



First in U.S. - Thermo-Chemical Hydrolysis Increases Biogas Production

Energy Innovation

Faced with rising landfill disposal fees and energy costs, the Kenosha Water Utility (KWU) redesigned their solids management process to address these growing concerns. Multiple changes were made to the process in a pointed effort to reduce their reliance on purchased energy and their costs associated with landfilling the biosolids.

Kenosha recognized that they could expand on their existing biogas utilization by installing the PONDUS thermo-chemical hydrolysis sludge pretreatment system; the first use of such a technology in North America. They partnered with local Kenosha firm, Centrisys, to help design and implement the biogas recovery project. Additionally, KWU submitted the resulting design concept to the Focus on Energy Renewable Energy Competitive Incentive Program (RECIP), and was awarded a \$500,000 grant to help with the implementation of this project.

This solids management project was the largest energy project undertaken by the utility to date, and gave the utility the chance to utilize truly innovative technology to help them meet their goals.

“We were very excited to implement this project because of all of the benefits it provided the Utility and our customers. The \$500,000 grant from Focus on Energy was a huge incentive for us to move forward with it.”

– Ed St. Peter, General Manager for Kenosha Water Utility

KENOSHA WATER UTILITY

The Kenosha Water Utility (KWU) has operated since 1895, and currently provides water and sewer service to nearly 110,000 people in the greater Kenosha metropolitan area of Southeastern Wisconsin. The waste water treatment plant was placed into service in the late 1930s and has undergone several key expansions since that time. The last major capital improvement was a major infrastructure and process upgrade in the 1980s. KWU has worked consistently with Focus on Energy since the program’s inception in 2001. Previous participation focused on lighting upgrades and industrial process improvements which are now saving the utility 1.25 million kilowatt-hours per year.

CENTRISYS

Centrisys, the provider of the PONDUS process technology used for this project, was founded in Kenosha in 1987, initially as a centrifuge service team. Since its inception, Centrisys could offer more than just repairs; its goal had consistently been to improve the technology itself. Now, Centrisys actively advances centrifuge technology, making its products and design assistance a smart choice for this particular project.

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PROJECT SPECIFICS

PONDUS Thermo-Chemical Hydrolysis Process (TCHP)

To maximize their biogas recovery, Kenosha installed a truly innovative technology not yet utilized in North America: the PONDUS thermo-chemical hydrolysis process. Centrisys is the exclusive distributor of this process in North America.

This technology applies caustic soda and high heat over a period of about two hours to the waste activated sludge (WAS) before digestion. The resulting material is a pre-conditioned WAS; the biological cell walls are broken down and the organic acids are released. This pretreatment encourages the release of biogas; ideal for a biogas recovery project such as this.

Biogas Conditioning and CHP Generators

Kenosha had previously been using the biogas recovered from the digesters to power one pump in their pumping station, but decided to expand upon this. They now recover biogas from the active digesters and the PONDUS reactor, condition it, and use it to generate electric and thermal energy in combined heat and power (CHP) generators. This energy is then used to power the utility's new solids management process, with some to spare.

"For many years, biogas was used to power one pump in our pumping station. Any remaining gas was burned off via a flare at the back of our facility. Now, none of the biogas is wasted. The CHP units provide both electrical power and heat to help with solids digestion and solids drying."

- Ed St. Peter, KWU



PONDUS Reactor

NOT JUST ABOUT BIOGAS!

Effectively recovering the biogas, and using it to generate energy on-site, has allowed Kenosha to implement additional cost-saving measures:

- PONDUS increases the effectiveness of the digesters by removing some of the burden of digestion. The installation of Rotamix hydraulic mixers in each digester, plus the PONDUS pretreatment, allowed Kenosha to reduce their digesters from six to three. Because the digestion process is the largest consumer of thermal energy for the utility, cutting their active digesters in half drastically reduces their thermal demand, all while maintaining the same volume of digestion.
- The heat recovered from the CHP generation is also used to dry sludge on a new belt dryer. This Sulzle-Klein belt dryer produces biosolids of a high quality, allowing them to be reused beneficially instead of landfilled.

An innovative approach to biogas can be the key to unlocking an overall more effective solids management system.

