



CHP
TECHNICAL ASSISTANCE
PARTNERSHIPS

Sievers Family Farms

Sustainable Business Model

Project Overview

Sievers Family Farms, established in 1873, is a family-owned cattle farm located in Stockton, Iowa. Owners Bryan and Lisa Sievers are enthusiastic environmental stewards of the land and pride themselves on using all available natural resources. Their concern about the carbon footprint of a planned, 6-fold expansion of the farm's cattle feedlot led them to consider combined heat and power (CHP) and anaerobic digestion (AD) technologies.



Sievers Family Farms- Stockton, Iowa
PHOTO COURTESY OF SIEVERS FAMILY FARMS

The solution was a 1 MW CHP system fueled by the methane produced by the anaerobic digester. The system produces enough

electricity to power the entire feedlot expansion. Excess electricity is purchased by Alliant Energy, a parent company to Interstate Power & Light. The liquid byproduct from the AD is used as fertilizer, and the solid byproduct is used for animal bedding and compost. The liquid and solid byproducts of the AD system are referred to as digestate.

Quick Facts

LOCATION: Stockton, Iowa

MARKET SECTOR: Agriculture

FACILITY SIZE: 2,400 head of cattle

GENERATING CAPACITY: 1 Megawatt (MW)

EQUIPMENT: (1) Caterpillar 3516A Engine
Generator with Heat Recovery

FUEL: Anaerobic Digester Biogas

BIOGAS PRODUCTION: 390,000 scf/day

IMPLEMENTATION COST: \$7.3 Million

THERMAL APPLICATION: Heating for two, 85 foot anaerobic digesters with processing

BEGAN OPERATION: December, 2013

Anaerobic Biomass Digestion and CHP

Expansion of the business occurred with the construction of two new barns that enabled the farm to increase the cattle head count from 400 to over 2,400. With this expansion came waste management considerations. Instead of stockpiling the manure, it is processed through an anaerobic digester to create biogas that fuels the CHP unit.

Sievers Farms uses manure from the cattle, corn stover harvested from surrounding corn fields, and waste from regional food processors as the input material for the AD. There are two digesters with a volume of 970,000 gallons each. Approximately 30,300–35,000 gallons of manure and an additional 25,000 gallons of food processing waste are fed into the tanks every day. The mixture of manure, corn stover, and food processing waste has a solid hydraulic retention time of roughly 40 days. The digestion process removes 99% of the pathogens found in the manure, creating a valuable byproduct rich in nutrients and organic matter.



Bryan Sievers in front of the two anaerobic digester tanks
PHOTO COURTESY OF BRYAN SIEVERS



Sievers Family Farms' Caterpillar 3516A Engine
PHOTO COURTESY OF SIEVERS FAMILY FARMS

The gas produced by the digester process is scrubbed to remove hydrogen sulfide, producing a high-quality, marketable gas: 60–70% methane, 30–32% carbon dioxide. The digester gas fuels the engine, which generates up to 1 MW of power. An average of 125–145 kW is used onsite for farming operations, and 800 kW is sold to Interstate Power & Light through a Power Purchase Agreement (PPA) at 4.8 cents/kWh. The on-site use of the digestate eliminates the need (and cost) for imported inorganic fertilizers.

Soil sample results have verified a significant increase in organic matter content over the last several years. The carbon sequestered in the organic matter also serves to reduce the Farms' overall carbon footprint.

The heat from the engine is captured in a hot water loop and transferred to the digesters, scraper alleys, reception pits, and bio-fiber drying process. The majority of the maintenance of the CHP system is performed in-house.

Diverse Financing Options Utilized

The entire project cost was \$7.3 million, including the engine generator, anaerobic digester, effluent storage structures, separated solids storage structures, biomass storage structures, separators, dosing units, and pumps. Sievers Family Farms and Sievers Renewable Energy partnered with a local investor, Davidson Renewable Energy, to form AgriReNew, a joint venture to manage the income from sales of energy, environmental credits, and bedding and fertilizer from the anaerobic digestion and CHP system. In addition to the financial contributions of the owners, the project received the following contributions:

- Caterpillar Financial provided a loan to the project;
- USDA's Rural Energy for America Program (REAP) provided a grant of \$500,000;
- Natural Resources Conservation Service (NRCS) Environmental Quality Incentives Program (EQIP) contributed a grant of \$250,000; and
- Alliant Energy awarded a grant of \$200,000.

The USDA REAP and NRCS EQIP are federal programs that provide financial assistance to agricultural producers for energy efficiency improvements, renewable energy, and other efforts that promote clean water, air, and land.

"The ability to utilize all of the digestate to enhance soil productivity and health is what makes AD more sustainable than any other form of renewable energy produced on earth"

Bryan Sievers, Owner

The Sievers Farm CHP/AD project was awarded the *Biogas Project of the Year* by the American Biogas Council as well as the Iowa Governor's Environmental Excellence *Award for Outstanding Environmental Leadership and Innovation*.

For More Information

U.S. DOE CENTRAL CHP TECHNICAL ASSISTANCE PARTNERSHIP
www.cchptap.org

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

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