

Project Profile: Clover Hill Dairy



Aerial view of Clover Hill Dairy.
Photo Credit: U.S. Gain

DAIRY



Campbellsport, Wisconsin



Highlights

- Generated electricity from the combustion of biogas from 2007 to 2020
- Began upgrading biogas to renewable natural gas (RNG) in 2020
- Uses digestate for cow bedding and fertilizer

Clover Hill Dairy is a 3,500-acre, fifth-generation farm in Campbellsport, Wisconsin. The Bonlender family owns the 2,000 dairy cow operation. As part of their mission to continually improve the operation, the family installed an anaerobic digester to capture biogas from its herd's manure for electricity generation. The system has been operating since 2007.

About the System

Clover Hill Dairy's Two- Stage Mixed Plug Flow™ system treats manure that is continuously scraped and collected daily. The digester, designed by DVO, Inc., is a U-shaped concrete vessel with a fixed concrete cover. Containment of manure in a sealed environment allows the anaerobic digestion process to take place, while also reducing odors in the local area. Manure and wastewater enter and exit from the same end of the digester, a design that theoretically allows for future expansion on the enclosed end of the digester. A central wall houses hot water piping that heats the manure. The digester operates at a temperature of approximately 100°F and has a hydraulic retention time of 20 days, reducing pathogens contained in the manure.

When processed manure exits the digester, a screw press separator squeezes the liquid from the solids, allowing the solid digestate to be reused as cow bedding. This reduces the farm's need for other bedding materials, such as sand, straw, or wood shavings. The operation produces approximately 140 tons of solids each week, most of which is used on site. Any remaining solids are sold to another dairy for bedding. The farm uses the liquid digestate as fertilizer for its fields.

Biogas Use

From 2007 to 2020, Clover Hill Dairy used the digester’s generated biogas for electricity production. The farm began with a 210-kW generator but was quickly producing enough biogas to run a larger, 300-kW engine-generator set. In 2011, the farm increased its herd size and added a 180-kW generator. Biogas was treated with a passive hydrogen sulfide removal system and a chilling unit for condensate removal. Waste heat collected from the engines not only heated the digester, but also reduced the purchase of other fuels used to heat the milk house, parlor, and feed lanes. Additionally, the farm sold the carbon credits generated from the electricity production.

In 2020, project developer U.S. Gain partnered with technology suppliers DMT Clear Gas Solutions and CMD CNG Energy Solutions to install biogas conditioning and compression equipment at Clover Hill Dairy, as well as three other Wisconsin dairies with digesters, to produce RNG. Without a physical natural gas pipeline nearby, Clover Hill Dairy compresses and stores its biogas on site on a mobile unit which can be transported by truck to a pipeline injection site. The other three farms (Dallmann East River Dairy, S & S Jerseyland Dairy, and Deer Run Farm) deliver pipeline quality gas to the same, centralized injection point.

Nacelle Solutions, another U.S. Gain partner, owns, operates, and maintains the biogas handling equipment.

“For the past 13 years, [the digester] has provided us with many values, including higher quality, safer manure for fertilizer, electrical production and a renewable bedding source for our animals. By replacing our generators with the RNG system, our farm will see many added environmental benefits, such as less noise pollution, cleaner air, and less odor.”

– Joe Bonlender, Clover Hill Dairy



Biogas upgrade equipment at Clover Hill Dairy.
Photo Credit: DMT Clear Gas Solutions

Benefits

Clover Hill Dairy advances sustainability in the following ways:



- Protects human health by reducing pathogens in manure through the anaerobic digestion process
- Improves quality of life in the community by reducing odor on local farms
- Offsets the use of fossil fuels
- Reduces methane emissions from livestock manure and offsets carbon dioxide emissions from fossil fuel combustion
- Improves access to RNG for the transportation and thermal energy sector
- Reduces operating costs by producing natural bedding and fertilizer products that are used on site
- Generates revenue from the sale of excess bedding

SYSTEM DESIGN PROPERTIES	
Feedstock Processed	Dairy cow manure
Digester Type	Mixed plug flow
Population Feeding Digester	2,000 dairy cows
Baseline System	Storage lagoon
System Designer and Developer	DVO, Inc. (digester); U.S. Gain (RNG development)
Biogas Uses	RNG for pipeline injection
RNG Generation	140,000 ft ³ /day

Want to learn more?

For more information about Clover Hill Dairy, visit its website at <http://cloverhilldairy.com/>.

Find details about DMT Clear Gas Solutions' biogas upgrading technology at <https://www.dmt-cgs.com/products/biogas-upgrading/>. For information about CDM CNG Energy Solutions' customized compression systems, visit <https://www.cmdenergy.com/what-we-do/biogasalternative-applications/>.

Learn more about U.S. Gain's RNG development at <https://www.usgain.com/solutions/renewable-natural-gas-development/>.

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