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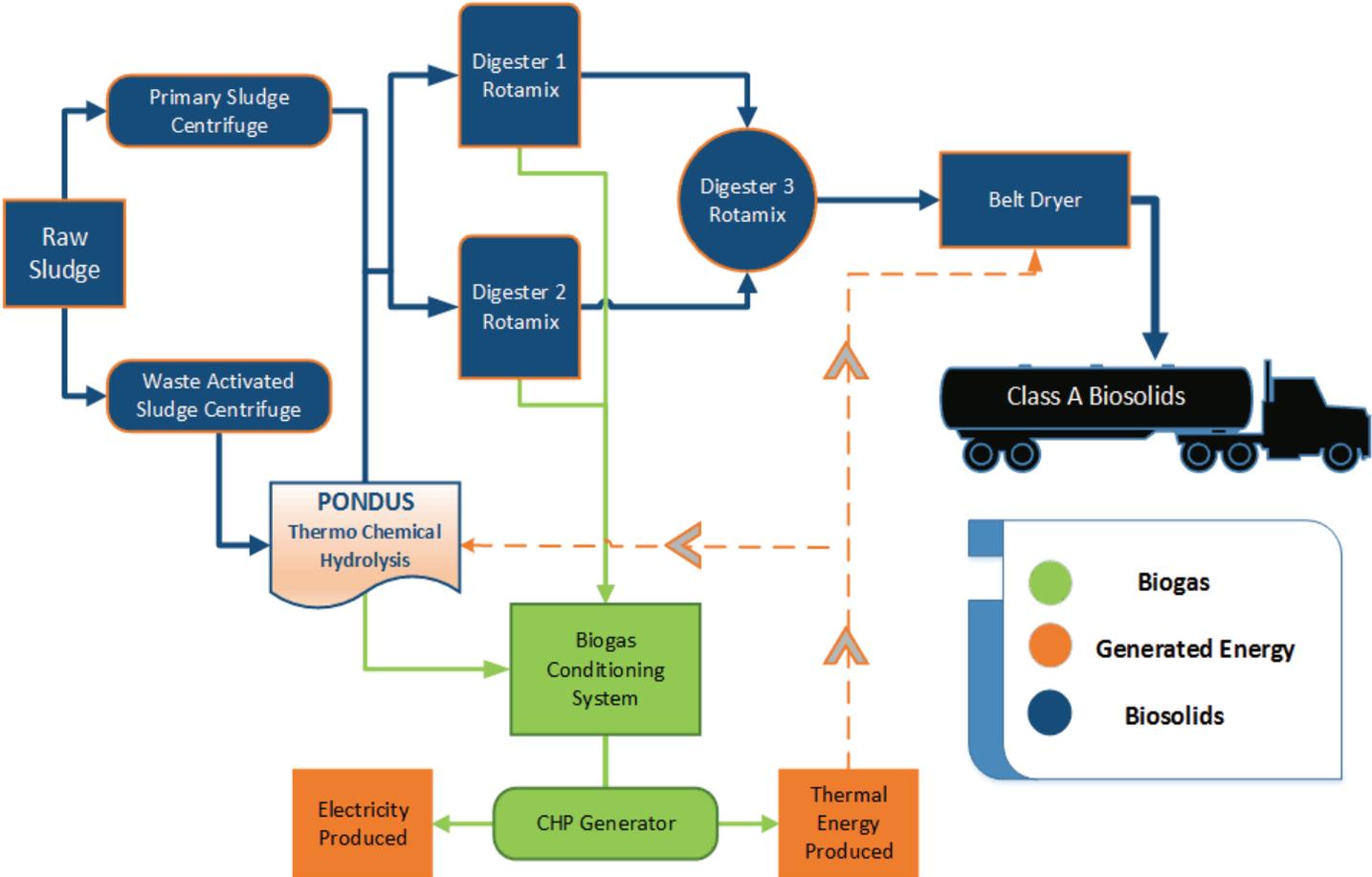
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BIOSOLIDS AND BIOGAS UTILIZATION AT KENOSHA WATER UTILITY



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PROJECT RESULTS

Optimization and Savings

The new system was installed and operational in October 2016. Optimization of the new biosolids management process is ongoing, and Kenosha's initial projections indicate that they will save roughly \$635,000 per year due to the reduction in purchased electricity and biosolids management costs. Focus on Energy estimates that the energy savings alone results in savings of more than \$500,000 a year over the lifetime of the project.

Recently, in March of 2017, the Wisconsin DNR granted approval to allow KWU to begin distributing the class A biosolids product consistent with Kenosha's Water Pollution Discharge Elimination System permit (WPDES), allowing Kenosha to find other destinations for the solids besides a landfill. KWU is working with the horticulture department of a local technical college to determine the beneficial uses of the dried biosolids. They are also reaching out to local farms and landscapers to determine what interest there may be in this product.

The system is now being operated under a wide variety of operational scenarios that will allow data to be collected to verify the effect that each individual component has on the treatment process and on the system as a whole. Optimizing multiple pieces of equipment at the same time is no small task. It takes a team effort and the plant staff has learned quickly how to operate the new system and to provide input into its optimization.

SUCCESSFUL INNOVATION

The benefits of this energy efficiency project go beyond the utility just receiving incentives from Focus on Energy. KWU is now expected to save its ratepayers over \$11,000,000 in energy costs from these improvements over the life-time of the project.

Up and running, the new system now uses internally-generated, renewable energy. Furthermore, the new system avoids greenhouse gas generation from both fossil fuel burning and methane discharge from the waste.



Pictured left to right: Katie Karow, Director of Operations, Curt Czarnecki, Director of Engineering, Jan Michalski, Water Commission Chairman, Joe Cantwell, Focus on Energy, Dave Lewis, Assistant General Manager, Melissa Arnot, Director of Operations, Patrick Juliana, Water Commissioner, Scott Gordon, Water Commissioner, Sue Hill, Director of Administration and Personnel, Eric Haugaard, Water Commissioner, Rhonda Jenkins, Water Commissioner, Ed St. Peter, General Manager.

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