

Waste Oil Wonder

Fueling water heaters with used fryer oil supports operators' commitments to become more energy efficient.

By Donna Boss

Using energy more efficiently is a well-touted, cost-saving practice for foodservice operators nationwide. Executives and operators also know that equipping their foodservice facilities with energy-efficient technologies is the right thing to do to preserve the planet for future generations.

Ed Rich, owner/operator of Culver's, Pleasant Prairie, Wis., and Paul Berlin, chief operating officer for Oscar Inc., Verona, Wis., a Buffalo Wild Wings franchisee, are two leaders willing to experiment with new technology to find energy-saving, environmentally-responsible solutions.

"I want to control my bottom line and do whatever I can to make better use of my resources," Rich says. In 2006, Rich researched and learned about Inov8 Int'l., La Crosse, Wis., a company that designs and manufactures burner systems that run on waste oil.

"This technology was originally designed to run on used petroleum oil in garages and large manufacturing plants, especially in the automobile sector," says Rebecca Faas, Inov8's president and co-owner, who is the daughter of the founder and inventor, Harry Foust. "We learned through Ed's input and experience how we could adapt the unit to work with used fryer oil in a restaurant. This technology provides restaurants with options other industries have had for some time." In a restaurant, the fryer oil can be the source of fuel for hot water heaters or, possibly, makeup-air-handling systems.

The concept of used oil as fuel has legs, apparently; Vegawatt Cogeneration System, which also uses waste oil to generate *supplemental* on-site electricity and hot water for foodservices, is a recipient of a National Restaurant Association Kitchen Innovations award this year. (Go to www.vegawatt.com).

"I worked with Culver's Franchise System's engineering department and the folks at Inov8 and we had to do a little backward engineering to find out how much used fryer oil would be required to



Standard Waste Oil Burner, used by Ed Rich at a Culver's unit. It's connected to a 120,000-Btu water heater. This prototype was the first to use used fryer oil as fuel.

produce the hot water we'd need," Rich explains. "Then we went ahead with the installation."

The Prototype

The basic components of the system consist of a small cast iron sectional boiler rated at 120,000 Btus, two indirect-fired tanks (one is used to store the used fryer oil and the other is used for additional hot water storage), a draft inducer, specialty pumps for the used fryer oil, and a filtering system. The patented technology includes pre-heating the oil under high-velocity conditions, filtering the heated oil, removing the vapor created during the heating process (for clean combustion), sealing the nozzle with specially designed needle, and delivering consistent oil pressure at the nozzle. The system includes a flame safeguard and digital temperature control that monitors the flame and delivers the oil only when everything is working properly.

The boiler was—and still is—set up as the primary source of hot water, but the restaurant's

conventional, gas-fired hot water tank stands by as backup. The restaurant generates about 40 gals. of used fryer oil a week, enough to almost completely replace the natural gas the restaurant used to heat its hot water.

Savings Realized

In the initial weeks after installation, the system lowered the restaurant's natural gas bill by about \$270 a month and eliminated oil storage costs. "We used to dispose of spent oil in a large receptacle outside," Rich says. His unit saved \$2,500 in energy costs

the first year of installation and the unit continues to use fewer therms than the traditional water heater.

"These are our results, but others might have different results because every store is unique," he explains. Variables such as product sales mix and oil usage, along with the Btus and therms used every month depending on the store's geographical location, will affect the results. Rich found his estimated three-year investment payback was on the money when he threw in rebates he received.

The system uses $\frac{3}{4}$

gal. of used oil per running hour. Based on the demand, the burner consumes about 6 gals. of spent fryer oil a day. Rich expects that the system will last longer than the seven years a conventional commercial water heater usually lasts; in fact, he expects the burner to last a good 20 years.

"I was fortunate because I had enough space in the restaurant to fit the prototype burner and water heater in a way that wouldn't require costly construction or retrofitting," Rich says. "As we all know, every square foot in a restaurant is critical. So, we had to be sure we had the right footprint to make this endeavor cost-effective."

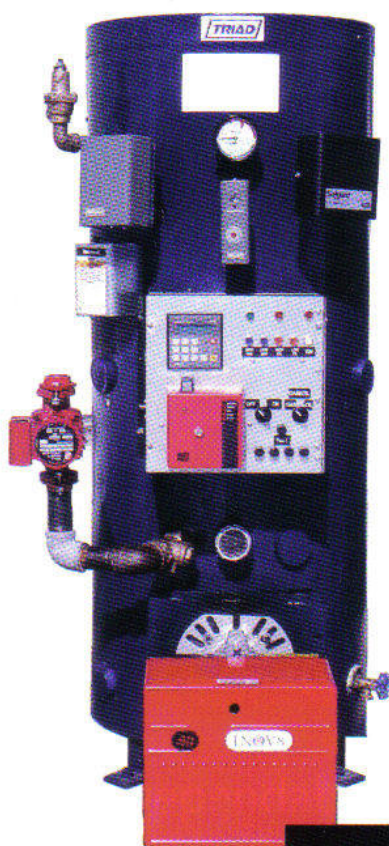
Rich's system is redundant because it's comprised of both the Inov8 S200 burner and the original water heater system. "We wanted to be certain with this prototype that we would never risk our hot water supply and could switch to the traditional system at any time if needed," he says.

