

Envision a biogas system that offers a municipal wastewater treatment plant energy self-sufficiency and is 100% privately financed. One municipality is turning that into a reality.

The village of Ridgewood, N.J., has arranged a public-private partnership with Ridgewood Green RME, an entity composed of Natural Systems Utilities, Middlesex Water Co., and American Refining and Biochemical, to transform liquid carbon waste into energy. The project, designed by HDR, uses biogas recovery, treatment and a combined heat and power system to improve air quality and lower energy costs at the village's water pollution control plant. Energy produced on site by an anaerobic digestion process that captures methane is converted to power. The project lowers the village's carbon footprint and converts wastes to electricity. The project launched in December 2011, and the new assets have been fully operational since early 2013.

biogas production. The heat required for anaerobic digestion also is generated by heat recovery off of the engine, further increasing plant efficiency and reducing emission of greenhouse gases. In turn, this biogas conversion facility now eliminates the need to flare the methane into the atmosphere.

The process starts with a liquid waste receiving station with an 11,000-gal receiving tank, feed pump and mixing pump. Waste is delivered to the plant by trucks and pumped through screens into an insulated, heated receiving tank. This feedstock then is fed from the receiving tank into the plant's existing anaerobic digester. Excess digester treatment capacity is put to use by a liquid waste receiving, holding and feeding system that significantly increases biogas production.

Instead of flaring the excess biogas, it enters a conditioning system that removes impurities such as hydrogen sulfide and siloxanes. After it is conditioned, the biogas is fed into a new combined heat and power reciprocating engine that generates electricity for the treatment plant and heat for maintaining the digester operating temperature.

Renewable Energy

The plant's design repurposes equipment already on site and is focused on efficiency from start to finish. In fact, the plant will reduce its power costs significantly under a 20-year agreement with Ridgewood Green RME.

The new system will create 240 kW of electricity, enough to power the treatment plant and heat the digester to operating temperature while lowering the carbon footprint.

Additionally, four solar generation facilities were constructed on several properties throughout Ridgewood to provide renewable energy. Installations at the village hall, fire department, EMS building and water pollution control facility have been producing electricity since February 2013. The biogas engine—the workhorse of the project—has undergone energy optimization testing and has been successfully integrated into the wastewater treatment process. The facilities are being operated by village employees in concert with Ridgewood Green RME.

In addition to cost savings from the utility bill, additional income is generated by selling all of the renewable energy certificates (RECs) to 3Degrees, a provider of renewable energy. RECs produced by the biogas technology at Ridgewood and the related solar projects have a relatively high value because of their unique characteristics, compared with other Green-e Certified National RECs. 3Degrees is purchasing Ridgewood's premium RECs and, in turn, supplying the Ridgewood water pollution control plant with lower cost Green-e Certified National RECs, equivalent to almost the entire plant's energy needs, thereby ensuring the plant is powered with renewable energy, while maximizing the project's return on investment. The sale of these RECs is part of the overall economic package that allows for the supply of lower-cost electricity, ultimately benefiting Ridgewood utility customers.

Already recognized for its forward thinking, the public-private partnership project was recognized as the Municipal Renewable Energy Project of the Year by the American Biogas Council (ABC). The ABC awards recognize projects that make a significant impact on the development of the biogas industry. The organization represents more than 200 companies dedicated to maximizing the production and use of biogas from organic waste. **W&E**

Joseph G. Cleary, P.E., is senior vice president and section manager of engineering design services for HDR. Cleary can be reached at joseph.cleary@hdrinc.com or 201.529.5151. For more information, write in 1108 on this issue's reader service form on page 41.



Gas cleanup equipment

Powering the plant

By Joseph G. Cleary

New Jersey WWTP uses biogas system to transform liquid carbon waste into energy



Gas holder

Project Overview

A biogas production system was designed to optimize the production of electricity from methane, and was constructed through a retrofit at the existing water pollution control facility. Ridgewood Green RME, through a 20-year public-private partnership with the village of Ridgewood, made the upfront capital investment to retrofit the new equipment to optimize the anaerobic digestion process and convert methane gas to electricity. Bio-Organic Catalyst Inc. also helped develop the project and continues to provide an enzyme product that increases biogas production. In addition, the production of electricity is enhanced through co-digestion with food wastes such as brown grease to increase

Valley Gamma Knife Center
[Click here to learn more.](#)



Bergen utilities converting sewage into valuable energy source

MARCH 29, 2015, 11:53 PM LAST UPDATED: MONDAY, MARCH 30, 2015, 1:42 PM

BY JAMES M. O'NEILL
STAFF WRITER | THE RECORD



KEVIN R. WEXLER/STAFF PHOTOGRAPHER

Ridgewood Director of Public Works Christopher Rutishauser at the village's sewage treatment facility.

