

Armed Against Ammonia

Maryland wastewater treatment plant defeats nitrification issues



By Sara Samovalov

Name: Smithsburg Wastewater Treatment Plant
 Location: Smithsburg, Md.
 Size: 330,000 gpd
 Infrastructure: 6 mm screens, SBR tanks with BioMag process, UV disinfection, filter cloth system



The BioMag system, pictured above, uses the inert material magnetite to add weight to biomass.

Holidays, hot chocolate, snow-covered landscapes, gingerbread—there are many reasons to love winter. But cold temperatures also can throw a wrench in the processes at wastewater treatment plants, as was the case in Smithsburg, Md., not long ago.

Ammonia Woes

The 330,000-gal-per-day Smithsburg Wastewater Treatment Plant (WWTP) faced settling issues and an inability to maintain high enough concentrations of mixed liquor suspended solids (MLSS) in the winter months. This hampered the nitrification process, forcing the plant to discharge greater amounts of ammonia.

At first, discharge requirements for the plant allowed for higher effluent ammonia limits in the winter months, but when Washington County, where the plant is located, received a new National Pollutant Discharge Elimination System (NPDES) permit from the state of Maryland that decreased effluent ammonia limits year-round, it was time for a change.

"We determined that the facility was unable to meet these new parameters in the permit and required an upgrade," said Julie Pippel, director of Washington County's Division of Environmental Management.

The Process

The Smithsburg WWTP has been operating as a sequencing batch reactor (SBR) facility since the 1990s. Wastewater flows into the plant through two 6 mm screens before entering the SBR tanks. Water goes through ultraviolet disinfection and is discharged into a creek on the property. Solids are subjected to a filter cloth system and thickening before being hauled from the Smithsburg WWTP to the county's Conococheague WWTP for further processing prior to landfilling.

After the county handed down the new, more stringent permitting requirements, the Smithsburg WWTP sought a solution to its ammonia discharge issues. One option—building new tanks to maintain a higher mixed liquor volume—posed a challenge due to the plant's location near a floodplain.

"When you see aerial photography [of the WWTP], you see this beautiful, round circle of green," Pippel

said. "The 100-year floodplain goes up through most of that area."

When seeking a solution that could handle the plant's ammonia issues without expanding its existing footprint, the county investigated and ultimately settled on the BioMag process from Evoqua. BioMag already had been demonstrated during a pilot project at Washington County's Winebrenner wastewater treatment facility, located about half an hour from Smithsburg.

BioMag uses magnetite—an inert, natural material—to add weight to biomass. The process increases the specific gravity of biofloc, causing it to settle five times faster than unballasted sludge. The magnetite is reclaimed during solids processing and later reused.

Evoqua initially brought a trailer to Smithsburg to utilize the process during one winter cycle before completing a full-scale installation. The completed system officially was opened in October 2015.

"What [BioMag] allowed us to do at this facility is by putting the feed recovery equipment in, feeding the ballast in, getting it into the biomass and going through the reaction cycle, it allowed [Smithsburg] to maintain a population of mixed liquor high enough so they could successfully nitrify even in those colder winter month periods," said Bob Backman, senior technical manager for the BioMag system.

Eye on Expansion

BioMag's installation capped off what Pippel terms "Phase 1" of upgrades for the Smithsburg facility. Phase 2 will comprise expanding the plant from a 0.3- to a 0.6-mgd facility. Funding permitting, Pippel hopes to complete the expansion around 2020.

In the meantime, the county will upgrade its other treatment facilities, including Winebrenner and Conococheague, with BioMag systems. While the upgrades are a costly outlay, the county will save money in the long run—to the tune of \$16 million, according to Pippel.

"When we look at the 20-year, full economic and financial cost of this, these processes save the county a substantial amount of money," she said. **w&wd**

Sara Samovalov is associate editor for W&WD. Samovalov can be reached at ssamovalov@sgcmail.com or 847.954.7966.