



Patterson Farms

250 kW CHP Application

Project Profile

combined heat & power in farms

Quick Facts

Location:

Auburn, NY

Dairy Size:

2400 acres, 1700-head

Facility Loads (current, peak):

80-200 kW power
677,200 BTU/hr summer and
384,800 BTU/hr winter Waste Heat

Major Components:

One 250 kW Caterpillar G379
RCM; 982,845 gallon digester

Annual Energy Cost Savings:

\$75,000 annually (~\$205/day)
avoided electricity cost + fluctuating
carbon offset money

Installed System Cost

\$1.5 million

Began Operation

Construction started August 2004,
Commissioned October 2005.

Reasons for Installing CHP

Situated about two miles from picturesque Cayuga Lake in upstate New York, Patterson Farms is a 2400 acre, 1700-head dairy farm that generates around 50,000 gallons of manure waste daily. Because it is in a high-risk environmental area, a digester seemed like a natural solution for odor and nutrient management. CHP was selected to provide the necessary heat to maintain digester temperature while supplying electricity for the facility.



Project Overview

Close proximity to Cayuga Lake raised concerns about runoff from manure spreading. In 1999, Patterson farms constructed a 4.5 million gallon

uncovered lagoon to contain the manure from their 1700-head dairy farm. While helpful to mitigate environmental runoff issues, the open lagoon complicated odor problems on the farm. In early 2001, the Pattersons began to investigate the possibility of installing a digester.

RCM Digesters of Oakland, Ca, was chosen to design and engineer the digester, which was installed onsite using farm labor. The digester complex features 2 storage tanks for the dairy animal manure (50,000 gallons) and imported food waste (18,000 gallons), one large premix tank (50,000 gallons), and the complete mix digester itself (982,845 gallons), as well as ancillary mixers and material handling equipment. The digester has a hydraulic retention time (HRT) of approximately 20 days.

In addition to the consistent manure supply generated by the farm's dairy herd, Patterson Farms receives 15,000 gallons of whey food waste (and tipping fees) from the Kraft cream cheese factory via truckload every day. The dairy manure is collected via an automated scraping system and pumped to a dedicated storage tank. The food waste and manure are then combined and fed to the digester. The complete mix mesophilic digester produces 173,300 cubic feet of digester gas daily (60-70% methane).

Approximately 1/3 of the gas is fed to the engine to produce electricity, and the remainder is flared on site. Carbon credits from all of the combusted gas may provide additional revenue to the farm. New York's net metering law provides avoided cost reimbursement to the farm for generated electricity after a year of operation. The reimbursement rate is currently unknown, but may allow for another engine investment to burn the entirety of the generated gas for electricity. The Patterson home is located across the road from the dairy farm and served by a separate meter, hence it is restricted from digester-generated electricity use.

Digester Features:

- Digester supply and food waste/manure mixing are regulated by logic controllers (~6 batches per day). The gas production rate is relative constant, depending on influent supply rate (from the mixing tank).
- The gas is dried, but not otherwise cleaned. Engine oil is changed bi-monthly due to contamination by a small amount of hydrogen sulfide (H₂S) dissolved in the digester gas.
- Heat recovered from the engine maintains the digester temperature between 98 and 100 degrees Fahrenheit (approximately the temperature of a cow's stomach!).
- 16 kW (approximately 8% of the 200kW capacity) is parasitic load for the prime mover – used to power mixers, blowers, and pumps integral to the digester operation.

“The digester helps us deal with the odor problem, and the food waste tipping fees and electricity payments generate positive cash flow for the farm”
Connie Patterson,
owner

Digester Tank with out the Cover



Storage and Mixing Tanks



Financing

Four grant proposals were written: two for digester funding from NYSERDA (a plug flow design, and a complete mix design), a proposal to Cayuga County, and a proposal for grant funding under the USDA rural development renewable energy grant program. They received \$1.2 million in combined funding to install a complete mix digester at the site. The \$300k farm contribution was subsidized by a NYSERDA interest adjustment of 4%, amortized over 10 years. Tipping fees received from receiving Kraft food waste also contribute to the fiscal health of the project.

Interconnection Challenges:

- The interconnection and permitting process were new to Patterson Farms, and much time was devoted to navigating the government channels to ensure compliance.
- The Patterson's had to install \$100,000 worth of electrical equipment to handle the increased electrical load and amalgamate the electrical service for net-metering.
- Net-metering rules only allow compensation for any excess electricity placed on the grid after one full year in the program. At that time a 'true-up' occurs and the utility pays the avoided cost rate charge to the farm for electricity generated (about 0.06 \$/kWh). New York currently has no 'green power' premium in their net metering regulations.

Upgraded Electrical Service



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