The bright orange flame that routinely danced from a pipe on the roof of Ridgewood's sewage treatment plant did not exactly serve as a welcome beacon for Christopher Rutishauser, Ridgewood's public works director. Instead, it became a nagging reminder of lost opportunity.

The facility was flaring off methane, a greenhouse gas created when bacteria break down sewage.

"I'm cheap," Rutishauser said. "I saw the flame and saw money being wasted. I thought there had to be a way to reuse the methane."

Rutishauser and Bob Gillow, the plant supervisor, researched the issue and came up with a plan to capture the methane and use it as fuel for a generator that produces electricity. The facility covers its own energy needs and has excess electricity to sell to the grid.

At wastewater treatment plants in New Jersey and across the country, the methane once flared off as waste is being used to produce electricity. Sewage has become a money-making resource. And following the success of these pioneers, other agencies are starting to take a look as well.

Advances in technology are making it easier to turn all kinds of waste into electricity — from cow manure on dairy farms to the gas from decomposing food.

"There's a ton of innovation happening," said Patrick Serfass, executive director of the American Biogas Council.

"Using the biogas to generate electricity is particularly beneficial for sewage treatment facilities, since they are among the largest consumers of electricity in a municipality, given the energy needed to pump the sewage," he said, adding that cutting costs can reduce rates down for customers.

At the Bergen County Utilities Authority, the power produced with biogas has saved the agency more than \$13 million in recent years, officials said. The agency burns the methane in a cogeneration facility to handle the hot water and electric needs of its wastewater treatment plant in Little Ferry, and has done so since 2008. Electricity is the agency's largest annual cost — about \$2.8 million a year.

The Ocean County Utilities Authority generates 40 percent of its electricity using captured methane, saving \$500,000 a year.

In the sewage treatment process, wastewater is separated from solids. The water, or effluent, is cleaned and discharged into a nearby river. The solids are put into giant tanks, called anaerobic digesters, where bacteria feed on the waste. During that process, the bacteria discharge methane.

"The methane can be used not only to power electric generators, but used in vehicles," Serfass said. "And the solids left over in the digesters can be used to make a variety of commercial and residential fertilizer and garden products."

Anaerobic digesters were originally installed at treatment plants to reduce complaints from neighbors about odors, and to cut the amount of sludge — the solid waste byproduct — that had to be carted away and dumped at a landfill. Less sludge means lower landfill fees. Now, there's another incentive — producing electricity.

Of 1,241 sewage treatment plants with anaerobic digesters nationwide, about 860 are using biogas in some way. The Passaic Valley Sewerage Commission, which serves many Bergen and Passaic towns, does not capture methane from digesters at its Newark treatment plant, but the agency is looking into it, spokeswoman Hollie Gilroy said.

Experts are looking at other ways to harness methane. The American Biogas Council estimates there are 11,000 potential sites — including about 8,000 dairy farms, 2,400 sewage treatment plants and 450 landfills — that could capture methane and convert it to energy.

Farmers install anaerobic digesters to handle livestock waste, reduce odor and cut the amount of sludge. "Now, they're looking at anaerobic digesters to see how much electricity they can produce," Serfass said.

The Ridgewood sewage treatment plant, in Glen Rock, has two anaerobic digesters to handle the 3 million gallons of raw sewage generated by Ridgewood daily. But about 80 percent of the methane generated comes from something other than sewage — Ridgewood accepts 2,000 to 7,000 gallons a day of fats, oils and grease trucked in from area restaurants.

"Fats, grease and trap wastes are very good to put in a digester — they're like candy for the bacteria," said Dave Specca, a bioenergy expert at Rutgers University's EcoComplex, the state's clean energy incubation center. "They just chew away at the sludge."

The haulers that collect the fats pay Ridgewood a tipping fee to take the material — revenues total about \$200,000 a year — and Ridgewood passes 75 percent of that to the entities that own and operate the equipment to capture and burn the methane in the generator. To insulate taxpayers from the risk of the Ridgewood venture, the village entered an agreement with a group of companies — Natural Systems Utilities, Middlesex Water Co. and American Refining and Biochemical — that installed the equipment and retains the profits from selling the electricity. Ridgewood buys the electricity back at a reduced rate, still saving money.

Like fats, food waste also generates more methane in anaerobic digesters than sewage does, and the next step is to develop ways to recycle food waste into energy on a large scale, experts say.

Of the 10 million tons of municipal solid waste generated in New Jersey last year, 15 percent of the total — 1.5 million tons — was food waste, evenly distributed between residential and commercial sources, the state Department of Environmental Protection says.

"There's strong interest in the state," Specca said. "The challenge right now is a place to go with it — the food waste currently recycled largely gets trucked to Delaware and Pennsylvania composting facilities."

