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Ed St. Peter
Kenosha Water Utility General Manager

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Ed Nevers
Donohue & Associates Senior Vice President & Kenosha Water Utility Project Manager

Project Roles
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Project Summary
The Kenosha Water Utility completed the Energy Optimization Resource Recovery Project in 2015. The project reduced energy and solids handling costs by 20%, reduced dependence on fossil fuel energy by 40%, removed 10,000 tons annually from landfills and produced a Class A EQ biosolids product that produces the annual reuse of 500 tons of nitrogen and 250 tons of phosphorus.

The project delivered a cost-effective and eco-friendly solution to biosolids handling, processing and disposal. This design integrated equipment and processes never used in North America, while incorporating the technologies into existing buildings and a 1980s infrastructure. Goals included:

- Increase biogas generation from the sludge anaerobic digestion
- Generate electricity from the biogas to produce over 500 kW of continuous power for the facility
- Use electricity generated to offset peak energy pricing during high-demand periods
- Use electric and thermal energy to dry the biosolids and reduce the volume of biosolids cakes to 90%
- Eliminate the volume and cost of landfilled biosolids
- Produce high-quality biosolids that meet Class A biosolids criteria
- Recover and use waste heat as the main thermal energy supply for the facility

At the same time, the new process and individual technologies had to maintain the existing effluent quality and not increase ambient noise level, odor or particulates beyond the facility area.

Discover more at Centrisys-CNP.com
EnerJen Power North American Installation of PONDUS TCHP

PONDUS Optimizes Your Sludge Treatment Process

More biogas, lower biosolids treatment and disposal costs, PONDUS TCHP is simple and effective without the use of steam.

Reduce Viscosity of Thickened WAS up to 80%
Reduce Anaerobic Digestion Volume up to 50%
Improve Biosolids Dewatering up to 20%
Reduce Polymer Consumption up to 30%
Reduce Digester Foaming

CASE STUDY: Kenosha Water Utility Energy Optimization Resource Recovery Project

Original or Innovative Application of New or Existing Techniques

Thermal Hydrolysis Process (THP)
- CNPs PONDUS uses caustic soda and heated water to break down waste-activated sludge and enhance biogas production. The thermal energy, required for the hydrolysis process, transfers and heats the digesters. This process breaks down the cell membranes of the thickened waste-activated sludge, releasing organic acids which are consumed quicker in the anaerobic digestion process.
- Following installation, Kenosha achieved a 30% increase in biogas production. Minimal digester foaming has been experienced since the upgrade, attributed to PONDUS.

Thickening Improvements
- Centrisys’ THK200 sludge thickener for primary sludge reduces the amount of water fed to the anaerobic digestion process. The benefit is significant, as it serves to:
  - Increase digestion time
  - Enhance digestion performance
  - Reduce biogas production
  - Reduce the amount of biogas required to heat the digesters

- The THK200 doubled the solids concentration and cut in half the amount of water sent to the digestion process.

Digester Improvements
- Donohue designed the digester mixing system to perform at solids loading rates that far exceed conventional loading rates, almost double the recommended 10 States Standards and WDNR requirements.
- Pre-thickening the sludge with the THK200, along with the robust digester mixing system, allows the digestion process to perform with half of the original digester volume. Kenosha effectively operates with half the number of digesters in service, reducing from six to three.

CHP Units
- A pair of combined heat and power (CHP) cogeneration units are powered entirely by biogas, providing supplemental power to the plant. They also supply heat for the dryer, PONDUS, anaerobic digesters and central plant-heating loop. Each CHP unit is capable of producing 330 kW of electrical energy and 422 kW of thermal energy.

Biogas Conditioning System
- A biogas conditioning system was designed to reduce maintenance and increase the longevity of the CHP units.

Pre-Energy Optimization Project Improvements

2009: Centrisys’ CS21-4HC dewatering centrifuge replaced three plate and frame presses, reducing the dewatering footprint, chemical usage (lime and ferric), disposal and operation costs. The ROI was 1.5 years.

2011: Centrisys THK200 for WAS replaced four DAFT units. The THK200 operated 24/7, used no polymer, achieved 5% TS cake and 95% capture. Kenosha also avoided $100k in DAFT repairs. In 2015, for the Energy Optimization Project, the THK200 (WAS) was slightly modified to currently use a low polymer dosage to extend the operating range to 6-7% TS thickened solids for PONDUS.

Exceeding Client/Owner Needs
- The Kenosha Water Utility project represented a collaborative design-build partnership that brought together Donohue & Associates (engineers), Centrisys/CNP (project developer), contractors, subcontractors and Kenosha Water Utility officials to successfully complete the project on schedule and within budget. The design-build team was able to successfully design, build and operate the new facilities in 13 months. A typical approach normally takes two years or more. Today, the Kenosha Water Utility stands to save $750k annually.

2017 ACEC Grand Award Winner

Left to right: Ed St. Peter (Kenosha Water Utility), John Martin Antaramian (Mayor of Kenosha), Michael Kopper (Centrisys/CNP), G. John Ruffolo (4th District Kenosha Alderman), and Mike Gerbitz (Donohue & Associates)
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