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Moving beyond biosolids

Features - Operations Spotlight

KB BioEnergy's Akron, Ohio, anaerobic digestion facility is undergoing a transformation that will allow it to accept food waste alongside biosolids.

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Codigestion of food waste: few currently implement it, many are considering it, everyone's talking about it—and justifiably so. Food waste diversion legislation driven by awareness of food scraps' egregious greenhouse gas emissions and landfill space residency is prompting a combative twofold approach to the issue: 1. reducing food waste to begin with and 2. diverting what food is tossed to clean energy and organic bioproduct creation. It is within the diversion methodologies that food waste codigestion popularity is rising.

Existing anaerobic digester facilities, like those at KB BioEnergy's renewable energy facility in Akron, Ohio, are poised to strategically upgrade their current infrastructure to accept food waste for codigestion.

Digesting tossed food alongside biosolids can be advantageous for current digester operations due to food waste's robust biogas potential, added earnings from tipping fees, surplus fertilizer production and benefits associated with an improved carbon footprint and keeping organics out of the landfill.

Expansion plans are now in the works for KB BioEnergy to begin bringing food waste on-site for codigestion beginning as early as 2018. A large part of KB BioEnergy's strategy for easing this operational transition comes from preparing for the expansion years in advance and a solid understanding of what areas of the current facility must be considered.

A BRIEF HISTORY

KB BioEnergy installed a set of anaerobic digesters in 2007 (Phase I) with a capacity to annually process 5,000 tons of Akron's dried biosolids. This state-of-the-art system from BIOFerm Energy Systems, Madison, Wisconsin,

coined Euco Titan, was the first of its kind in the U.S., and included one wet complete-mix digester, Coccus, paired with one dry plug-flow digester, Euco.

Many U.S. wastewater treatment facilities use anaerobic digestion, however, KB Bioenergy's Euco Titan system was uniquely capable of processing dewatered biosolids arriving to the digesters at approximately 18 percent total solids (TS) to produce energy and soil conditioner.

Due to Phase I's stark success and profit margin, an expansion was added in 2013 (Phase II) which presently allows the facility to process 100 percent of the city of Akron's biosolids—15,000 tons per year—through the addition of two more Euco digesters and two more Coccus digesters.

This operation has a present day capacity of 1.8 megawatt electric and generates enough renewable electricity to power nearly 1,600 homes. High-quality Class A soil conditioner products are simultaneously created alongside clean energy by drying and pelletizing the digestate material to greater than 92 percent TS content.

making preparations

Dating as far back as the initial stages of Phase II, personnel at KB Bioenergy had the foresight to choose components that could one day be adapted for a codigestion Phase III expansion at their facility. Today, changes are taking place which will allow for the processing of valuable food wastes alongside biosolids. A range of renovations will be made to allow for this transition with the most notable being temporarily decommissioning the original Phase I digester units in preparation to start back up again—but this time digesting food waste.

Around 40,000 to 50,000 tons per year of liquid food waste, plus an additional 20,000 to 25,000 tons per year of high-solids food waste, is expected to be codigested at KB BioEnergy within the original Coccus and Euco tanks once Phase III upgrades are fully implemented. The liquid food waste trucked in will be stored in newly constructed heated holding tanks and an indoor feedstock receiving area to control and treat odors. A storage and transfer area will be erected for the high-solid food waste.

These waste streams may consist of minimally contaminated, preconsumer food waste such as fats, oils and greases (FOGs), grocery waste, local food processing material, bakery scraps and organic superstore waste. The high-solid organic portion of this mix will undergo grinding and maceration with new preprocessing equipment; if materials have higher than anticipated contamination levels, screening and sorting may also be required.

Expansion success story

In June 2011, two digesters from DVO Inc., Chilton, Wisconsin, helped turn Brian Furrer's family farm into an operation called Bio Town Ag. Because the first digesters were so successful, a third DVO digester was installed in 2013.

The Furrer family farm has been in operation since 1966, but with the help of DVO's digesters, the multigenerational family agribusiness is now 100 percent sustainable—using DVO's digesters to turn manure, food waste and organic waste into energy. At Bio Town Ag, based in Reynolds, Indiana, no organic waste stream is considered waste—it is a resource.

Bio Town Ag is an operation of 4,500-head beef cattle and 800-head sow and swine. The majority of the waste put into the digesters is comprised of food and commercial processing waste from the surrounding region.

Bio Town Ag is the largest U.S. agricultural biogas-to-energy project. Combined, the three digesters at Bio Town Ag total to 222 feet wide by 300 feet long and can hold 7 million gallons of waste. DVO's patented two-stage mixed plug flow technology integrates and refines two conventional technologies: mixed and plug flow.

The system continually mixes a wide range of waste solids using a first-in, first-out design, guaranteeing retention time and maximizing waste digestion, says the company.

The electricity produced from the digesters is enough to power more than 4,000 homes. The digesters reduce 43,800 tons of carbon dioxide emissions from coal-fired power plants and save 127,750 tons of material from going to landfills.

The digesters can produce enough biogas to power more than five 1.05 megawatt units.

The micronutrient-rich fertilizer saves 7,250 tons of phosphorus, nitrogen and potassium mined for artificial fertilizer. DVO's nutrient recovery technologies mark a major advancement in the industry, according to the company. The company's options are designed to remove 90 percent of phosphorous and 70 percent of ammonia from hog waste. These recovery options can provide farmers nutrient management flexibility and help them comply with environmental regulations.

Once all food materials are in a pumpable form, a new blended feedstock tank will accept both liquids and ground high-solids food waste. This stream will then be pumped to the existing Phase I digester tanks to create biogas and digestate.

Depending on feedstock availability and sourcing, an additional 600 kilowatts electric combined heat and power unit (CHP) may be installed alongside the 1.8 megawatts electric CHP to create additional energy from the surplus biogas.

A 200,000- to 300,000-gallon capacity tank also will be constructed to hold the extra digestate solids before they are transformed into nutrient-rich pelletized fertilizer and added to the existing value chain by way of current centrifuges and dryer equipment.

LOOKING TO THE FUTURE

A future-forward outlook at wastewater treatment plants can allow for designing a facility that requires relatively few modifications during expansions—planning for interface with the existing facility allows for an easier, and more cost-effective, transition to codigestion. And for facilities with existing digesters that have not thought ahead for expansion, it can still be worthwhile to consider accepting food waste if there is sufficient space on-site.

KB BioEnergy's early planning will allow many of the codigestion changes, such as upgrading the process control system, to require only simple renovations to current equipment.

Some updates will be more intensive despite KB BioEnergy's preemptive strategy and thorough evaluation of what components can be retrofitted versus what needs to be removed or added to the system.

For example, the biogas lines originally sized for a biogas flow half that of what will be produced once food wastes are accepted and will need to be upgraded. They also will need to address odors and residuals and a pump/control/engine room and add in a different pump room.

Even as KB BioEnergy plans for the upcoming codigestion Phase III, it is continuously looking even further into the future. Ideas include the possibility of a Phase IV expansion another five or six years out where postconsumer municipal solid waste could also be processed. This would require more infrastructure and handing of residuals.

The author is channel marketing manager at BIOFerm Energy Systems, Madison Wisconsin.

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