



Perdue Farms

999 kW Biogas CHP system

Project Overview

The Perdue Farms facility in Cromwell, Kentucky is a medium size poultry processing plant first established in 1995. The plant processes ready to cook, retail tray packed meats and uses large amounts of hot water and electricity for processing. In 2011, Perdue completed the installation of a 999kW CHP system fueled by biogas produced in an on-site anaerobic digester.

Reasons for Installing CHP

Perdue processes approximately 1.2 million chickens a week and thus requires large amounts of hot water. The CHP system was installed to provide hot water to the plant and sell electricity to the grid, reducing the amount of natural gas required to heat water. The system was sized to the biogas availability and produces approximately 20 percent of the annual hot water needs and roughly the equivalent of 20 percent of the plant's electricity needs. Perdue is a partner in the Generation Partners, Green Power Switch program, a TVA program designed to purchase renewable electricity from small generators. The generated electricity is therefore sold to the grid and not used onsite as is common for CHP systems. During grid outages the CHP system provides electricity to the plant allowing to keep part of the operations online.

The biogas project was developed to not only reduce energy costs but improve the site's wastewater operations. In November 2010, Perdue had completed the first phase of the project by covering the large anaerobic lagoon. The naturally occurring biogas could thus be captured and put to beneficial use and reduce uncontrolled emissions at the same time.

The project has converted the methane and carbon dioxide emissions typically produced by the lagoon into electricity and thermal energy. This emissions reduction is equivalent to 52,000 tons of CO₂ annually.

Quick Facts

LOCATION: Cromwell, Kentucky
MARKET SECTOR: Food Processing
IN OPERATION SINCE: 2011
FUEL: Anaerobic Digester Gas
GENERATING CAPACITY: 999kW
THERMAL OUTPUT: 3.2MMBtu/hr hot water
EFFICIENCY: 82%
EQUIPMENT: 1MW Jenbacher 320 Reciprocating Engine (derated to 999 kW for PPA) Cain Industries Exhaust heat recovery unit
USE OF THERMAL ENERGY: Process Hot Water
USE OF ELECTRICAL ENERGY: Sold to TVA under a PPA
INSTALLED COST: \$1.375 Million
ANNUAL SAVINGS: \$914,000
PAYBACK: < 1.5 years
EMISSIONS REDUCTION: 52,000 tons CO₂ Equivalence



PERDUE'S COVERED LAGOON ANEROBIC DIGESTER

Equipment and Configuration



BIOGAS COLLECTION AND FLARE

The Cromwell facility requires large amounts of potable water and therefore draws water from the nearby Green River. After use, the wastewater is sent to a large on-site wastewater treatment plant before it is returned to the river. Part of this treatment process includes an anaerobic lagoon to reduce the organic load (COD) by 95%. The added cover allows the capture and storage of the biogas before it is used in the CHP system.

The captured biogas from the lagoon is piped to the packaged CHP system, which integrates a GE Jenbacher engine, heat recovery unit and auxiliary heat rejection unit. The electrical switchgear and transformers control the power and allow it to connect to Warren Rural Electric Cooperative Utility.



RECIPROCATING ENGINE CHP SYSTEM

EQUIPMENT

- Covered Lagoon Anaerobic Digester
- 3 acre, 12 million gallon lagoon
- 7-10 day retention time
- Lagoon cover is able to expand to store over 7 days of gas
- Operates close to surface water temperature
- GE Jenbacher 320 Reciprocating Engine Generator Set
- Cain Industries Exhaust heat recovery unit
- Auxiliary Radiator

The CHP system was designed in such a way that it can power part of the Perdue plant in case of an outage or emergency. The system also integrates an engine radiator which allows the generator to run when the plant is not in operation.

Cost

The total installed cost for the CHP plant was \$1.375 million with a simple payback of under 1.5 years. The revenue from the electricity sold under a Power Purchase Agreement (PPA) to TVA and the reduced natural gas costs both contribute to the quick payback. Furthermore, the facility is registered with the North Carolina Utilities Commission as renewable energy facility and is able to sell Renewable Energy Credits for additional revenue. Perdue also received \$240,000 in federal stimulus funds awarded through the Kentucky Cabinet for Economic Development's Industry Facility Retrofit program.

Testimonial

The benefit of the "free" heat provided by our CHP system is substantial. The recovered heat (engine and exhaust) from our Renewable fuel CHP engine at Perdue Farms in Cromwell, Kentucky nearly eliminate our needs for hot water heating during summer months and annually replaces 22% of our purchased natural gas fuel. Our system net efficiency is 82% with 40% achieved with our heat recovery.

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For More Information

U.S. DOE SOUTHEAST COMBINED HEAT AND POWER TECHNICAL ASSISTANCE PARTNERSHIP

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PERDUE

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