrete time period and then operated in batch treatment mode. A single reactor basin accomplishes equalization, aeration and clarification in a timed sequence.

"We selected the OMNIFLO SBR system from Siemens because it would eliminate the need for separate secondary sedimentation and associated MLSS (mixed liquor suspended solids) return," said George Calloway, Fruitland WWTP superintendent. "This process was seen as an advantage over competing designs because of its minimal use of in-tank equipment and its heat conservation during cold weather with the use of submerged aeration."

*The city of Fruitland, Md., chooses an SBR system to reduce nitrogen and phosphorus levels while protecting Chesapeake Bay*



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The system also provides process control and remote input changes with the programmable logic controller. The feast-famine condition to which the biomass is subjected creates a robust biological population that minimizes the impact of shock loads and provides for optimum settling characteristics of the biomass.

The SBR installed in Fruitland also includes a jet aeration system as well as a SCADA monitoring and control system that allows for remote access, observation and troubleshooting. Operators can check the process and make adjustments during off hours or in the case of an alarm. The plant has also installed a traveling bridge filter and an ultraviolet (UV) disinfection system to improve operation and produce higher quality effluent.

### Operating results

Started in December 2002, the wastewater treatment system has consistently met the wastewater treatment design levels of 8 mg/L for nitrogen and 2 mg/L for phosphorus. The system has also allowed the plant to meet the BOD limit stipulated by its NPDES permit.

“This plant has been great—the small footprint, automated controls and remote access have allowed us to operate with a small, dedicated staff,” Calloway said. “And, although no operation or process is without issues, there have been very few with this one.”

Calloway added, “The cost of operation is considerably higher, but this is based on a comparison between the two plants. We went from a trickling filter plant with little energy usage to a plant that is full of pumps and blowers. The end product, I believe, is worth the difference, and it can be operated with a small staff.”

The facility has received several awards: first place in the Clearest Wastewater Finale Effluent Competition from the Maryland Rural Water Association in 2003; the Environmental Excellence Award from the Salisbury Area Chamber of Commerce in 2004; and the Maryland Rural Water Association’s Wastewater System of the Year Award in 2004. Two of the plant’s operators received Wastewater Operator of the Year awards from the Maryland Rural Water Association in 2004 and 2006.

### Looking ahead

The Fruitland WWTP will be required to meet the new enhanced nutrient removal limits by 2010, as specified by the Chesapeake Bay 2000 Agreement. This agreement was signed by Maryland, Virginia, Pennsylvania and the District of Columbia to further reduce the nitrogen and phosphorus entering the bay. Enhanced nutrient removal refines the BNR process, removing total nitrogen to levels as low as 3 mg/L and total phosphorus to 0.3 mg/L or less.

To meet these requirements, the plant is exploring several options, including the possibility of adding a third SBR basin, which would increase the capacity to 1.06 mgd. **WWD**

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