

# San Francisco Chronicle

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## DAVIS

### When kitchen waste isn't wasted

### Upscale Bay Area restaurants helping feed machine that turns scraps into electricity, vehicle fuel

[Glen Martin, Chronicle Environment Writer](#)

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Grass-fed beef, organic vegetables and seafood from sustainable fisheries have made it possible for Bay Area foodies to make fine dining an act of social conscience for quite a while.



Now they can feel virtuous about one more thing: the grub they leave on their plate.

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That's because scraps from some of the region's trendiest restaurants -- Zuni Cafe, Jardiniere, Oliveto and Boulevard, among others -- are being enlisted in the quest for renewable energy. Eight tons a week of everything that comes back on plates or is rejected by the kitchen will be sent to a state-of-the-art digester at UC Davis, where it will be transformed into valuable "biogas" -- methane and hydrogen -- and fertilizer.

The digester -- an impressive amalgam of vats, piping, cables, conveyers and hoppers -- was unveiled Tuesday at a site near the campus' wastewater treatment plant. The project is a joint venture between the university and a private Davis firm, Onsite Power Systems Inc.

The system employs anaerobic bacteria -- microbes that function in the absence of oxygen -- to break down waste in large tanks, yielding copious volumes of flammable gas.

Ultimately, the plant will handle 8 tons of garbage a day, said its designer, Ruihong Zhang, a professor of biological and agricultural engineering at UC Davis. Each ton of slops will produce enough gas to supply 10 homes, but for now, enthusiasts primarily see it as a way to fuel garbage trucks and other commercial vehicles while reducing landfill volume. The digesting process converts between 60 and 90 percent of organic solids to biogas, Zhang said.

Some Bay Area cities -- including San Francisco -- already send their food waste to a composting site near Vacaville, where it is turned into soil amendment. But in a world increasingly stretched for natural resources and overflowing with garbage, that's not enough, said Zhang. Her anaerobic digester kicks things up a notch, extracting fuel as well as fertilizer from kitchen and yard waste.

Digesters have been around in one form or another for several years, but none has proved commercially feasible. Zhang said her plant is superior to earlier models because it is far more efficient in terms of gas production and cost. It's also the first commercial digester that yields both methane and hydrogen in separate stages, she said.

The two gases can be burned together for either electricity generation or vehicle fuel. At some future date, Zhang said, the hydrogen will be separated for use in hydrogen fuel cells -- devices that have yet to be perfected, but are the holy grail for promoters of green-car technology.

"Basically we can produce the biogas to many different formulas," said Zhang. "This is a system that's ready to go. We've been working on it eight years. The technology has been tested and patented. It can be scaled up or down depending on need, and it's all based on commercial components."

Dave Konwinski, the chief executive officer of Onsite Power Systems, said Zhang's invention will allow waste companies to build digesters to specifications right at the garbage transfer sites, obviating the time, fuel and human power now required to lug refuse from cities to landfills.

Konwinski, whose firm has an exclusive commercial contract for the digester, said about 20 companies or municipalities already have expressed interest in buying the devices.

One of them is Waste Systems Inc., which handles garbage for the city of Industry in Los Angeles County. Jeff Duhamel, Waste Systems' president, said his company has set aside \$400,000 for planning, permitting and engineering a Zhang digester.

"We're moving ahead with this," he said. "Ultimately, we figure it'll cost us about \$2 million."

And that's a bargain, said Duhamel. Industry relies on the same landfill -- the nation's largest -- used by the city of Los Angeles.

"The problem is that it'll close in 2013, and at that point we'll have to send the garbage by truck or train 200 miles east to a new landfill in the desert," he said. "That will cost us \$60 to \$80 a ton. We think this digester will bring our costs down to \$30 a ton, when we figure in the ancillary benefits of using the gas to power our truck fleet."

The praise got a bit fulsome at Tuesday's event -- not just for Zhang's digester, but for the garbage that charges it.

"Maybe we can now look at America as the Saudi Arabia of waste," said Rep. Dan Lungren, R-Gold River (Sacramento County). "That can be a tremendous opportunity for us. I look forward to the day when we don't look at this as an alternative energy source, but as a conventional energy source."

Neal Van Alfen, the dean of the UC Davis College of Agricultural and Environmental Sciences, said the digester takes advantage of a resource modern society generates in abundance.

"We have to switch from the biomass laid down millions of years ago (oil, coal and natural gas) to the biomass we're producing today," he said.

Certainly, the supply of biogas raw material is abundant. The California Integrated Waste Management Board estimates that 22 million tons of wet organic waste is produced in the state each year. That could be used to generate 895,000 kilograms of hydrogen gas a day -- the daily equivalent of 1,363,000 gallons of gasoline.

Some words of caution were raised Tuesday. While hailing Tuesday's event as "momentous," Val Tiangco, a representative from the California Energy Commission's Public Interest Energy Program, noted the digester still has to prove it can go from 8 tons a week to the 25 tons a day required for general commercial feasibility.

And a minor glitch in a demonstration of the digester caused a few palpitations. When Zhang threw a switch to power a generator to run two large fans that, in turn, would inflate wildly gyrating green fabric mannequins, there was a brief hum -- then silence.

No biggie, though -- a defective extension cord was discovered, the switch was thrown again, and the green figures danced madly in the blue October sky. The future of anaerobic garbage digestion seemed secure.

And that's a good thing, say supporters, considering the scant alternatives.

"We've made a lot of progress as a society," said Duhamel, "except when you look at garbage. For the past 200 years, we've been handling it the same way -- burn it or bury it. That can't go on. We have to change."

*E-mail Glen Martin at [glenmartin@sfchronicle.com](mailto:glenmartin@sfchronicle.com).*