

Kenosha Energy Optimized Resource Recovery Project

*TRANSFORMING MUNICIPAL WASTE BY-PRODUCT INTO
ENERGY-INDEPENDENT, ECO-FRIENDLY SOLUTIONS*

Kenosha's holistic solution for a self-reliant future in wastewater treatment



With decades-old technology falling into disrepair, many municipalities operating wastewater treatment facilities across North America are increasingly faced with a dilemma – maintain and repair the old and inefficient systems, or invest in new technologies. And when it comes to costs, either option ends up being an expensive endeavor for taxpayers. But one forward-thinking wastewater utility had another idea in mind – invest in a self-sufficient operation to reduce energy and disposal costs at the same time.

Designing an integrated system to meet multiple demands

The Kenosha Energy Optimized Resource Recovery System Project called for a range of complex requirements and the integration of multiple technologies in order to:

Generate onsite electrical power

The Kenosha Plant is rated at 28 million gallons per day. Not surprisingly, the energy for running a plant of that capacity doesn't come cheap. Kenosha, which is reliant on the local utility company for energy for electricity and heat, pays to the tune of \$200,000 to keep operations running.

Reduce the volume of biosolids requiring disposal

Costs for landfill disposals can be staggering. For the Kenosha Utility, biosolids disposal tallies 9,250 tons per year, which adds up to nearly \$350,000 annually. Other costs, ranging from processing to transportation, make the handling of larger volumes of biosolids expensive.

Produce biosolids that meet Class A criteria

Class A biosolids can be earmarked for beneficial use such as land-applied fertilizer, or energy – these are cost-neutral or revenue-producing applications. There are very few restrictions to using, applying or disposal of Class A biosolids.

Improve the solids management operations

The older technologies require a larger footprint with greater operation and maintenance requirements. The new technologies deliver the energy, volume and disposal requirements while still maintaining the existing effluent quality of the plant, without increasing ambient noise level, odors or other particulars beyond the plant.

A holistic solution for the solids-handling process

Building on an established relationship between the Kenosha Utility and CNP's parent company Centrisys Corporation, CNP came to the utility with a forward-thinking solution to upgrade the Kenosha Plant. The result was a first-of-its kind process in North America with the installation of the PONDUS Thermo Chemical Hydrolysis Process (TCHP). Scheduled to begin operations in November 2015, the utility is set on a path towards energy independence, eco-friendly disposal and significant long-term cost-savings.

The process will enhance the solids portion of the treatment plant's operations by harnessing the by-product for beneficial reuse. As sludge is transported through the system, it is thickened and then broken down through an anaerobic digestion process. A by-product of this process is methane gas, which is reused as a fuel in combined heat and power gas engines to supply heat for beneficial reuse and to generate electricity. The new PONDUS Hydrolysis Process allows waste activated sludge (WAS) to be used as a fuel source for the first time. The final biosolids byproduct is solidified and reduced in volume for final Class A Biosolids.



A Unique Partnership

CNP has exclusive distribution of the PONDUS Hydrolysis Process in North America.

The CNP Team worked together with the utility assisting with the process engineering and integration of the technologies for the overall system.

The CNP Team will work with the utility to provide optimization assistance for the technologies after start-up.

Parent company, Centrisys Corporation, located in Kenosha, WI, supplied one dewatering and two thickening centrifuges

for WAS and Primary Sludge thickening. Centrisys is the only USA manufacturer of decanter centrifuges for municipal water and wastewater.

Kenosha Utility is responsible for the equipment upgrades and implementation of the new process. The utility will also provide input and review as part of the design process and provide construction inspection/oversight. The utility will complete the testing and data collection that will be key in validating the process improvements and cost savings this system provides.

A technology ecosystem

While each technology plays a critical role individually, it is their unique integration that works together to bring this forward-thinking project to life:

Two **Centrisys THK 200's Thickening Centrifuges**, one for Primary Sludge Thickening and one for Waste Activated Sludge Thickening (WAS), combine to reduce the liquid volume within the sludge stream and thicken the sludge before entering the primary anaerobic digesters. This thickening technology yields a concentration of seven percent solids compared to the three to four percent solids produced by the older DAFT (dissolved air floatation) system. With thicker sludge, less water is sent to the digesters, reducing the number of tanks needed from six to three, lowering heat and energy costs.

PONDUS Thermo-Chemical Hydrolysis Process (TCHP) (United States Distributor – CNP) is the first installation of this technology in North America. The PONDUS Hydrolysis Process leverages thermal energy and chemical sodium hydroxide, breaking down cell walls of the microorganisms in WAS, and rendering the sludge more digestible by the anaerobic digesters. This innovative technology allows for additional methane to be derived from waste activated sludge previously not possible without PONDUS Hydrolysis.

The Kenosha waste water plant currently has six **Anaerobic Digesters**, but will soon reduce the number to three (two primary, one secondary) thanks to THK and the incorporation of PONDUS (TCHP). The anaerobic digesters create two byproducts in the process – biosolids and biogas (methane). Because the PONDUS (TCHP) breaks down the cell walls of WAS, the volume of biosolids that require handling after digestion is reduced. Methane is a reusable fuel source which will be utilized to generate thermal and electrical energy.

The **Biogas Conditioning System** reduces maintenance and increases the longevity of the CHP cogeneration units. This technology removes moisture and siloxane when the methane gas is produced. This occurs during the digestion stage in preparation to fuel the combined heat and power system.

Combined Heat and Power Cogeneration (CHP) units are powered entirely by the digester gas. Each unit will produce 330 kilowatts of continuous power, enough to power all equipment in the process, as well as provide supplemental power to the rest of the plant. In addition, the CHP units will produce heat that can be harnessed for reuse in the dryer and PONDUS System as well as for heating the anaerobic digesters and central plant heating loop.

The **Centrisys CS21-4HC Dewatering Centrifuge** installed in 2010 removes liquid from the digested sludge taking the biosolids to a 28-30 percent dry solids concentration, reducing the volume of biosolids for disposal.

A **Low Temperature Belt Dryer** takes the biosolids from the dewatering centrifuge from a dry solids concentration of 30 percent to 90 percent. The dryer also meets the time and temperature requirements to qualify the biosolids for Class A. This allows for land applied fertilizer or fuel applications.



PONDUS Thermo Chemical Hydrolysis Process (TCHP)

Benefits

Increased Biogas Production between 25 to 35%

Reduced disposal costs

Reduced polymer costs for dewatering

Increased digester capacity

Reduction of digester foaming

In Summary:

More biogas, lower biosolids treatment and disposal costs

PONDUS Hydrolysis - SIMPLE and EFFECTIVE without the use of STEAM

“ While the technologies each individually bring value, it is their holistic approach, as well as the collaboration of partners involved, that make this project special. The key for this successful initiative is trust among partners – Kenosha Water Utility, Centrisys and CNP leaders – and trust from the City of Kenosha in these leaders to deliver.

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General Manager, Ed St. Peter

The partnership for this project is a continuation of the partnership that began in 2011 between Kenosha Utility and Centrisys with previous plant installations, including the dewatering centrifuge and waste activated sludge thickener. This set the stage and confidence for this flagship project.

In spite of the groundbreaking technology and system upgrade, the taxpayers may not even notice - thanks to this first-of-its-kind self-financing solution that will generate power, heat sources, and provide more cost-effective disposal.

It's a win for everyone, and the ecosystem, too.