

Dairy Power™

Overview

- *Pennwood Farms of Berlin, Penn., worked with the USDA Rural Energy for America Program (REAP) to construct an anaerobic digester.*
- *Since the digester was built in 2011, it has generated approximately 1.5 MWh of electricity and more than 1,500 tons of bedding.*
- *The clean bedding generated by the digester also saves the farm approximately \$60,000 in bedding costs annually.*

Pennwood Farms is part of a winning combination in Pennsylvania

Secretary of Agriculture Tom Vilsak recently visited a Berlin, Penn., farm and praised its commitment to the environment, stating: “Using enhanced manure management techniques (anaerobic digestion) not only provides a new source of income for farmers, it also improves air and water quality while providing renewable electricity for hundreds of homes in the community — it’s a win-win-win.”

The dairy, Pennwood Farms, is a 500-cow dairy that utilizes an anaerobic digester to process manure into electricity and clean bedding. The construction of the digester complex is an example of a dynamic public/private partnership. In this type of partnership, funds from a U.S. Department of Agriculture (USDA) Rural Energy for America Program (REAP) grant were used to build the digester system.

The digester, which was designed and built by RCM International, produces enough biogas to generate electricity for the farm and several homes in the community, decreasing electricity costs and adding revenue to the farm through reverse metering on the grid. The clean bedding generated by the digester also saves the farm approximately \$60,000 in bedding costs annually.

Since the digester was built in 2011, it has generated approximately 1.5 MWh of electricity and more than 1,500 tons of bedding. These numbers represent a significant reduction in greenhouse gas (GHG) emissions, an improvement in air and water quality, and significant renewable energy production.

Pennwood Farms’ efforts support the USDA and the Innovation Center for U.S. Dairy’s agreement to work jointly in support of the U.S. dairy industry’s goal to reduce GHG emissions of fluid milk by 25 percent by 2020, advance technology to produce renewable energy, improve environmental quality and enhance profitability for U.S. dairies.

Key components for successful operations:

- The digester is integrated into the entire farm operation, where business value comes from revenue from the sale of electricity and reduced operating and bedding costs.
- The digester development company provides performance guarantees, so the dairy producer doesn’t have to shoulder the burden of digester malfunctions, should they happen.
- The farm owns the renewable energy certificates (RECS)*; not the utility company.

Key benefits:

Financial opportunity — The digester generates a small amount of revenue from selling electricity on the grid and also saves on electricity and space/water heating costs. These cost reductions provide income to help sustain the economic viability of small farms.

Reduced manure management costs — Dairy farms see an immediate increase in their bottom-line savings by eliminating the costs of their previous manure management program.

Reduced bedding costs — The fiber produced by the digester is returned to the farm to use as cow bedding. In some instances, this is a more sterile and virtually pathogen-free material than the previous bedding source.

Environmental stewardship — The dairy producer is a better steward of the environment, as digesters reduce runoff issues (phosphorus and nitrogen) and GHG emissions.

Growing opportunities for small farm digesters

Pennwood Farms is an example of a growing trend to build anaerobic digesters on small dairy farms. The USDA is committed to increasing the adoption of anaerobic digestion on dairy farms nationally. Although past efforts have generally focused on large dairies, the USDA would like to extend adoption of anaerobic digestion to small farms, as well.

Small dairy digesters provide odor control that is important to farms facing the encroachment of residential development in rural areas. In addition, anaerobic digestion makes the digester effluent easier to store and spread under more conditions than untreated manure. The flexibility in field application of an odor-reduced effluent from digesters allows a farmer to recycle manure nutrients as organic fertilizer at the most opportune times, reducing nutrient losses to ground and surface water and improving crop yield. The temperatures used in anaerobic digestion also leads to the significant destruction of pathogens such as fecal coliforms (organisms associated with contaminated drinking water).

In the case of Pennwood Farms, biogas from the digester is used to fuel an engine generator to generate electricity. However, biogas also can be directly burned in a boiler to provide hot water for on-farm uses such as heating wash water and as a substitute for more expensive propane and fuel oil applications.

Pennwood Farms digester project by the numbers

Farm type	Dairy
Herd size	500 milking head
Type of digester system	Complete mix
Digester capacity	24,000 gal./day
Manure collection methods	Scraped into pit and gravity fed to digester
Biogas production	70,000 scf/day
Installed electrical generation	One 180kW engine (920,000 kWh electricity produced annually)
Ownership	Pennwood Farms
Digester designer	RCM International
Date operational	2011
Net metering utility contract (\$/kwh)	\$0.072
Engine brand	Man Motor
Feedstock	Manure
Products/by-products	Electricity and bedding
Utility	Penelec

Financial information

Investment	\$1.2 million (\$580,000 REAP grant and grants from the state)
Annual operating and maintenance cost	\$12,000 to \$15,000
Revenue	Revenue not available
Payback period	7 to 9 years (with grants)

The Dairy Power™/Biogas Capture and Transport™ project is focused on realizing the significant potential of anaerobic digester systems for U.S. dairy producers by helping put 1,300 methane digesters on dairy farms by 2020. Working with regional and national programs, the project addresses existing barriers, such as technology and financing.

Dairy Power/Biogas Capture and Transport is one of eight projects endorsed by the Innovation Center for U.S. Dairy® to help reduce greenhouse gas emissions and increase business value across the dairy industry. For more information about Dairy Power/Biogas Capture and Transport or to join our mailing list, email innovationcenter@usdairy.com.

The Innovation Center aligns the collective resources of the dairy industry to offer consumers nutritious dairy products and ingredients, and promote the health of people, communities, the planet and the industry.

*Renewable Energy Certificates (RECs) are generated when electricity is the primary product produced using biogas from an AD. Utilities purchase RECs from the digester operation to meet renewable portfolio standards or other state standards for renewable energy production. An REC price of \$1 per MWh is assumed for all states except California, which assumes an REC value to be \$8.50 per MWh. The average cow could produce 9.3 to 9.7 million RECs per year.