

Crave Brothers Farm reaps big benefits with energy efficiency and renewable energy

Installations include energy-saving lighting, water heaters, and an anaerobic digester

Energy efficiency is a natural way of doing business for Crave Brothers Dairy Farm in Waterloo, Wisconsin. Over the years, the Crave brothers' commitment to environmental responsibility has led them to install a number of energy-efficient and renewable energy projects that benefit not only Wisconsin's air and water—but also the farm, its employees, its cows, and its customers.

“Our family has a history of working in harmony with the land to produce quality milk and cheeses,” says George Crave. He and his family are partners with his brothers, Charles, Thomas, and Mark, and their families. George, a licensed cheese maker, explains: “We want to build our business for future generations of our family, and we are committed to doing that in a way that respects the Earth.”



With the assistance of Focus on Energy, the farm installed energy-efficient lighting that will save the farm almost 24,000 kilowatt hours annually.

In business since 1978, the 1,700-acre dairy farm started out producing milk, but expanded in 2001 to include on-site production of specialty cheeses.

EFFICIENCY FIRST

Efficiency is a top priority at Crave Brothers Farm. Says Charles Crave, “When we look at new equipment or options, we look for input from university research, the Focus on Energy program, electricians and the electrical engineers to make informed decisions about energy-efficient options.”

The Crave family has implemented a number of energy-efficiency projects with technical and financial assistance from Focus on Energy, Wisconsin's energy efficiency and renewable energy initiative.

Charles continues: “Our decisions include energy efficiency options because we know that it makes good business sense in the long run for that piece of equipment even though the payback may not be there right now.” With the anticipated energy savings from the farm's energy-efficient measures, along with the kilowatt-demand reduction, it's estimated that the farm will save more than \$10,000 a year.



The Crave Brothers currently milk over 1,000 cows.

For more information, call 800.762.7077 or visit focusonenergy.com.

Efficiency Projects and Resulting Savings at Crave Brothers Farm

Project Type	Cost	Focus Incentive	Annual Energy Savings	Annual Dollar Savings
Replace water heater and add heat-recovery tank	\$6,500	\$1,200	3,205 therms	\$6,400
Energy-efficient lighting	\$18,857	\$1,760	23,864 kWh	\$2,680
Install 8 low-energy waterers	\$5,648	\$400	12,000 kWh	\$1,320

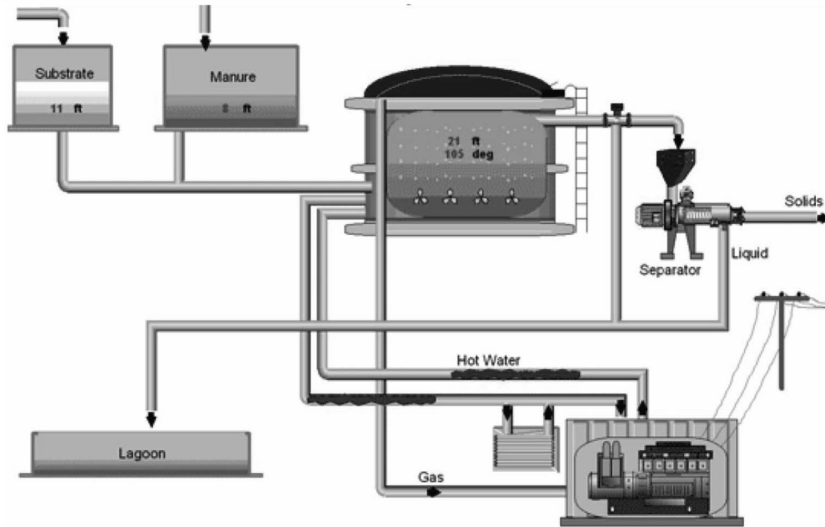


Diagram of Clear Horizons anaerobic digester system.



Crave Brothers Dairy Farm added a second digester tank to keep up with the farm's growth.



Clear Horizons' patented mixing technology combines cow manure with waste cheese whey from the Crave Brothers dairy and cheese operations to produce significantly more biogas than a manure-only digester.

"The Crave Brothers Dairy Farm and the Crave Brothers Farmstead Cheese are examples of family agribusinesses that Wisconsin and our utility should support," said Jason Kollwelter, agricultural program manager at We Energies. "We Energies works with operations such as the Crave Brothers to help them become more profitable and sustainable. Energy efficiency just makes good business sense from all angles." We Energies has provided incentives for energy-efficiency projects on the Crave Brothers Farm, including lighting and ventilation fans.

RENEWABLE ENERGY

Milk and cheese aren't the only things produced on the Crave farm. By fall of 2009, more than 1,000 milk cows and 1,200 heifers and dry cows will produce 50,000 gallons of manure each day. That's where the farm's anaerobic digesters come in.

