MIDWEST CHP APPLICATION CENTER

In Partnership with the US DOE

combined heat & power on dairy farms

Norswiss Farms
848 kW CHP Application

Project Profile

Quick Facts

Location:
Rice Lake, Wisconsin
Facility Type:
Dairy Farm
Number of Cows:
1,100 dairy cows
CHP Generating Capacity:
848 kW
Prime Mover:
Jenbacher JGS316 GS-B.L. Engine
Primary Fuel:
Anaerobic Digester Gas at ~65% Methane CH_4
Heat Recovery Source:
Jacket Water and Intercoolers
Heat Recovery Rate:
1.7 MMBtu/hr Hot Water
Heat Recovery Application:
Digester Heating
Digester Retention Time:
20 Days
Operation Schedule:
24/7
Local Electric Utility:
Barron Electric
Total Installation Cost:
$2,700,000
Began Operation:
April 2006

Project Overview

In April 2006, Norswiss Farms of Rice Lake, WI, a 1,100 cow dairy farm, began the operation of an 848 kW CHP system operating on anaerobic digester gas from cow manure. The CHP system, installed by Microgy, Inc., a subsidiary of Environmental Power Corporation, is driven by a Jenbacher JGS316 GS-BL biogas engine with JW/IC heat recovery to maintain the temperature of the digester tank. The CHP system operates 24/7 and exports all of the generated electricity to the grid. This system will annually generate over 6,500,000 kWh, enough energy for 600+ homes.

Norswiss Farms – Rice Lake, Wisconsin

From Cow Manure to Cow Power

The anaerobic digester was installed at Norswiss Farms to assist in the reduction of animal waste problems associated with manure disposal on farms, odor reduction and the potential revenue benefit resulting from the sale of electricity.

The methane conversion to energy process begins as the cow manure is collected and piped to a heated complete mix anaerobic digester where microbes break down organic material in an environment devoid of oxygen. Within the digester tank, waste decomposes over time into a variety of products, including biogas rich in methane (CH_4). The methane is then piped through a scrubber where moisture is removed and the gas is cleaned. The biogas is then sent to the Jenbacher engine where waste heat from the engine's jacket water and intercoolers is sent to a heat exchanger for hot water production that is then piped back to the digester to maintain the 750,000 gallon digester tank in the Thermophilic temperature range (120°F - 140°F). In addition to the cow manure, food waste oils are also used in the digestion process to help balance the gas quality and flow.

The retention time of the manure while in the digester averages 20 days. The slurry exiting the digester gets separated; the liquid goes into a nearby lagoon to be used as fertilizer and the fibrous solids and are used for animal bedding.

The Key Partnerships

In 2003, a partnership was formed between Dairyland Power Cooperative and Microgy Energy Systems to develop five CHP projects in Wisconsin incorporating anaerobic digesters on dairy and swine farms. Dairyland is required by the Wisconsin Renewable Portfolio Standard to comprise 10% of its electric energy portfolio from renewable energy sources.

Dairyland Power Cooperative is a generation and transmission cooperative that provides wholesale electrical requirements and other services for 25 electric distribution cooperatives and 19 municipal utilities. Dairyland has a generating capacity exceeding 1,100 MW and more than 3,100 miles of transmission lines that provides service in 62 counties within Illinois, Iowa, Minnesota and Wisconsin. Barron Electric is the local distribution utility to Norswiss Farms.

Microgy, Inc. builds, owns and operates anaerobic digestion and energy production facilities which utilize agricultural and food by-product waste to cost-effectively produce methane-rich biogas, while helping to address waste management issues. Microgy's agreement with Norswiss provides Microgy with the right to operate and maintain the digester for the duration of its operational life

Inland Energy Services is the authorized Midwest distributor for GE Energy's Jenbacher Gas Engines. Inland provides service, training and parts to the Norswiss Site for the Jenbacher JGS316 GS-B.L biogas engine system. Inland Energy Services has multiple locations in Michigan, Illinois, Indiana and Wisconsin.

Project Savings

- Norswiss Farms is expected to save over $70,000 per year on animal bedding, a by-product of the anaerobic digestion process.
- Norswiss Farms estimates additional savings due to increased cow comfort, a decrease in animal mortality and a better overall manure management plan.
- Norswiss Farms will experience revenue earnings from the sale of electricity to the grid.

Other Notes

- 59% CHP system efficiency
  - 36.9% electric efficiency
  - 22% from JW/IC heat recovery
- Norswiss Farms received $180,000 in project funding from the USDA 9006 Farm Bill of 2004.
- System simple payback is estimated at less than 10 years.
- System provides 190 MT per year of methane emission reduction at Norswiss Farms.
- Nearly 4,000 MT per year equivalent of green house gas emission (GHG) reduction.

Jenbacher Gas Engine

For further information, contact:

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"These farm projects will produce a constant supply of energy."
Ken Petersen
General Manager
Barron Electric

"There are now three farms which have seen the advantages of adopting our digester technology, and we expect many more to follow."
Andy Livingston
President
Microgy, Inc.

"This alliance with Microgy enables our Power Cooperative to expand our renewable energy portfolio as part of our long-term plan, to use clean, cost-effective sources of electricity."
William Berg
President
Dairyland Power Cooperative