The DEP has issued permits to Trenton BioGas to turn a dormant sludge plant in Trenton into a food waste recycling plant that could handle up to 400 tons per day. The company has yet to move forward with the plan.

Statewide efforts to require the recycling of food waste could lead to more opportunities for the biogas industry, experts said. In 2011 the borough of Princeton started a voluntary pilot program to recycle food waste. More than 21,000 families are participating, according to the DEP.

State Sen. Raymond Lesniak introduced a bill last fall that would require large food waste producers in New Jersey to compost or recycle the waste. Among those affected would be supermarkets, resorts, banquet halls, hospitals and educational institutions.

Sewage treatment plants could also one day accept food waste as a way to generate more methane. "At least a couple of our members are looking to accept food waste and grease to use in their digesters," said Peggy Gallos, executive director of the Association of Environmental Authorities, a group of public water, wastewater and solid waste service providers. "It's certainly an area for potential."

Email: oneillj@northjersey.com | Twitter: @JamesMONEill1

© 2015 North Jersey Media Group



Electricity production is enhanced when food wastes such as fats, oils and grease are added to the process by way of this liquid waste receiving station.

Nice Reward, No Risk

A NEW JERSEY VILLAGE GETS A COST-SAVING RENEWABLE POWER SYSTEM BASED ON BIOGAS AND SOLAR WITHOUT MAKING ANY CAPITAL INVESTMENT

By Doug Day

The Village of Ridgewood (N.J.) Water Pollution Control Facility is cutting its costs by adding biogas and solar power generation — that’s nothing new. But leaders in this village of 26,000 did it without spending money. Instead, they entered an agreement with other parties who provided the funds in exchange for sharing in project savings and revenue.

“We wanted to do it with a small plant in a community that wanted to be green, use renewable energy, save money, and do something good for the surrounding community and the environment,” says Dennis Doll, Middlesex Water Company CEO. “The plant ultimately

will be completely self-sustaining and will buy virtually no power from the local electric provider.”

Middlesex is one of the players in the public/private partnership that helped the Ridgewood plant save money without the capital outlay normally needed for such projects. Funds for the \$4 million project came from the private companies that own the equipment and will recoup their investment through a 20-year power purchase agreement.

Eventually, biogas and solar power will generate all the electricity for the village’s 1960s-era 5 mgd design flow/2.5 mgd average flow treatment plant.

LIQUID WASTE FUEL

A 240 kW engine/generator from Kraft Power runs off biogas that previously was flared. Waste heat from the unit supplies two anaerobic digesters. The generator went online in February 2013. To augment the plant’s methane production and improve project economics the village added a liquid waste receiving station in last October.

The liquid waste from restaurants and commercial establishments creates a revenue stream and helps local haulers. “Injecting liquid waste into the digesters dramatically enhances methane production, which accelerates electricity production,” says Doll.

“Haulers had been transporting liquid waste very long distance: as far as Pennsylvania. Those savings add to the value stream, besides reducing carbon emissions. The process also provides economic and environmental value by reducing chemicals used in the treatment process and reducing solids from the plant that were previously hauled away.”

The liquid waste program is still in its early stages — two or three trucks deposit material at the plant daily. “There’s plenty of market for the material,” says Doll. “In fact, we had to put in storage capacity because we’re getting more than we need at times.”

A solar array from Advanced Solar was also installed at the plant to add 50 kW of generating capacity. The electricity from the solar and biogas facilities is sold to the village at a reduced cost of 12 cent per kWh (plus a 3 percent annual escalator). The plant used to pay about 15 cents per kWh for utility power. The plant expects to save 1 percent per year.



Technology used to convert methane gas to electricity includes anaerobic digesters, a 240 kW engine/generator from Kraft Power, and a 50 kW solar field from Advanced Solar.

SHARING THE RISK/BENEFIT

The deal was done through a public/private partnership so that taxpayers in Ridgewood did not have to pay up front for any of it. Middlesex Water, Natural Systems Utilities and American Refining and Biochemical partnered with the village to form a new entity, Ridgewood Green RME.

"We own the physical assets and have a contract with the village," says Doll. "The plant is run by Village of Ridgewood employees, with operations support by Natural Systems Utilities. We entered a 20-year partnership and expect to fully recover our investment and earn a fair and reasonable return."

The village, meanwhile, gets a more efficient treatment plant and saves money. "Many municipalities are strained with their bonding capacity," says Doll. "It's often a difficult political sell to convince the local governing body to put out the funds for these projects. Under our business model, we not only develop the solution and implement it, but also finance it. That was very attractive to Ridgewood because they have

"It's kind of a no-brainer in terms of value to the environment and the ability to reduce cost and create value for all the parties."

