

U.S. DOE



CHP
TECHNICAL ASSISTANCE
PARTNERSHIPS

Hunter Haven Farms, Inc.

260 kW CHP System

Project Overview

Hunter Haven Farms, Inc., an 800 dairy cow farm located in Pearl City, Illinois, owns and operates a 260 kW anaerobic digester and gas-fired combined heat and power (CHP) system 24/7. The CHP system was designed and installed in two phases beginning in late 2004 and concluding in spring 2008. The system is used to produce electricity for the site as well as heat for the buildings and the digester itself.



Hunter Haven Farms, Pearl City, IL

Quick Facts

LOCATION: Pearl City, Illinois

MARKET SECTOR: Dairy Farm

FACILITY SIZE:

- 900 dairy cows
- 500 non-dairy producing young stock

FUEL: Anaerobic Digester Biogas

CHP GENERATING CAPACITY: 260 kilowatts

CHP THERMAL CAPACITY:

- ~ 1.5 MMBtu/hr hot water heat recovery

PRIME MOVERS:

- (1) 130 kW Caterpillar G342NA Engine Generator - installed 2005
- (1) 130 kW Caterpillar G342NA Engine Generator - installed 2008

PHASE 1 (2005) INSTALLED COSTS: \$960,000

PHASE 2 (2008) INSTALLED COSTS: \$199,500

OPERATION SCHEDULE: 24/7

ELECTRICITY GENERATED: 1,138,800 kWh/yr

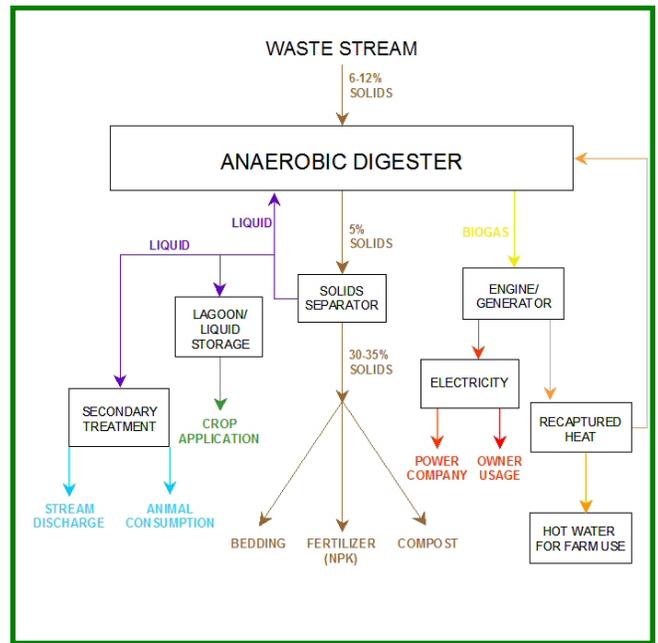
Issues Facing Hunter Haven Farms and the Anaerobic Digester/CHP Solution

Today, large-scale farming operations face many problems that receive increased regulatory attention that can be addressed through anaerobic digester with combined heat and power (CHP). To address these regulatory issues, Hunter Haven Farms, in 2005, installed GHD, Inc.'s proprietary anaerobic digester system and a 130 kW anaerobic digester gas-fired CHP system, utilizing grant-funding from the Illinois Department of Commerce & Economic Opportunity (DCEO) and USDA Rural Development-Section 9006. Building upon the success and reliability of the CHP system installed in 2005 and addressing the concerns of the increased herd capacity of 200 cows in 2007, a second 130 kW generator was installed and integrated into the existing CHP system. The CHP expansion was financed with grant-funding from DCEO and the Blue Moon Foundation.

Issues Facing Farmers	Solutions with Anaerobic Digester/CHP
Odor complaints	Reduce odor from farms by up to 80%
Government regulations pertaining to manure disposal	Provide a solution to managing on-farm waste that meet government regulations
Contaminant leaching to underground aquifers and run-off to surface waters, lakes, and rivers	Integrated management systems reduce the likelihood of contaminant leaching and run-off
Release of greenhouse gas emissions to the atmosphere from livestock manure	Combust methane to generate electricity and thereby reduce greenhouse gas emissions significantly

Anaerobic Digester & CHP Flow Process

Unprocessed cow manure, a renewable resource, is collected in a receiving pit and then sent to a 660,000 gallon anaerobic digester concrete vessel. The manure is mixed and heated with methanogenic bacteria to assist in the conversion of volatile fatty acids into anaerobic digester gas, consisting primarily of methane and CO₂. The anaerobic digester gas, collected from the anaerobic digester vessel, is utilized for fuel in the combined heat and power generators. The electricity produced by the 260 kW CHP system is used to offset the farm's purchased power while excess power is sold to the local utility 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 the engine air exhaust system. Approximately 30–60% of this recovered heat is utilized in the anaerobic digester system to maintain the required temperature of the digester. The remaining recovered heat is used by the farm as a replacement for hot water production and for in-floor heating of the farm and holding areas, as needed. The digester effluent is pumped from the effluent pit of the anaerobic digester vessel to a manure solids separator. The mechanical manure separator divides the influent digested waste stream into solid and liquid fractions.



Anaerobic Digester System Flow Diagram

Source: www.ghdinc.net

"These are extremely exciting projects which will benefit our farmers by providing new uses for crops and livestock and creating increased value for our agricultural products. These are the kind of clean initiatives that help our nation become less dependent on foreign sources of energy."

- Donald Manzullo,
16th District Illinois Congressman, Retired

The solids are dewatered to approximately a 35% solid material. The separated solids, having the same odor and pathogen reduction characteristics as the liquid stream, are utilized by the farm for bedding replacement (an expense reduction). Use of the separated solids for bedding typically comprises about 40–60% of the generated separated solids from a typical farm. The residual ted solids may be sold to other farms for bedding purposes or sold to after-markets, such as nurseries and composters, for soil amendment material. The liquid from the manure separator, now with the majority of the large solids removed, flows into the farm's storage lagoon. A large advantage of the effluent from the anaerobic digester treatment process is that the viscosity of the effluent is such that, as opposed to the raw manure influent, the liquid effluent can be pumped through an irrigation nozzle for field spreading.

Source: www.ghdinc.net

Other Notes

The anaerobic digester installed at Hunter Haven Farms can manage waste for up to 1,200 dairy cows. Manure from five cows typically produces one kilowatt of electricity, or enough power for one home. The system is capable of meeting the peak electric demand of the farm, producing enough power for 260 homes. Currently, only one 130kW engine operates at a time as electricity sell-back prices do not justify selling back to the grid at this time. The farm recently completed a 6 week shut down of the system to clean out soot build-up. The facility is extremely pleased with this schedule as it is the first time the system has been shut down in 10 years of operation.



Hunter Havens Farm CHP System



Plaque Located on CHP Building at Hunter Haven Farms

For More Information

U.S. DOE MIDWEST CHP TECHNICAL ASSISTANCE PARTNERSHIP

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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.