

POWER PROFILE

Customer: Gresham Wastewater Treatment Plant

Location:

Gresham, Oregon

Customer Business Issue:

Energy self sufficiency

Solution:

Two G3508 gas gensets, C9 diesel genset, paralleling switchgear (480V)

Cat® Dealer:

Peterson Power Systems



Cat® generator sets help the Gresham Wastewater Plant achieve energy net zero.

POWER NEED

Located near the Columbia River northeast of Portland, the Gresham Wastewater Treatment Plant (WWTP) is a basic secondary activated sludge facility that receives an average of 13 million gallons/day (mgd) of wastewater.

Dating back almost 30 years, efforts were made to curb the plant's big appetite for power. Anaerobic digesters were installed at the plant in 1990 in an effort to make the plant more efficient by deriving biogas from the solid waste matter that settles out during the treatment process. Raw, untreated biogas derived from the digesters fed a 250 kW generator that helped power about one quarter of the plant.

"We wound up turning it off in 2002 when it burned out," recalls Alan Johnston, senior engineer with the City of Gresham Wastewater Treatment Plant.

In 2005, after receiving grants from the Energy Trust of Oregon and the Oregon Department of Energy, the City installed a Cat G3508 gas generator set that produces 400 kW in a combined heat and power (CHP) application. The cogeneration system includes a modern biogas scrubbing system that removes moisture, hydrogen sulfide, and siloxanes. The Cat genset produces power and heats the buildings with jacket water heat. It has been supplying 50 percent of the treatment plant's power needs since 2005, saving about \$250,000 in annual avoided electrical costs.

But even with the addition of the Cat® 400 kW cogeneration unit, excess biogas had to be flared, Johnston says. In 2007, Gresham's mayor, Shane Bemis, signed a climate action agreement with the U.S. Conference of Mayors, which ultimately led Johnston to examine ways to make the treatment plant even more energy efficient.

SOLUTION

After further analysis, Gresham decided to shift its focus in 2008-09 to reduce power consumption while increasing biogas production.

The journey to energy independence began in 2009 when the Gresham WWTP received a grant from the Oregon Economic Development Commission to study ways to increase the environmental and operational efficiency of the treatment plant. One outcome was a study on the benefits of accepting fats, oils, and grease (FOG) from restaurants to remove them from the waste stream and instead use them to boost electrical generation.

Based on revenues generated by a FOG tipping fee at the facility and avoided electrical utility fees, the conclusion was that it would be cost-effective with an ROI of seven years. Gresham acted on the recommendation, and currently takes in about 30,000 gallons per day of FOG. The product is slowly injected into the digesters, and according to Johnston, the organic matter has nearly doubled biogas production.

"FOG has a lot of energy stored in it; about 12 cubic feet of biogas produced for every gallon injected into the digesters," Johnston says. "The study concluded that adding FOG receiving facilities is economically viable, and it turns out that there is a market for this service in our area."

Energy net zero means producing the same amount of energy that a facility uses to operate.

For Gresham, net zero became a real goal in 2010 when investments were made as part of the capital improvement cycle. A formal energy management team was created, and Gresham established a goal of achieving energy net zero at the WWTP by 2015.

The increase in biogas made possible the installation of a second Cat G3508 gas genset in 2015, increasing power output and allowing the facility to operate on its own, independent of power from the utility grid.

With support from management and staff, five major capital upgrades were phased in over a five-year span.

In February 2015, on schedule and on budget, the first energy net zero month occurred. The

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WWTP generated more electrical energy on site from renewable biogas cogeneration and solar power than it consumed. Today, the Gresham WWTP generates about 10 percent more electricity than it needs via a combination of energy efficiency, codigestion and cogeneration, and a solar array.

"We didn't do it just because it was fun and exciting, we did it because it made financial sense," Johnston says. "That's how the City of Gresham operates, and we had shown over 10-year period we'd have a seven-year payback on all of these projects, and that's really what sold it to the mayor.

"We've had a ton of support—all the way from my bosses to managers to the city council and mayor through all of these projects—and I'm glad it was so successful because I pushed it for years saying it would work, and it has."

Over the 10-year journey to energy net zero, the Energy Trust of Oregon supported the City of Gresham with technical assistance, project development support, and cash incentives that lowered the costs of the energy efficiency measures—as well as the two CHP generator sets and the facility's solar array. Business Energy Tax credits and biomass incentive funds from the State of Oregon also were essential to making net zero a reality.

RESULTS

Now entering its fifth year of operation as a net zero wastewater treatment plant, Gresham is the first facility of its kind in the Pacific Northwest and the second in the country to hold that distinction.

The net result is about \$1 million in annual savings to the ratepayers of Gresham, which includes \$500,000 in avoided utility costs, \$350,000 from FOG tipping fees, and the balance in avoided costs by using the jacket water heat from the gensets to heat the buildings. As an added benefit, Class B biosolids that are the byproduct from the anaerobic digesters are applied to agricultural fields as fertilizer at no cost to area farmers.

"When you talk about our wastewater treatment, which traditionally has been our biggest energy hog, in less than 10 years it's producing its own energy on site," Bemis says. "So it's not only green in terms of green energy, it's green in terms of money."

Achieving net zero status is made possible by the high uptime of the Cat gensets, Johnston says. To ensure continuous operation, Gresham relies on its Cat dealer, Peterson Power Systems, which provides service through a Customer Support Agreement.

"One of the big reasons why we have a successful program here is because of the relationship we have with our local Cat dealer, Peterson," he says. "Anytime we have issues with the engines, we call them, and we have a guaranteed 24-hour interval for their technicians to come out here to fix the problem.

Over four years, Gresham's cogeneration plant has averaged about 95 percent uptime.

"And we couldn't have done that without the support of Peterson Power Systems," Johnston says. "If the Cat engines aren't running, we're in trouble. So, we try to average over 90 percent run time, and in over four years we're at 95 percent and that includes all the overhauls, top end work, oil changes, and unrelated construction issues that take those engines down.

"So really, it's a pretty impressive thing when you think about it—if the engines run 80 percent of the time, we're not net zero," Johnston adds. "It's always easy in the honeymoon phase of big projects to have engines running good and everybody's happy, but to have done it now for four years with all the issues you run into with older equipment, it's pretty impressive."

For more information, please visit cat.com/powergeneration



This Cat G3508 gas generator set has been supplying 50 percent of the treatment plant's power needs since 2005.