

Manure-powered generator reaches output milestone

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HOMER CITY - A little more than two years after it went into operation, Brookside Dairy's anaerobic digester - a system that generates electricity from cow manure - reached a significant milestone this month: its one millionth kilowatt of electric power.

That's enough electricity to power 800 typical homes for a year, according to Jim Resh, manager of the Indiana County Conservation District and the project manager who helped get the digester designed, financed and built. The digester cost more than \$434,000 and was made possible with the help of an Energy Harvest Grant from the state Department of Environmental Protection.

When Brookside's anaerobic digester went online in the spring of 2006, it was a first in Indiana County. It remains the only one in use locally and is one of 16 in Pennsylvania.

The digester's main source of fuel is 10,000 gallons of manure contributed daily by the farm's 450 Holstein cows. The manure and animal bedding are scraped from the floor of the stalls into a circular, concrete digester tank partially buried underground. The tank is covered by a white polyethylene dome.

In the absence of oxygen, naturally occurring bacteria break down the manure in the tank. The digestion process releases a bio-gas that is captured under the dome. The bio-gas is about 70 percent methane and about 30 percent carbon dioxide. The methane is burned as fuel in a 150 horsepower engine generator.

To make the system even more efficient, hot water recovered from the engine's cooling jacket is circulated through pipes suspended inside the digester, warming the manure and making it an even more efficient producer of methane.

The digested effluent then flows to a holding tank where it is stored until it is spread on fields as a fertilizer.

Brookside Dairy, established in 1806, is the county's oldest dairy farm. It is co-owned by brothers Keith and Kevin George.

**Aaron George**, Keith's son, is a Penn State University grad with a degree in agriculture systems engineering. He oversees the daily operations of the digester.

George said the digester provides all the power for the farm's electrical needs - lighting, running the milking machines and operating big fans to keep a refreshing breeze circulating around the cows on sultry summer days. The more comfortable the cows are,

the more they eat. And the more they eat, the more milk they give.

The digester sometimes generates more electricity than the farm needs.

"At times we export power" to REA Energy, Resh said. The farm receives about 2 cents per kilowatt for the power it sells to REA. That amount, George said, is relatively insignificant compared to the overall operating expenses of a large dairy farm.

"Where we see benefit is not having to buy power," George said.

The farm's monthly electricity bills were \$4,000 to \$4,500 before the digester was installed, he said. With the digester, monthly bills are in the \$600 range. (The farm's owners still have to pay some service-related charges even though the digester often generates more than enough electricity for the farm.)

The digester has become more efficient with the introduction of additional fuels.

About 5,000 gallons of whey every 10 or 11 days from the Smicksburg cheese plant and yeast from the Latrobe beer brewing plant are now added to the manure in the digester tank. And Resh said it's possible that some waste cooking grease from local restaurants may eventually be added to the mix.

The system produces so much methane that a flare has been added to burn the excess gas, and George said the farm owners are looking into the possibility of adding a turbo-charger to the engine. It would require more fuel and burn the excess gas, but it would also generate more electricity.

George said the Brookside digester is steadily making 80 kilowatts of electricity an hour, and unlike wind-powered turbines that produce power only when the wind is blowing, the anaerobic digester operates more than 99 percent of the time. George only shuts the engine down briefly every 12 days to change the oil.

Aside from producing electricity, anaerobic digesters have other benefits.

Resh said they increase the value of manure as a fertilizer by converting organic nitrogen into a mineralized form that can be taken up more quickly by plants. Weed seeds suspended in manure subjected to anaerobic digestion are less likely to germinate and grow more weeds when the treated manure is spread on farm fields, reducing the amount of herbicide needed.

The offensive odor of manure is reduced through anaerobic digestion, allowing the leftover effluent to be spread on farm fields closer to residential areas without complaints.

And because methane is a greenhouse gas, burning it in a digester generator slows down the rate of global warming.

According to Resh, a supply of electricity comparable to the 1 million kilowatts produced by the Brookside digester in the last two years, if generated at a coal-fired station, would have pumped 2.2 million pounds of carbon dioxide and 18,000 pounds of sulfur dioxide into the atmosphere.

Gov. Ed Rendell has set a goal of having renewable resources produce 18 percent of the electricity used in Pennsylvania by 2015, and farm digesters are expected to help achieve that goal.