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Wastewater Treatment

A Windfall from Waste: Lucrative Septage Handling Earns New Hampshire Town $1.3 M Annually

Ballasted Settling Technology Enables Plant to Process 20 MG of Septage per Year

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For Florida wastewater treatment facilities that are grappling with the upcoming septage land application ban, the experience of a New Hampshire plant provides an attractive alternative for plant upgrades at no cost for taxpayers, while also profiting from septic waste. An innovative ballasted biological treatment helped the Allenstown, N.H., wastewater treatment plant (WWTP) expand capacity and generate $1.3 million in new revenues per year from septage.

The Allenstown facility serves two municipalities with a combined population of 15,000. The original plant was designed 30 years ago as an extended aeration activated sludge process with a 1.05-mil-gal-per-day (mgd) capacity. Raw wastewater passes through a headworks, aeration, clarification, and chlorine disinfection. Solids wasted from the treatment process are dewatered on a screw press, combined with septage solids, and landfilled.

An Affordable Solution for Increasing Capacity

Although the communities' sewers are not combined, infiltration and inflow were contributing to serious wet weather capacity issues that were amplified by the existing shallow clarifiers (7 ft deep). The state's Department of Environmental Services in 2005 found that the plant was exceeding capacity and placed a moratorium on sewer connections.

The utility sought design recommendations from consultant Hoyle, Tanner Associates (HTA). The firm proposed a comprehensive plant upgrade, including sequencing batch reactors, but voters twice rejected a proposed bond issue because of the project's high cost. Unable to get voters to approve a full plant upgrade, the sewer commission asked HTA to find a Plan B.

The firm recommended installing the BioMag® Ballasted Biological Treatment System from Evoqua Water Technologies. At a fraction of the price of the original plan, the BioMag system's low cost enabled the commission to work out a funding plan. Federal funds from the American Recovery and Reinvestment Act (ARRA) provided 50 percent of the funding needed for the project. The other half was provided by the sewage commission from the utility's capital reserve generated from septage revenue. Thus, the project was completed at no cost to taxpayers.

The project team was limited by the existing infrastructure, including the shallow clarifiers; however, the innovative BioMag System overcame that limitation. The technology integrated with existing infrastructure to greatly enhance its performance, which minimized project costs, including engineering and construction costs. The project was completed at a fraction of the cost of a full-scale upgrade and the municipality achieved consistent permit compliance.

Ballasted Settling Process

The BioMag System adds fine particles of magnetite (a readily available, fully inert iron ore) to conventional biological floc to make it heavier, dramatically improving settling rates and increasing clarifier performance without the addition of capital-intensive new tankage. It has proven effective where secondary clarifiers are at the choke point in wastewater treatment plants. This ballasted settling technology allows the biological process to carry a much higher biological solids concentration, providing more treatment capacity in existing tanks, with significantly smaller treatment volumes than alternative technologies.

Magnetite ballast is continuously recovered from the waste solids stream for recovery and reuse in the system. The WWTP recovers about 95 percent of the magnetite, which is stored on site, then blended into a sidestream of the return activated sludge and fed directly into the bioreactor where it is gently mixed and fully infused with the contents. As the specific gravity of the floc increases, biological solids settle faster and more reliably, resulting in extremely low clarifier sludge blankets.

The mixed liquor suspended solids concentration increases without the risk of upset, and the clarifier easily handles the increased solids loading rate. As a result, operators gain more control over sludge blankets, especially during storms, and tank capacity can be freed up for nutrient removal.

Capacity Increased and Settling Improved

The 20 mil gal (MG) of septage that annually arrive at the WWTP had negatively impacted the sludge settleability. In addition, the 7-ft-deep clarifiers did not provide much buffer capacity to handle peak flows. With the BioMag system implemented, settling issues disappeared, providing better handling of septage loads. The design flow was increased by 30 percent, which lifted the moratorium on sewer connections. Now, this facility can handle peak flows at five times the design flow, while maintaining a stable sludge blanket.

The new BioMag system came online in February 2011. About the same time, the plant staff made other modifications that included converting the extended aeration to a Modified Ludzack-Ettinger (MLE) process. The operations staff worked closely with HTA and Evoqua to install and start up the BioMag system. Different parameters were monitored during the commissioning of the ballasted aeration basin and clarifier to optimize the amount of magnetite in the system and the magnetite recovery rates.

The MLE and BioMag system improvements also enabled the plant to nitrify. Before the new system, the plant could not fully nitrify because of inadequate solids retention time (SRT); now, the plant easily achieves the SRT needed for complete nitrification with a high mixed liquor solids concentration because the clarifiers perform reliably and can handle the higher solids loading. The plant now has the ability to completely nitrify throughout the year.

The plant effluent meets biochemical oxygen demand and total suspended solids limits of 30 mg/L for release to the Merrimack River. While the state has not yet set new mass loading requirements, the plant's next permit mostly likely will require reductions in effluent concentrations as capacity increases. This, plus anticipated future requirements on ammonia, phosphorous, and copper, will make the BioMag system and its ability to stabilize the process and improve effluent quality even more critical to plant performance. But, most importantly, the BioMag system has paved the way for turning waste into profit for the citizens of Allenstown.

Dana Clement recently retired as senior superintendent of the Allenstown (N.H.) Wastewater Treatment Plant and currently serves as a consultant to the facility. John Irwin is technical sales manager with Evoqua Water Technologies in Ann Arbor, Mich.