NAME:

Hampton Roads Sanitation District - Nansemond Treatment Plant

LOCATION:

Suffolk, Va.

PLANT SIZE:

30 mgd

INFRASTRUCTURE:

Screening, primary clarifier and pumping, biological nutrient removal, disinfection, effluent pumping, scum disposal, odor scrubber

Three reactors installed in the facility have the ability to recover 1.5 tons of fertilizer on a daily basis.

The cost of producing the fertilizer from the nutrients will be offset by marketing the product to landscapers, golf courses and nurseries.

By Clare Pierson

Partnership in the Bay

New nutrient recovery and removal brings environmental and monetary bonus

The Hampton Roads Sanitation District's (HRSD) service area includes 17 cities and counties of southeast Virginia, an area of more than 3,100 sq miles and a population of 1.6 million. Wastewater flows through municipal collection systems to HRSD's interceptor system. This network of pipelines and pump stations conveys the flow to 13 treatment plants, which have a combined capacity of 249 million gal per day (mgd).

The Nansemond Treatment Plant (NTP), which began operation in 1983, is a 30-mgd facility that has received national awards for outstanding compliance with its environmental permits for 22 consecutive years. It treats wastewater and discharges into the James River, which leads into the Chesapeake Bay.

Center of Attention

In recent months, the region has been under some scrutiny and an intense spotlight. The watershed's worst problem is nutrient pollution—most notably, phosphorus and nitrogen—which fuels the growth of algae blooms that impact water quality and aquatic life. Chemical contaminants, air pollution, landscape changes, erosion and over-harvesting of fish and shellfish also stress the Bay and its wildlife.

President Obama issued the Chesapeake Bay Executive Order on May 12 that assembled a team of agencies to better protect the Bay. The team will decide the changes that need to be made regarding environmental regulations, programs and policies for the Bay, strengthening storm water management practices for facilities in the watershed, developing a best practices guide for reducing pollution runoff and assessing the impacts of climate change on the Bay and a strategy to adapt to these impacts.

The plant is currently being upgraded to a five-stage biological nutrient removal process to meet new nutrient regulations, which requires the NTP to average 8 mg/L total nitrogen and 2 mg/L total phosphrous annually.

Nutrient Removal & Recovery

Until recently, the NTP was using bacteria for nutrient removal from the raw sewage and the liquids were recycled to the headworks of the plant. The process was effective at removing nutrients, yet it offered the option of exiting them in solid fashion only. According to Bill Balzer, plant manager at NTP, recycling of the nutrients (primarily phosphorus) was consuming valuable plant capacity. Furthermore, no recovery option was available.

In 2007, the NTP began to pilot test a new recovery process called Pearl, by Ostara Inc. In this process, an Ostara reactor initiates a chemical reaction that processes the sludge liquids and recovers phosphorus and other nutrients, dramatically reducing the phosphorus and ammonia load returned to the liquid treatment train by 90% and 20%, respectively. The recovered nutrient stream is mixed with appropriate doses of magnesium chloride and caustic to precipitate struvite pellets. The pellets are then harvested from the reactor and formulated to become Crystal Green, marketed as an environmentally friendly, slow-release, commercial fertilizer that ensures that nutrients are absorbed by plants—in turn, reducing fertilizer runoff and pollution of the Bay's fragile ecosystem.

Successful Commissioning

According to Philip Abrary, president of Ostara, the pilot test of Pearl was successful and all parties were pleased with the results. All the agreements were signed in November 2009, and then construction on the Struvite Recovery Facility—an extension of the NTP—began. Everything had to be built from scratch and then integrated into the existing wastewater treatment plant.

Abrary said that with three reactors installed in the facility, 1.5 tons—3,000 lb of fertilizer—can be recovered on a daily basis. This amounts to 1 million lb per year.

"The recovery of the nutrients also eliminated buildup of struvite crystals in the plant pipes downstream of the dewatering process, which was a costly and time-consuming maintenance problem," Balzer said. "It will reduce the recycle load of nutrients from the dewatering process and complement the implementation of the improved biological nutrient removal process by recovering valuable plant nutrient removal capacity."

On May 27, 2010, a ribbon-cutting ceremony took place at the NTP, featuring Robert F. Kennedy as the keynote speaker. The plant is still in startup mode and is expected to be in full production by September 2010.

Partnership Blooms

In a unique public-private partnership, HRSD will offset the cost of the production of Crystal Green by selling all of the fertilizer produced at the facility to Ostara, which will be responsible for the marketing and sale of the product.

"It is a form of a partnership where the facility belongs to them and they operate it," Abrary said. "We provide a guaranteed off-date [for the nutrients], and they don't have to worry about disposal. The product can cover their operating costs."

"They are not in the fertilizer business," he said, "so we take full responsibility in the marketing and sales of the product to places like landscaping companies, golf courses and nurseries. Their responsibility ends as soon as it leaves their plant, and it is our responsibility to sell and make revenues."

"We now have a long-term solution for sidestream treatment that eliminates escalating chemical costs that would have been passed on to our ratepayers," Balzer said. "The project recovers a valuable resource, which provides a beneficial reuse for the agriculture industry." WWD

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