



**MIDWEST
CHP
APPLICATION
CENTER**

In Partnership with
the US DOE

combined heat & power on dairy farms

Holsum Dairy, Irish Road

700 kW CHP Application

Project Profile

Quick Facts

Location:

Hilbert, WI

Type of Industry:

Dairy Farmer

Facility Size:

4,000 Holsteins

CHP Electric Capacity:

700 kilowatts

Prime Movers:

▶ (1) 500 kW Deutz Engine

▶ (1) 200 kW Caterpillar Engine

Fuel Type:

Anaerobic Digester Gas

Installed Cost of Anaerobic

Digester/CHP Project:

\$2,000,000

Simple Payback:

7 years

Year of Installation:

2001-2002

Project Overview

Holum Dairy Irish Road, a 4,000 dairy cow farm located in Hilbert, Wisconsin, owns and operates a 700 kW anaerobic digester (AD) gas-fired combined heat and power (CHP) system. The AD/CHP system installation began in 2001 and was completed in 2002 and was one of the early manure treatment systems using anaerobic digestion on a dairy farm in Wisconsin. The generated electricity is sold to the local electric utility and the recovered heat is captured and used for the digester milking parlor, office and holding and transfer areas. The integrated system was designed and installed by GHD, Inc., an engineering firm located in Chilton, Wisconsin, that specializes in petroleum and farm related environmental engineering.



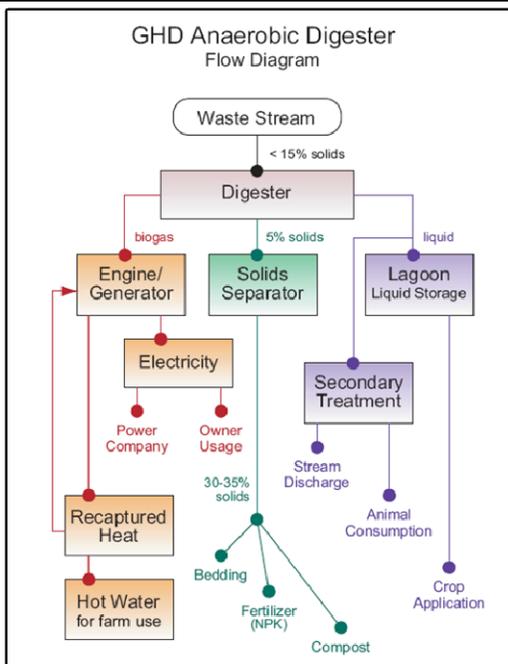
**To the right: Holsum Dairy, Irish Road
Digesters**

Source Energy Center of Wisconsin

Holsum Dairy Incorporates Anaerobic Digestion

Large-scale farming operations face many manure management problems including odor complaints, proper waste disposal and the release of greenhouse gases into the atmosphere. These issues can be addressed through the use and operation of an AD/CHP system. In an effort to control the farm's odor issues and seeing the opportunity to generate electricity from a renewable energy resource, Holsum Dairy decided to install a mixed plug-flow anaerobic digester coupled with a biogas-fired CHP system. Prior to the AD/CHP project, the manure at Holsum Dairy was handled with a flush system and was stored in open lagoons which when decomposed, released large amounts of methane, a harmful greenhouse gas. Since the AD/CHP system has been installed, Holsum Dairy has been pleased with the large reduction of odor and has enjoyed the benefits of the AD/CHP system including:

- Electric generation to use or sell
- Bedding for animals
- Heat for farm use
- Odor reduction
- Increased ammonia control
- Increased fertilizer value
- Pathogen reduction/GHG reduction
- Weed seed reduction
- Low maintenance
- Phosphorus and metal reduction



Source:www.ghdinc.net

Anaerobic Digester System Flow Diagram

generated electricity is used on-site by the farm with the excess power sold to the local utility, Wisconsin Public Service under a power purchase agreement. The recovered heat, in the form of hot water, is collected from both the engine jacket liquid cooling system and from the engine air exhaust system. A portion of this recovered heat is utilized in the AD system to maintain the required temperature of the digester at 100°F. The remaining recovered heat is used by the farm as a replacement for hot water production and for in-floor heating of the milking parlor, office, and holding and transfer areas. The farm also has a backup boiler that can run on diesel or biogas to supplement the existing heating system.

Once digested, the waste does not disappear. The majority of the volume remains, however the effluent that emerges after 22 days is not considered a waste by Holsum Dairy. A mechanical manure separator separates the effluent's solids from the liquids. The liquid, a clear odorless stream, flows into the farm's storage lagoon. The viscosity of the liquid effluent is such, as opposed to the raw manure influent, that it can be pumped through an irrigation nozzle for field spreading. The nutrients are taken from an organic-state to an inorganic state, making the liquid "plant-accessible", meaning it can be applied to growing crop without burning the leaves. The separated solids, having the same odor and pathogen reduction characteristics as the liquid stream, are utilized by the farm for bedding replacement. Use of the separated solids for bedding typically comprises about 40-60% of the separated solids from a typical farm.¹ The remainder can be sold to other farms.

Incentive for AD/CHP Applications

If the above advantages of having a AD/CHP system were not enough for Holsum Dairy, there are still more. Holsum Dairy, along with its sister farm, Holsum Elm Dairy, receive "funding" from TerraPass for their AD/CHP project. Terra Pass is an organization committed to helping individuals and organizations be proactive in regards to climate change by funding projects using clean, renewable energy, such as farm-based AD/CHP systems. By selling carbon offset certificates, Holsum's project becomes more economically feasible. Carbon offsets are measured by TerraPass in 'pounds of carbon dioxide' offset. Since Holsum's project primarily offsets methane into the atmosphere, their project's benefits are converted to 'pounds of carbon dioxide equivalent' to determine how many carbon offset certificates can be sold to TerraPass members.

Utilizing All that AD Can Offer

Holsum Dairy utilizes two mesophilic mixed plug-flow digesters that are laid end to end. All the waste is collected in a receiving pit and sent to a concrete vessel. The manure is heated in an oxygen-free environment to convert volatile fatty acids into anaerobic digester biogas. The biogas consists primarily of CH₄ (methane) and CO₂ with trace amounts of compounds. Cow manure is well suited for anaerobic digestion as a single cow can produce enough waste to generate 0.1 to 0.2 kW from the generated biogas.

Holsum Dairy supplements the waste from its herd with waste from three area food processing facilities. The farm collects tipping fees for the 1 to 1.5 semi loads of waste product that they collect on a daily basis. The collected wastes include food waste, malt ingredients and slaughter-cow waste and are untreated prior to collection.

The biogas, generated from the digestion vessels, is utilized in two engine generator units, a 500 kW Deutz engine and a 200 kW Caterpillar engine. The 700 kW of

“There are a lot of parts to the digester operation that make it financially feasible. It’s difficult to do it without all these parts working together. The sale of the power generated by the digester, supplemented by the income from selling the carbon credits, along with the use of compost from the digester for bedding, has made it financially feasible to install and maintain the digesters.”

*--- Kenn Buelow ---
Co-Owner, Holsum Dairy*



Caterpillar Engine Generator Set

Source: Energy Center of Wisconsin

For further information contact:

*Midwest CHP Application Center
1309 S Halsted St
Chicago, IL 60607-7054*

*Phone: (312) 996-4382
Fax: (312) 996-5620*

www.CHPCenterMW.org



¹ <http://www.ghdinc.net/>