

Powerful leftovers

By Sharon Stello/Enterprise staff writer

Tons of broccoli spears, melon rinds, fish bones and other food scraps from Bay Area restaurants will be transformed into natural gas and electricity in a waste-to-energy system that starts Tuesday at UC Davis.

The Biogas Energy Project was designed by UCD Professor Ruihong Zhang and her students in the biological and agricultural engineering department.

Industry partner Onsite Power Systems, a leader in the renewable resource market, joined the project early on. The company has an exclusive licensing agreement with the university to commercialize this technology.

Eight years in the making, the first large-scale demonstration system is up and running at UCD's wastewater treatment plant south of the main campus.

The first load of food waste was dumped into one of the tanks and began producing gas a week ago. Operators will flip the switch on a generator to begin turning that gas into electricity at a ceremony Tuesday.

Seeing the system in action for the first time was a special moment for the team.

"It's been working beyond expectation," said Dave Konwinski, CEO of Onsite Power Systems. "The first time going up there, seeing the pressure gauge rising — that we were making biogas — was like, 'wow.' It's beyond what we planned on."

Zhang said the system has been operating smoothly and producing gas steadily.

"It is very exciting to see the results from the laboratory transferring to the commercial demonstration scale," Zhang said.

They will use this demonstration system to fine-tune the process and test how much methane and hydrogen can be produced with different kinds of waste materials: food scraps, food processing waste, green waste and animal bedding. And they will look at the marketability of byproducts such as compost.

The demonstration system will run for three years, but they should have enough data to start building systems for customers in the first quarter of 2007. The City of Industry in Southern California wants a 25 tons-per-day system as soon as there's enough data available, probably in January, Konwinski said.

He said the system costs \$1 million to \$10 million to build, depending on size. That investment, he said, is usually recouped in three to five years.

"We've had national and international interest beyond belief," Konwinski said.

French Polynesia President Oscar Temaru came to check out the project's potential in June. Representatives from 12 other countries also have visited, Konwinski said.



Dave Konwinski, CEO of Onsite Power Systems, shows the pipes on top of the tanks that carry hydrogen and biogases at the Biogas Energy Project at UC Davis. The plant takes food waste and turns it into energy. Greg Rihl/Enterprise photo

The demonstration system will process 8 tons of organic waste a week, ramping up to 8 tons per day. Each ton can produce enough energy to power and heat 10 California homes. Natural gas produced also could fuel cars and trucks.

Food leftovers come from premier restaurants including San Francisco's Slanted Door, Jardiniere, Scoma's, Boulevard and Zuni Cafe, and Oakland's Oliveto and Scott's Seafood.

Norcal Waste Systems normally transports the food waste to Dixon where it turns those scraps into compost to be sold to organic farmers, which in turn supply the restaurants that later generate the scraps.

For the next few years, these scraps will instead go to the UCD biogas project. The material will be turned into compost more quickly and energy will be produced in the process.

Waste is mixed with water in a giant steel tank. No chemicals are added. Naturally occurring bacteria break the waste down into organic acids. At this stage, some hydrogen is produced, drawn off and ready for use as fuel.

The water containing organic acids is mixed with other bacteria that produce methane. This natural gas is captured, cleaned and can be compressed for use in compressed natural gas buses, cars and trucks. Or the methane can be burned to power a generator that produces electricity.

The demonstration system has wireless controls and remote data access, allowing researchers to check on the system from office computers across campus.

Zhang said this waste-to-energy system provides a waste disposal solution and a clean, renewable energy source. It also controls odor, pathogens and greenhouse gas emitted into the air during the normal decomposition process.

The system runs on only 5 percent of the energy produced, compared to much higher amounts needed to operate other waste to energy systems, Konwinski said.

It's constructed with commercially available components. Donated and used equipment comprise 80 percent of the system's parts, including five 10,000-gallon tanks from a winery.

Major research funding was provided by the California Energy Commission's Public Interest Energy Research program. Valentino Tiangco, senior technical lead for PIER, was impressed with the system on a recent visit.

"It's encouraging. It's a real demonstration," he said.

Tiangco said California produces 80 dry tons a year of resources that could be turned into energy. Of that, only 5 million tons a year are used for energy production.

"The potential is enormous," he said.

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