DENNIS DOLL

virtually no risk. All they have to do is buy all the electricity we can produce, and every kilowatt-hour they buy is cheaper than what they had been paying."

Through Ridgewood Green, the project also generates high-value renewable energy certificates (RECs), sold under a multiyear agreement to 3Degrees, a marketer of renewable credits and carbon offsets. Doll says the project could have been viable without the credits, but they substantially improve the payback for investors. Along

THE PLAYERS

The Ridgewood Green RME project is a team effort with a variety of players. In addition to the Village of Ridgewood, the owners include:

Middlesex Water Company, providing water and wastewater utility services mainly in New Jersey and Delaware through various subsidiaries (www.middlesexwater.com).

Natural Systems Utilities, offering sustainable water and energy solutions for municipal, industrial and institutional clients (www.naturalsystemsutilities.com).

American Refining and Biochemical, an investment company that manages private company, private equity fund and project equity investments dealing with environmental and renewable energy projects.

Other companies taking part in the project:

- **Bio-Organic Catalyst:** Optimization of the biogas system; supplying an organic product to enhance biogas production while reducing odors and grease build-up
- **HDR-HydroQual Engineers:** Engineering/design and construction assistance
- **Advanced Solar Products:** Turn-key installation of the solar energy equipment
- **3Degrees Group:** Maximizing revenue through purchase of solar and biogas RECs and sale of Green-e Certified RECs to make sure the project uses only renewable energy

PERFORMANCE³
NEW LEVELS OF EFFICIENCY
IN AERATION TANK SYSTEMS.

150 YEARS
of Quality,
Reliability &
Performance

PD BLOWER • HYBRID BLOWER • TURBO BLOWER

Your challenge: Reducing costs while treatment demand continues to increase. Now you can lower your energy consumption for WWTP aeration and gain process efficiencies with a choice of three blower technologies: Positive Displacement Blower | Hybrid Blower | Turbo Blower
This Is Performance³.

Up to 80% of the energy consumption in WWTP is used in the aeration process. With Aerzen Blowers you can realize efficiency improvements and air flow optimization to meet highly fluctuating demand. By selecting a Hybrid Blower you can manage the base load and match the demand spikes with a Turbo Blower.
This Is Performance³.



AERZEN
EXPECT PERFORMANCE

Aerzen has 150 years of success manufacturing reliable, quality blower equipment.

Let the Aeration specialists at Aerzen guide you to the right technology for your WWTP application.

Call 610-380-0244 or email aerzen@aerzenusa.com to achieve Performance 3.

See Performance 3 in action at www.aerzenusa.com



The cycle of solutions - water and wastewater technology

Water is crucial for our survival. Clean water supplies and efficient sewage treatment have never been more important. KSB's know-how and extensive product range help you meet all water supply and treatment requirements, efficiently and effectively. We offer end-to-end solutions addressing all stages of the water cycle from water extraction to sewage treatment.

Our technology. Your success.
Pumps • Valves • Service



Four solar installations placed throughout the village help maximize energy production.

with the sale of RECs, the project purchases lower-cost Green-e Certified RECs that ensure that the plant will get 100 percent of its electricity from renewable sources.

THINGS TO COME?

Such deals are becoming more common, adds Doll: "It's kind of a no-brainer in terms of value to the environment and the ability to reduce cost and create value for all the parties. It's in pretty wide use in Europe. As we've proposed this model in other cities, one question that keeps coming up is why there isn't more of this happening.

"We've found that there just hasn't been the need. There hasn't been the same intensity in this country on reducing costs at wastewater treatment plants through renewable energy. As more municipalities become aware of the technology and the opportunity, they are getting more interested in these solutions. The fact they don't have to finance them makes it that much easier."

For those taking the financial risk, Doll says, the outlook is good: "The customers are not going away. You have a steady feedstock — the wastewater influent is basically an endless supply. Those are relatively easy hurdles to get over." Doll expects the popularity of such partnerships to keep growing. This one received an Environmental Achievement Award from PlanSmart NJ for its leadership in protecting, restoring and enhancing the environment.

"We have proposals in other cities around the country to do something similar on a bigger scale," Doll says. "Everyone we've talked to likes the business model. I believe you're going to find this market opening up in the next several years, and you'll see more of these projects getting done." tpo

What's Your Story?

TPO welcomes news about environmental improvements at your facility for future articles in the Greening the Plant column. Send your ideas to editor@tpomag.com or call 715/277-4094.

- ✓ New & Used Equipment
- ✓ Videos and Podcasts
- ✓ Online Exclusives
- ✓ Editor's Blog
- ✓ Free Subscription
- ✓ Article Reprints
- ✓ Digital Editions

www.tpomag.com