



Holsum Elm Dairy

1,200 kW CHP System

Project Overview

Holsum Elm Dairy, a 4,000 dairy cow farm located in Hilbert, Wisconsin, owns and operates a 1,200 kW anaerobic digester gas-fired combined heat and power (CHP) system. The system was installed due to previous success at the nearby Holsum Dairy, Irish Road facility with a similar system. The digester/CHP system installation began in 2006 and was completed in 2007.

Success with Anaerobic Digestion and CHP

Large-scale dairy operations milk hundreds to thousands of cows. All of these cows produce a great deal of waste. Holsum Elm, however, knew how to handle that. Having installed anaerobic digesters and biogas recovery for CHP at its older facility, Holsum Dairy Irish Road, the company replicated CHP at Holsum Elm. Prior to the CHP project at Holsum Elm Dairy, the manure at Holsum Dairy was stored in open lagoons which when decomposed, released large amounts of methane, a greenhouse gas damaging to the atmosphere and our environment. By producing energy with biogas, Holsum Elm is utilizing a renewable



Holsum Elm Dairy, Engine Generator Set

source of energy with much lower environmental impacts than conventional fossil fuel. Also, the methane that would have been released to the atmosphere is now captured and combusted with this biogas utilization project.

carbon dioxide (CO₂). The digester gas is used to fuel the two 600 kW Guascor engine generator sets. The electricity produced by the combined 1,200 kW CHP system is used on-site by the farm, with the excess power sold to the local utility, Wisconsin Public Service, under a power purchase agreement. By using anaerobic digester gas in a CHP system,

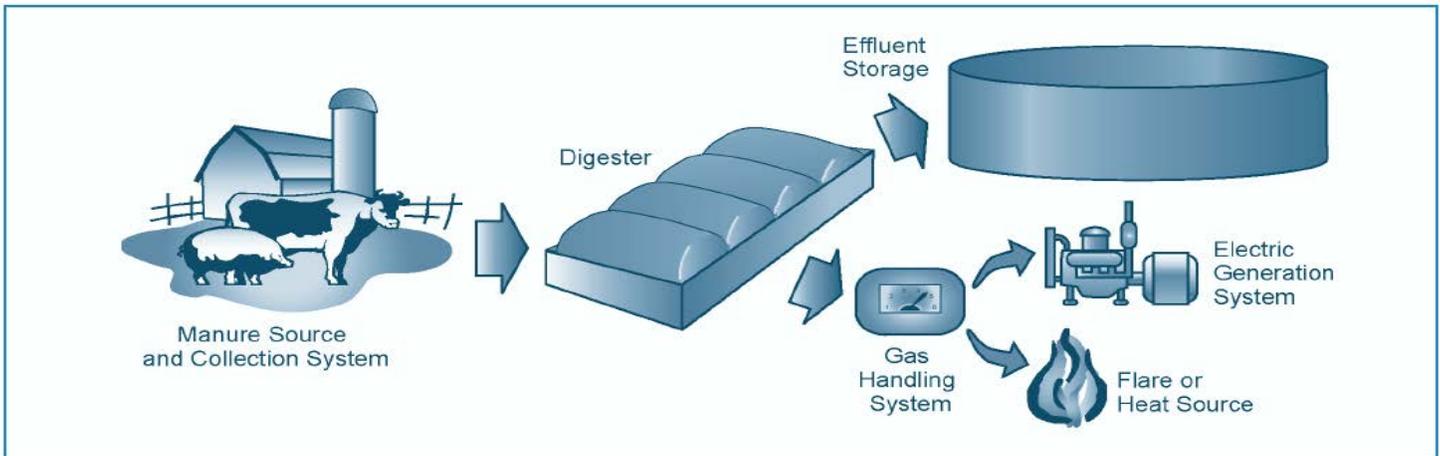
Quick Facts

LOCATION: Hilbert, Wisconsin
MARKET SECTOR: Dairy Farm
FACILITY SIZE: 4,000 Holstein cows
CHP GENERATING CAPACITY: 1,200 kilowatts
EQUIPMENT: (2) 600 kW Guascor Engine
FUEL: Anaerobic Digester Biogas
TOTAL PROJECT COST: \$2,400,000
HEAT RECOVERY: Hot Water
BEGAN OPERATION: 2007

Odor Control, Clean Energy, and More

At Holsum Elm the dairy cow wastes, and other facilities' wastes (including food processing wastes), are sent untreated into the anaerobic digester. The manure is mixed and heated with bacteria that assists in the breakdown of waste material and contributes to the production of the anaerobic digester gas, consisting of methane (60–80%) and

methane that would have been released to the atmosphere is utilized, and CO₂, methane and other greenhouse gases are offset by providing from a renewable resource instead of generating electricity from a typical coal-fired utility power plant.



Basic Anaerobic Digester/Combined Heat and Power System Flow Diagram

Source: www.epa.gov/agstar

Heat is recovered from the engine jacket, exhaust, and radiator, in the form of hot water. It is utilized in the anaerobic digester system itself to maintain the required temperature of the digester. The remaining recovered heat meets the farm's need for hot water and for in-floor heating of the milking parlor, office, shop, and holding and transfer areas.

Once digested the manure takes the form of an odorless effluent, which after treatment flows into the farm's storage lagoon. An advantage of the anaerobic digester treatment process is that the viscosity of the effluent is such that the liquid effluent can be pumped through an irrigation nozzle for field spreading. Holsum Elm's liquid effluent goes to farmers who grow feed for the dairy as crop fertilizer. 95% of the effluent is transported within 4 miles, with 75% of the liquid piped, and the rest trucked. The separated solids can be used for bedding, potting soil and mulch. Holsum Dairy produces 16 semi loads of digested solids per week. One third of the digested solids are used for the farms own bedding needs and the remaining two thirds are sold to 10 other area dairy farms at \$15 per ton. By using these solids and the solids from the other dairy on-site and selling the excess to other farms, Holsum saves \$360,000 annually on bedding. The co-owner of the farm, Kenn Buelow, is also investigating using the solids in other revenue streams such as pellets for wood burning stoves, particle board and plastic piping.

"We originally installed the digesters to control odor and provide energy. The plan was to break even on our investment. But since installing, we have been able to increase revenues and reduce our cost."

- Ken Buelow, Co-Owner, Holsum Elm Dairy

Anaerobic Digester/CHP Technologies to Fit Your Farm

U.S. Environmental Protection Agency AgSTAR has identified dairies with 500 or more animals as the most viable agricultural candidates for anaerobic digester projects. Other factors to consider are how often the manure is collected and the solids content of the waste. Facilities with stable year-round manure production which collect at least 50% of their manure daily are well suited for these types of

systems. According to AgSTAR, the digester technologies that can be utilized on a farm include covered lagoons, complete mix digesters and plug-flow digesters. Holsum Elm Dairy utilizes a two-stage mixed plug-flow digester system as this technology meets the farm's requirements for treating the farm's slurry manure with a total solids content of 3 to 10 percent. The preferred prime mover technologies for most dairy farms utilizing biogas from anaerobic digesters are reciprocating engines, microturbines, and fuel cells.

For More Information

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The Midwest CHP TAP is a U.S. DOE sponsored program managed by the Energy Resources Center located at the University of Illinois of Chicago.