ClimateWire
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TECHNOLOGY:

San Jose to get energy and compost from its garbage

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ClimateWire: Tuesday, November 26, 2013

Long known as a culinary capital and grower of much of the nation's food, Northern California last week became home to the world's largest food waste-to-energy plant, a behemoth anaerobic digester that occupies a 39-acre brownfield site in north San Jose on the edge of the San Francisco Bay.

The digester's 16 concrete-lined chambers, which rely on dry fermentation to convert food scraps and other organic materials into methane gas, are initially capable of processing 90,000 tons of refuse per year -- wastes that would otherwise be trucked to landfills, according to the project's developers, GreenWaste Recovery and Zanker Road Resource Management.

The two firms launched the Zero Waste Energy Development Co. (ZWEDC) after San Jose in 2010 adopted changes in its waste management practices to capture the organic portion of the 1.8 million tons of solid waste generated annually by the city's residents and businesses, including roughly 3,000 restaurants.

According to ZWEDC, the facility's first phase of operation will process the city of San Jose's commercial organic waste -- including pre- and post-consumer food waste, residuals from wet and dry materials, and yard waste -- under a 15-year contract between the city and the company.

In addition to dramatically reducing the amount of solid waste going to landfills, the digester's phase 1 operation will annually capture 125 million cubic feet of methane gas, considered by scientists to be a much more potent greenhouse gas than carbon dioxide.

The gas, which would normally be vented or flared from a conventional landfill, will instead be converted into an energy fuel to help power an adjacent recycling facility owned by the partnership. Excess power will be sold to regional utility Pacific Gas and Electric Co. to help meet California's renewable portfolio standard, which calls for 33 percent of the state's electricity to come from renewable resources by 2020.

The environmental benefits will also help San Jose meet 10 goals laid out under its sustainability program, called "Green Vision." Among them are to divert 100 percent of the city's wastes from landfills by 2022 and to convert much of that diverted waste into energy.

San Jose, Calif.'s waste-to-energy process starts with organic garbage (top) and ends with high-grade compost (bottom), and in between, it generates a considerable amount of methane for energy uses. Photo courtesy of Zero Waste Energy Development Co.

'Saving our landfills'

"This project is very significant because it gets at organic waste, which is kind of the last big source of raw materials that is still going into landfills in California," Jo Zientek, San Jose's deputy director of environmental services, said in an interview.

While most cities in the densely populated Bay region haul their waste hundreds of miles to rural treatment plants, "we're actually taking care of the whole problem right here in our city limits, which is quite unique," she added.

While the ZWEDC digester is set to take its first truckloads of organic waste early next month, developers say the facility will eventually be able to take in as much as 270,000 tons of organic waste per year -- roughly the equivalent of 60 fully loaded garbage trucks per day. The waste will then be broken down in a zero-oxygen environment by bacterial microorganisms.

Spencer Morgan, the facility's safety and environmental compliance manager, said the San Jose plant represents nothing less than "the future of waste management."

"We're pretty much saving our landfills," he said. "These sites are getting filled up rapidly, and there's not enough room for future generation. We have the technology to divert a lot of this organic waste and use it for other purposes. So why not take advantage of it? It's a huge step."

While the San Jose biogas plant will set a new bar for size, scale and advanced technology, the process of converting waste to energy dates back many years and has applications in a variety of sectors, most notably municipal wastewater treatment facilities, which use wet anaerobic digestion chambers to convert methane into a fuel for heat and electricity.

According to U.S. EPA, about 1,400 wastewater plants in the United States use some form of wet anaerobic digestion, and around 900 of those plants convert biogas into renewable energy.

Moreover, the technology is finding applications in new places and using new streams of organic wastes.

Heat to a casino, juice to a stadium

In October, one of the nation's largest free-standing wet anaerobic digesters opened in Milwaukee adjacent to a casino owned by the Potawatomi tribe of Forest County, Wis. The plant relies on organics waste from Wisconsin bakeries, cheese plants and soy processing facilities, according to officials with Greenfire Management Services LLC, the tribally owned management firm operating the digester.

The biogas produced by the plant's two 1.3-million-gallon digesters is burned in an on-site generator capable of sending 2 megawatts of electricity to the grid, where it is purchased by regional utility We Energies. The project will eventually provide hot water to a 381-room casino hotel that is under construction, according to Stephanie VanHaag, Greenfire's director of business development.

Many smaller digesters, including some unique demonstration projects, are also appearing in places not normally thought of as waste-handling venues. For example, the Cleveland Browns recently installed a massive food grinder and 2,500-gallon storage tank at their FirstEnergy Stadium to capture an estimated 3.5 tons of food waste generated by vendors and 70,000-plus game day fans.

The Browns stadium project, spearheaded by Cleveland-based Quasar Energy Group, will produce biogas for electricity generation as well as biosolids that can be used to fertilize farm fields. "Big sports complexes generate a lot of waste in a little period of time," Quasar President Mel Kurtz recently told the Cleveland *Plain-Dealer*.

Developers of the ZWEDC facility in San Jose stress that one key difference between their technology and most of the existing digesters -- including those in Wisconsin and Ohio -- is its reliance on dry fermentation, meaning the digestion process requires very little water. A percolate tank is used to activate the bacteria at the beginning of each digestion cycle. But once digestion begins, the process works with very few inputs of additional energy or natural resources.

According to Lafayette, Calif.-based Zero Waste Energy LLC, the designer and licensee of the German-invented dry digestion technology being used by ZWEDC, the approach is ideal for urban areas and other sites where regulations or public health concerns require operators to work within small footprints and keep waste streams tightly controlled.

Zientek, the San Jose deputy director of environmental services, said her city is pleased to be the first U.S. site to host the new waste-to-energy technology. And as awareness of the environmental costs and benefits of organic waste management grows, she believes other cities, large institutions and even private businesses will adopt the technology.

"Right now, a lot of the businesses that will benefit the most from this waste strategy don't even know it's happening," she said. "But San Jose is the 10th largest city in the country, and our goal is to have one of the most progressive solid waste systems out there. This moves us a big step in that direction."