In 2006, the Crave brothers partnered with Clear Horizons, a firm that specializes in organic waste-management solutions and biogas energy systems, to install a sophisticated, computer-controlled anaerobic digestion system.

Anaerobic (oxygen-free) digestion is a biological process in which microorganisms break down organic waste and produce gas, mainly methane with some carbon dioxide. After some cleanup, this gas can be burned just like natural gas to generate electricity.

At the time, the farm was home to about 700 cows. As the Craves grew the milking herd and moved heifers from neighboring farms to the main farm, Clear Horizons added a second digester tank and upgraded to 633 kilowatts of generation capacity in the winter of 2008-09.

Today, the Craves' dual 750,000-gallon digester tanks help the farm manage the manure produced by the herd while generating over four million kilowatt-hours of clean, renewable electricity. This is enough to power nearly 450 homes.

Clear Horizons owns the computer-controlled digesters and electrical generators and operates them over the Internet from the company's office in Milwaukee. The company also maintains the digesters, freeing the Crave family to run their business. In addition, Clear Horizons handled utility power-purchase and interconnect negotiations at the beginning of the project, as well as politics and permitting associated with construction.

All told, Clear Horizons received nearly \$245,000 in financial incentives from Focus on Energy for installing the digester system and will net more than \$300,000 annually from the sale of electricity to their local electrical utility, WE Energies.

The company generates income from the system by selling excess electrical production back to the utility, as well as from sales of organic bedding and potting mix created from the digesters' solid waste.

ORGANIC WASTE INTO ELECTRICITY

The Crave Brothers system was installed in 2007 and Clear Horizons designed and built the digester as its first project of this type for a live-stock operation after researching other plants in the United States and Germany.

At the Crave farm, manure gravity-flows and drops through a slotted floor to a collection pit in the milk cow barns. Heifer manure is scraped to a centralized collection pit with a skid steer. The farm adds about 3,000 gallons of whey permeate from the cheese operations each day. The waste moves into the digester and separator, and the liquid portion flows by gravity to a 10.5-million-gallon pit and is later used as fertilizer on the farm.

The digesters produce biogas, which is treated with passive hydrogen sulfide removal and a chilling unit for condensate removal. It is then fed into a 633-kilowatt Jenbacher JMC312GS synchronous spark-ignited engine generator set.

About 8 percent of the electricity generated is used to power the digester system, with the

excess sold to We Energies. Heat captured from the generator is reused to heat the digester, substrate tank, and pumping and separation rooms, as well as to heat the farm's large shop, office building, special-needs building, hot-water system, pasteurizer, and pressure washers.

Solids are separated using a Vincent KP-16 screw-press solids separator. Clear Horizons reuses this solid waste to produce organic potting mix and bedding. Crave Brothers purchases this bedding and uses the liquid byproduct as fertilizer on its fields.

LEADING THE WAY

The Craves, known throughout Wisconsin as agri-business innovators, are industry leaders in energy efficiency and the use of clean, renewable energy.

Equipped with the latest research, advice from energy professionals, and information and financial incentives from Focus on Energy, Crave Brothers strives for economy and environmental sustainability with the installation of energy-saving lighting, water heaters, waterers, and even a renewable energy system in the form of an anaerobic digester.

The unique relationship between Crave Brothers and Clear Horizons benefits both businesses and serves as an innovative model for other farms. Specifically, it allows the Crave brothers to focus on their primary businesses—milk production and cheese operations—without getting bogged down by manure management, the operation and maintenance of the digesters, or the packaging and sales of digester byproducts.

FOR MORE INFORMATION

Focus on Energy Financial Incentives

focusonenergy.com/reincentives

"Wisconsin Agricultural Biogas Casebook"

focusonenergy.com/biogascasebook

Biogas Toolbox

renewwisconsin.org/biogas/biogastoolbox.htm

**Renewable Energy System Facts
Crave Brothers Dairy Farm—Waterloo, Wisconsin**

Type of system: Complete-mix anaerobic digester

Capacity: Two 750,000-gallon tanks

Collection method: Gravity flow to pit

Design temperature: 99°F

Digester notes: Above-ground steel tanks, proprietary mixing technology, remotely managed via Web

Design hydraulic retention time (HRT): 25 days

Design solids: 12%

Biogas use: Electricity and heat

Installed capacity: 633 kW

Solids separation: Yes, screw press

Ownership: Designer owns digester and energy generation

Digester designer: Clear Horizons, LLC

Date operational: Phase 1, 2007; Phase 2, 2009

Herd size: 1,000 milk cows, 900 heifers/dry cows

Design capacity: 1,000 milk cows, 1,200 heifers/dry cows in Phase 2

Bedding type: Digested solids

Current HRT: n/a

Current solids: 11–14%

Utility contract: Yes, all electricity is sold to utility

Engine Brand: Jenbacher

Solids use: Bedding; also composted and sold as soil supplement

Utility: We Energies