Accelerated Upgrade to Anaerobic Digestion Facility Paves the Way for New Yogurt Plant

CASE STUDY

Location: **Cortland, New York**
Owner: **City of Cortland**
Engineer: **Cedarwood Engineering**
Contractor: **Hubbard Construction**
Agent: **Koester Associates, Inc.**

Problem

Over the last several decades, the Cortland, New York, area has lost thousands of manufacturing jobs. When a large dairy processor expressed interest in placing a new Greek yogurt plant in an industrial park in Cortland, the community improved its chance to secure the plant and provide future economic growth by upgrading the city's wastewater treatment plant (WWTP) so it could offer no-cost trucked waste disposal for the dairy facility.

One of the significant issues driving the upgrade was that the acid whey from the Greek yogurt process could not be accommodated by the current wastewater treatment facility. The municipality needed a quick solution.

Installed Equipment

Quantity	Equipment Name	Size
2	Radial Beam 304SS Fixed Covers	36 ft diameter
2	Internal ExtremeDuty Mixers	24 in diameter
1	DuoSphere Digester Cover	36 ft diameter
2	External ExtremeDuty Mixers	24 in diameter
1	Tube-in-Tube Heat Exchanger	0.42 MBTU

The City of Cortland worked with Cedarwood Engineering to upgrade the WWTP plant so it could process the waste from the yogurt plant and generate heat and electricity from the methane produced from the trucked waste.

Analysis of Alternatives

The municipality had initially planned a new, large digester to accommodate the trucked waste, as well as a modest upgrade to its existing digester facilities. However, the time required for this option caused the facility to rethink the design of the project, and it decided to do a thorough upgrade to the existing digesters to more quickly accommodate the needs of the new yogurt plant.

Recommended Solution

The timeline was aggressive. WesTech received a purchase order in March, and the equipment was delivered in early June. The tight schedule encouraged the team to overcome any design obstacles that threatened delay. With

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the time constraints, WesTech suggested options that would work well with the equipment that was already in place at the facility.

The new plan replaced the aging carbon-steel fixed covers with new covers made of 304 stainless steel, changed the gas storage from a fiberglass floating cover to a DuoSphere™ dual membrane gas holder, and converted the secondary digester to a third primary digester. These upgrades increased the plant's capacity so it could accommodate dairy waste and give the facility staff breathing room to plan the new digester and associated combined heat and power (CHP) equipment to be completed in a later phase.

The initial phase included:

Mixers

The existing gas mixing systems on the primary digesters were only marginally effective, even when they were working properly. The plant had issues with throughput, volatile solids reduction, and gas production. It was clear that the plant needed to improve its mixing to meet the project goals.

The facility had seen, and wanted, a gas piston-type system for the mixer because this design had no moving parts in the tank. But this required a costly retrofit and would have taken valuable building space for the compressors. The facility decided to install four WesTech ExtremeDuty™ sludge mixers, which saved space, assured reliability, and helped the project schedule stay on track. An added benefit was that these mixers are reversible and can reduce the risk of rapid volume-expansion events because they can pump down to eliminate low-density sludge, scum, and foam.

Covers

The existing steel covers had corroded badly and needed to be replaced. To meet the schedule, two stainless steel covers were provided to replace the existing ones. Stainless steel covers are faster to install, as they require less welding than carbon steel covers, no blasting, and no painting.

External ExtremeDuty sludge mixers

To capture the increased gas produced by the added whey, Cedarwood Engineering recommended the DuoSphere dual membrane cover to replace the floating cover. This would give the facility significantly more storage and flexibility when it implemented cogeneration in the next phase of the project. The ability to run at a higher operating pressure than the plant had with the concrete-ballasted rigid fiberglass gas holder was also a plus.

Heat Exchanger

The tube-in-tube heat exchanger was selected to preheat the whey before sending it to the digesters. This feedstock is trucked in from the dairy processing facility, and the heat exchanger ensures that it stays in a liquid state

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for processing. The heating requirement is more significant in the winter, but the heat exchanger system is designed to accommodate these seasonal variations.

Implementation

One of the things that sets this project apart from others is how well the project team, client, contractors, manufacturer, and engineers cooperated and adapted to the various needs of the project under the tight timeline. "All partners worked in concert, putting the success of the project ahead of other considerations," said Bruce Adams, superintendent of the Cortland Wastewater Treatment Facility. "Having partners that were nimble and responsive was very important to the project's success."

The DuoSphere was the first cover installed, requiring just three weeks for installation (a much shorter time than installing the steel covers) and allowing this newly covered and mixed digester to start up much sooner than the others.

The installation of the stainless-steel covers was particularly well suited to the Cortland plant and its project schedule. Stainless steel covers eliminate priming, painting, and the need to periodically inspect the interior coatings. The shop welding of alternate "pie slice" pieces allowed the covers to be quickly installed.

The internal mixers were easily mounted at the center of each of the two fixed covers. The two external mixers were mounted to the outside of the DuoSphere-covered digester.

Tube-in-tube heat exchanger

New stainless steel cover and DuoSphere dual membrane gas holder

At high temperatures, minerals may collect and form hard grey-colored granules referred to as "milk stone," which can foul the heat exchanger tubes. To minimize the problems, the heat exchanger was provided with glass-lined tubes and fittings, and the facility set up an annual inspection schedule. Ports were provided on the piping so that if fouling becomes a problem, an acid wash system can be installed, and the heat exchanger will be periodically cleaned in place.

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With an aggressive schedule, it was not surprising that the occasional coordination challenge arose. For example, the size and location of the heat exchanger made for a difficult installation. The exchanger needed to be almost completely disassembled to fit through the access hatch, around some piping, and into position and reassembled two stories below. Only later did the installer realize that WesTech could have designed the heat exchanger in smaller sections had everyone been aware of this issue.

"WesTech was highly responsive throughout the installation and start-up process, reacting quickly to any issues that popped up and working closely with our agent, Koester Associates, to ensure all their equipment was properly installed and operational," Adams said.

digester complex into a facility with a 50-percent greater hydraulic capacity and the ability to treat this new, unique waste stream in a sustainable way. "The wastewater facility is far and away the largest greenhouse gas (GHG) producer within the Cortland city government," Adams said. "The combined heat and power project at the heart of our relationship with the dairy businesses will reduce our GHG to a small fraction of what it was. The next phase of the CHP project promises to reduce the carbon footprint to near zero."

The project is a timely response from the municipality to the challenge of climate change and shows potential residents and businesses that the city is proactive regarding environmental stewardship.

The digester facility has a much greater capacity because of the upgrades, particularly with the mixing improvements, and this will benefit the plant for many years to come. Carbon steel equipment was replaced with long-lasting stainless steel to avoid the regular expenses, downtime, and hazards of inspection, repainting, and replacement.

WesTech is proud to be part of this project that quickly gave the WWTP the ability to provide no-cost trucked waste disposal for the new dairy plant. This improves the city's competitive economic position, allows for future opportunities, and strengthens the local economy. Additionally, the update gave the City of Cortland more control over operational costs of its most energy-intensive endeavor – wastewater treatment.

Results

The Cortland WWTP successfully transformed a 75-year-old

After: New covers installed on existing tanks for the anaerobic digestion location at the site, including internal and external mixers

Before: The Cortland Wastewater Treatment Plant with anaerobic digestion site indicated by the circle

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