New Generation

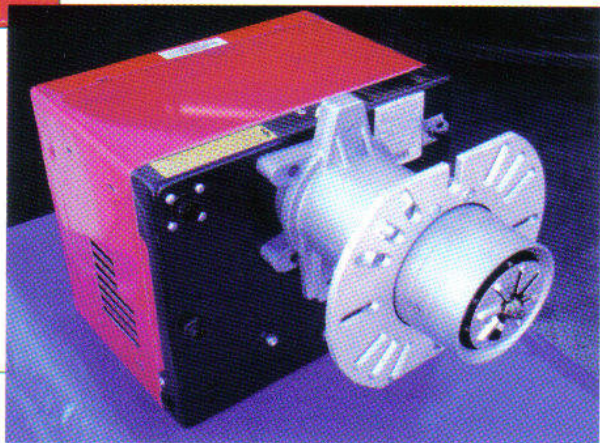
In an effort to eliminate redundancy, Inov8 developed its next-generation G-Series burner, featuring a vertical boiler with a natural gas backup built in. In terms of size, it's close to a standard water heater.

The G-Series is a combination natural gas/waste oil burner, which will fire at full gas, a mixture of gas and fryer oil, or full fryer oil, depending on used oil supply. The burner has the ability to sense if oil pressure has been depleted (it will detect loss of oil flame or other conditions) and automatically reverts to burning 100 percent natural or propane gas by means of an electronic programmer logic control (PLC). "For restaurants, this is vitally important—the switch is seamless so the restaurant will never experience a lack of hot water or heat," Faas says.

"A third-party test agency must test heating equipment to safety standards established by American National Standards Institute and Underwriters Laboratory. All of our products have been tested by Intertec ETL-Semko to these safety standards for sales in the U.S. and Canada," Faas says. The G-Series was certified in March. Oscar Inc.'s Berlin is testing the G-Series system this spring in one of his eight Buffalo Wild Wings' locations.



New Generation Gas/Oil Burner, or G-Series, used by Berlin in a Buffalo Wild Wings unit. It incorporates a vertical water heater made by Triad. The unit can seamlessly switch to natural or propane gas if the used oil supply runs low.



Like Rich, both cost savings and moral imperative prompted Berlin to investigate the new hot water boiler system using the restaurant's oil, which he says totals thousands of tons annually. "Taking this action is the right thing to do as we commit to being a sustainable business and helping protect the environment," he says.

If the new equipment functions as Berlin expects, he says, "and I don't have to spend time with such issues as maintenance, I may install the new system in other restaurants when their hot water tanks need to be replaced. The Buffalo Wild Wings' corporate executives and other franchisees are very curious to see the results of our test to know if they should consider this for additional units."

Looking Ahead

"The new equipment will cost several thousand dollars more than our existing water heating equipment, but we believe we will see a payback within a year," Berlin adds. After that, he expects to realize ongoing cost savings in reduced energy usage and in rebates from Wisconsin's Focus on Energy, an organization comprised of state utilities and industry partners to help residents and businesses save energy

and money. He also expects long-term savings from the system's anticipated 20-year life expectancy. While the new system is in its test phase, Berlin says the old water heater will remain in place.

What about services who pay for used fryer oil? "For years, a company picked up our oil and paid us," says Berlin. "Then they stopped paying, now they're paying again." Repurposing the oil into an energy source is an attractive and more certain alternative, he adds.

Berlin and Rich emphasize that these systems are just one part of their restaurants' commitment to sustainable practices. Other efforts, such as installing energy-saving lighting and dishwashing equipment, and controlling when equipment is turned on and off, are very effective. But both Rich and Berlin are happy to try out the cutting-edge technologies that promise substantial results, as well.

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System Design Pointers

- **Oil filtering and storage considerations:** Food debris from fryer oil will settle within a couple days if the oil is held over 120°F. If you don't give the oil time to settle and it cools too soon, the food debris will be more difficult to remove and can block the filter.
 - **Burner selection criteria:** Inov8 recommends users opt for the combination G-series gas/oil burner with the PLC automated control (that switches between fuel sources) if one or more of these conditions exist: 1) available oil is less than 30 gals. per week (gpw), 2) the oil has more than 3 percent water content, 3) the user has a low Btu-content oil (such as glycerin), or 4) the user cannot risk loss of heat or hot water.
 - **Use it for water heating or space heating:** This is based on customer preference, but Inov8 can recommend a system based on the size of a facility's utility room and the quantity of oil the facility produces. If a restaurant uses up to 50 gals. per week (gpw) of fryer oil, that's enough to run a water heater. If a restaurant generates 50 to 100
- or more gpw, that's enough to provide space heating. Keep in mind that 100 gals. of used fryer oil yields 13 million Btus of usable energy. That replaces 130 therms of natural gas each week, enough to provide space heating for a medium-sized restaurant. Operators can choose either hot water production or space heating—but likely not both as most restaurants wouldn't produce enough waste oil.
- **Inov8 system size in Btu or water volume:** Generally the size can be compared to an existing furnace or water heater. If this information is not available, then a standard heat load calculation can be used. Inov8 can assist in sizing the proper replacement system.
 - **Payback period:** The energy cost to produce enough hot water for a medium-sized restaurant can be nearly eliminated with about 40 gals. of used fryer oil a week. At this rate, equipment payback is about two years. If a restaurant processes more oil each week, payback will be quicker.

Source: Inov8 Int'l, www.inov8-intl.com