A New Way to Manage

By Michael Kopper & Michele Whitfield

Thickening centrifuges save Kenosha wastewater treatment plant operational costs

The Kenosha (Wis.) Water Utility (KWU) is a forward-thinking organization that prides itself on continuous improvement, especially when it comes to the energy used and produced at its wastewater treatment plant.

Key to its ongoing efforts to upgrade its treatment plant are two Centrisys 200 THK thickening centrifuges that contribute to anaerobic digester efficiency, which in turn, allows the plant to reduce energy consumption. At the same time, the thickening centrifuges contribute to a first-of-its-kind process designed to enhance methane production as part of the plant's over-arching goal to achieve energy independence—while also reducing the volume of biosolids that need to be landfilled.

Establishing Goals

For decades, the Kenosha wastewater treatment plant relied solely on a dissolved air flotation thickening (DAFT) system to thicken sludge before it entered the 28-million-gal-per-day plant's six primary anaerobic digesters.

Originally added to the plant in the 1960s and upgraded in the 1980s, the DAFT system thickened sludge to a target solids concentration of 4%. By the late 2000s, however, the system began to show its age and decision-makers were faced with continuous repairs and upgrades. Repair costs were of particular concern given the scale of the system. It occupies two floors and consists of four bays, seven sludge pumps and three clear-water pumps, among other equipment.

Concurrently, plans called for a more progressive approach to energy production and consumption at the plant. That meant taking a close look at the anaerobic digesters and finding a way to create efficiencies, especially given the need to heat all six of them to 100°F throughout the year—including during often sub-zero Wisconsin winters.

KWU's ultimate aim was to reduce the liquid volume within the sludge stream and thicken it before feeding it to the primary digesters. Less water sent to the digesters ideally would reduce the number of digesters needed, in turn, lowering heat and energy costs.

With more substantial repairs to the DAFT system looming and bigger-picture goals coming more keenly into focus, KWU needed to determine the best direction to take for sludge thickening.

Thickening Centrifuge

In the process of deliberating, KWU decision-makers learned of a thickening centrifuge available from Centrisys Corp., which had earlier installed a successful dewatering centrifuge at the plant. It suggested the thickening centrifuge as a way to eventually replace the DAFT system—and help the plant move closer to its energy goals.

The Centrisys THK 200 thickening system, which requires no polymer under normal conditions, was designed to use centrifugal force to efficiently and cost-effectively separate liquids and solids. A feed capacity of up to 1,000 gal per minute (gpm) and a flow rate up to 1,000 gpm are possible in the largest unit; and a single THK thickener is capable of achieving dry-solid concentrations as high as 10%, depending on the application. Additionally, the self-contained, compact units consume minimal space in relation to DAFT systems, and consume 0.11 KW of power per gal per minute.

After analysis, KWU worked with Centrisys to install a THK 200 thickening centrifuge in 2011 along side the DAFT system for handling waste-activated sludge (WAS). Located in a walkway between two DAFT tanks, the unit occupies 100 ft, in stark contrast to the 10,000 sq ft consumed by the DAFT system.

The Next Level

The thickening centrifuge for WAS delivered favorable results not long after installation and

Centrisys made routine adjustments to optimize the unit. But KWU had more need for sludge thickening given even bigger energy goals.

Specifically, plans began to take shape for the Kenosha Energy-Optimized Resource Recovery System Project. The long-term project, which is a combined effort that involves KWU, Centrisys and its technology process arm, CNP Technology Water and Biosolids Corp., is designed to move the plant closer to energy independence and yield a lower-volume, eco-friendly biosolids product. Among the many facets of the initiative announced in September 2015 is the installation of North America's first Pondus Thermo- Chemical Hydrolysis Process (TCHP), which gives the plant more reusable methane than would otherwise be possible.

In planning the project, decision-makers opted to install a second THK thickening centrifuge to handle primary sludge. The second unit was installed in 2015. The use of two thickening centrifuges would result in even higher solids concentration (or lower liquids concentration). Combined, that meant the two units would do more to reduce the number of digesters to be heated. Working together, both also would lower the volume of biosolids, resulting in lower costs for landfill disposal. All the while, the ability to more significantly thicken the sludge stream is key to the Pondus TCHP's ability to generate additional methane.

Cost Savings

The addition of thickeners allowed KWU to meet its shortterm goals, and the utility fully expects them to contribute to its long-term goal of energy independence as the various systems that make up the Energy-Optimized Resource Recovery System Project are optimized throughout 2016.

The thickening centrifuge now serves as the main unit for thickening WAS, although the plant has retained the DAFT system for redundancy as the energy optimization project unfolds.

By adding the initial thickening centrifuge for the WAS thickening process, KWU avoided as much as $100,000 in repairs to the DAFT system. As such, the unit saves the plant time that would otherwise need to be devoted to maintaining the DAFT system. Additionally, the thickening centrifuge has increased the solids concentration to as high as 6%, versus a high of 4% with the DAFT system.

With the second primary sludge thickener now operational and working in tandem with the WAS unit, the plant has been able to increase its digester feed solids concentration to 7%. In all, the new thickening process is sending approximately half of the liquid to the digesters when compared with the amount it sent to them using the DAFT system alone. KWU fully expects the two combined thickeners will allow the plant to reduce the number of digesters from six to three, greatly reducing the energy consumption required for anaerobic digestion.

Looking ahead, KWU plans to gradually pull digesters offline as the Energy-Optimized Resource Recovery System Project becomes fully operational later in 2016. For now, plant officials are working closely with Centrisys and CNP to optimize all system components, including the thickening centrifuges, to ensure all systems are working synergistically and goals are met. That includes a wastewater treatment plant that is nearly energy independent, in addition to an operation that is able to lower costs associated with inefficient and labor-intensive older technology—while achieving even more cost savings, thanks to fewer biosolids to landfill.

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