Peak Performance

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By Elisabeth Lisican

Name: H.L. Mooney Advanced Water Reclamation Facility
Location: Woodbridge, Va.
Capacity: 24 mgd
Infrastructure: Pumping stations, pre-aeration, screen and grit removal, equalization basins, clarifiers, denitrification, gravity thickening, filters, UV, dewatering, fluidized bed incinerator, ash settling drying

The H.L. Mooney Advanced Water Reclamation Facility has doubled its treatment capacity since its completion in 1979.

Advanced water reclamation facility recognized for its effluent quality & compliance

Situated in eastern Prince William County, Va., along the U.S. 1 corridor near the Potomac River, the Prince William County Service Authority's (PWCSA) H.L. Mooney Advanced Water Reclamation Facility treats influent wastewater from customers located in the eastern half of the county.

The facility was completed in 1979 and initially had a sewage treatment capacity of 12 million gal per day (mgd). The first major upgrade to the facility, which increased treatment capacity to 18 mgd, was completed in 1997. PWCSA completed a $131.7-million upgrade in 2010 to help further safeguard Chesapeake Bay through more intensive nitrogen and phosphorus removal. The project also expanded the facility's treatment capacity to 24 mgd to accommodate continuing population growth in the county.

Plant Infrastructure

A unique feature of the plant's infrastructure is gravity flow throughout the site. Two offsite pumping stations lift wastewater to the plant's headworks and wastewater flows by gravity to Neabsco Creek. The plant also features nitrogen removal flexibility, with two configurations for nitrogen removal.

"Under design conditions, the suspended growth activated sludge will produce a secondary effluent with a nitrate concentration of about 6 to 8 mg/L," said Maureen O'Shaughnessy, process engineer for PWCSA. "The nitrates will be further removed in the denitrifying filters with the addition of methanol at the filters.

"Under current flow and load conditions, the suspended growth activated sludge can be operated as a four-stage Bardenpho process, with methanol addition to the second anoxic zone," O'Shaughnessy continued. "In this mode, nitrogen removal is achieved in the activated sludge and the denitrifying filters are operated as conventional filters for solids removal, with no methanol addition."

Treatment Challenges

Among the plant's biggest challenges are stringent effluent quality standards.

"The plant is located in the watershed of the Potomac River and the Chesapeake Bay. Each of those water bodies has water quality standards that govern the final effluent quality requirements of the H.L. Mooney plant," O'Shaughnessy said. "The current Virginia Pollutant Discharge Elimination System Permit (VPDES) permit requires an annual average total nitrogen of 3 mg/L and a monthly average total phosphorus concentration of 0.18 mg/L. The plant has been achieving the phosphorus removal to 0.18 mg/L by ferric chloride addition since 1998, when the Potomac Embayment Standards were implemented in our VPDES permit."

The plant completed an upgrade in 2011 at a cost of approximately $150 million to achieve an effluent total nitrogen limit of 3 mg/L.

Other challenges are site constraints and close neighbors. "Like many publicly-owned treatment works around the country, the plant was built in a remote location that is now close neighbors with urban and residential land usage," O'Shaughnessy said. "The plant site is about 55 acres, with 38 acres associated with water reclamation. The location is bordered on two sides by residential development."

To combat these challenges, the plant is installing new odor control facilities, including primary clarifier covers, which are undergoing design.

For the Long Haul

In the near and long term, PWCSA will continue to consider technologies that improve operational efficiency and process control and meet evolving regulatory requirements at the water reclamation facility. It has plans to integrate low-energy turbo blowers, as the current blowers require replacement. Another technology under evaluation is ammonic-based dissolved oxygen control in the bioreactors to reduce energy usage and improve process control.

The facility recently was awarded the Platinum Peak Performance Award from the National Association of Clean Water Agencies, which is given to member public utilities that have operated without a permit violation for five consecutive years.

"It's a significant achievement to go five years in full compliance with our permit," O'Shaughnessy said. "It takes daily attention to the plant and to the effluent quality. Everybody has to work together to keep things running smoothly and to be that consistent." w&wd

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