New Technology Turns Food Leftovers Into Electricity, Vehicle Fuels

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Starting today, tons of table scraps from the Bay Area's finest restaurants will be turned into clean, renewable energy at a new UC Davis research and technology demonstration facility.

The Biogas Energy Project will process eight tons of leftovers weekly (and later as much as eight tons daily) from premier restaurants such as San Francisco's Slanted Door, Jardiniere, Scoma's, Boulevard and Zuni Café, and Oakland's Oliveto and Scott's Seafood.

If all goes well, each ton of broccoli spears, cantaloupe rinds and fish bones will produce enough energy to provide electricity to power 10 average California homes for one day.

The Biogas Energy Project is the first large-scale demonstration in the United States of a new technology developed in the past eight years by Ruihong Zhang, a UC Davis professor of biological and agricultural engineering. The technology, called an "anaerobic phased solids digester," has been licensed from the university and adapted for commercial use by Onsite Power Systems Inc.

The goal of this innovative public-private alliance is to divert organic matter -- stuff made from plants and animals, such as food waste and yard clippings -- away from landfills and into the energy grid. That reduces greenhouse gas emissions from landfills and turns trash into a substantial source of clean energy.

"The new Biogas Energy facility at UC Davis allows us to conduct innovative research on renewable energy sources. By utilizing agricultural and food waste as alternatives to fossil fuels, UC Davis continues the tradition of protecting California's environment," said Neal Van Alfen, dean of the College of Agricultural and Environmental Sciences.

"The College of Engineering is leading a campuswide initiative that emphasizes renewable energy, energy efficiency and transportation," added Engineering Dean Enrique Lavernia. "The opening of the Biogas Energy Project marks a significant step, and we're delighted that we were able to partner with industry in addressing this important problem for the state and for the nation."

Zhang's system differs from other anaerobic digesters, most of which are in use on municipal wastewater treatment plants and livestock farms, in three key ways:

-- It processes a wider variety of wastes -- both solid and liquid -- including food scraps, yard trimmings, animal manure and rice straw. More than 5 million tons of food scraps go into California landfills each year.
-- It works faster, turning waste into energy in half the time of other digesters.
-- It produces two clean energy gases -- hydrogen and methane. Other digesters produce only methane. The gases can be burned to produce electricity and heat, or to propel cars, trucks and buses.

Zhang has proved in the laboratory on a small scale that in anaerobic, or oxygen-free, conditions, naturally occurring bacteria can quickly convert food and green wastes into hydrogen and methane gases.

Now the challenge is to make the gases in consistently high quality and

large volumes over the long term.

Zhang believes it can be done. "My UC Davis students and I have determined the efficient bacterial species and their favorite environmental conditions for turning various wastes into gases," Zhang said.

"We know what happens with bacteria in 10 to 5,000 gallons of water and waste. Now we expect to see those bacteria perform as well, if not better, when they are in 50,000 to 300,000 gallons."

If they do, Onsite Power Systems CEO Dave Konwinski will be closer to his goal of selling similar power-production facilities to waste-generating businesses, such as food processors, farms and dairies, and municipal green-waste collection programs.

"Onsite will actually scale the digester to fit the customer's operations, then build it on their property. We will take the customer's waste stream in and send the energy it produces right back out to their plant," Konwinski said.

"This technology will make a substantial dent in both our landfill needs and our use of petroleum and coal for fuels and electricity. It also will reduce our greenhouse gas emissions."

Onsite Power Systems has invested almost $2 million in helping Zhang refine the technology and prepare it for transfer to the commercial market. The other major funding source for Zhang's ongoing research has been the California Energy Commission's Public Interest Energy Research (PIER) program, which has awarded the university grants of nearly $1 million.

Source: UC Davis