



Combined Heat and Power (CHP) at Perdue Farms Poultry Processing

Site Description

The Perdue Farms facility in Cromwell, Kentucky is a medium-sized poultry processing plant that uses large amounts of hot water and electricity to process and package about 1.2 million fresh chickens each week. To help meet their energy needs, Perdue utilizes a CHP system to generate electricity and heat water. The system is fueled by biogas produced in an anaerobic digester at its on-site wastewater treatment plant.



Key Benefits

- **Cost Savings:** Use of biogas from an onsite anaerobic digester reduces the amount of natural gas purchased to heat water.
- **Power Reliability:** If utility power to the plant is interrupted, Perdue uses the electricity it generates to power part of the plant.
- **Continuity:** The CHP system can continue to generate and sell electricity to the utility when plant operations are down by using an engine radiator to cool the thermal energy.
- **Renewable Energy Generation:** Perdue sells the power and associated renewable energy credits (RECs) to a TVA program that purchases renewable electricity from small generators.
- **Emissions Reduction:** Capturing biogas to fuel the CHP system rather than allowing the uncontrolled methane and CO₂ from the wastewater treatment lagoon to escape into the air reduces site emissions by 52,000 tons CO₂ equivalent.
- **Payback:** Both the revenue from the electricity sold under a Power Purchase Agreement (PPA) to TVA and the reduced natural gas costs contribute to the quick payback.



Reproduced with permission from Perdue Farms.



Facts at a Glance

- **Cost:** \$1.375 Million
- **Savings:** \$914,000 annually
- **Payback:** < 1.5 years
- **Installation Year:** 2011
- **Fuel:** Anaerobic Digester Gas
- **Capacity:** 999 kW plus 3.2 MMBtu/hr hot water
- **Efficiency:** 82%
- **System Components:** 1 MW Jenbacher 320 Reciprocating Engine (derated to 999 kW for PPA); Cain Industries exhaust heat recovery unit; auxiliary radiator
- **Owner/Operator:** Perdue
- **Thermal Use:** Process Hot Water
- **Electrical Energy Use:** Sold to TVA under a PPA
- **Emissions Reduction:** 52,000 tons CO₂ Equivalent



Covered lagoon where biogas from anaerobic digestion is captured. Reproduced with permission from Perdue Farms.



Reasons for Installing CHP

In 2011, Perdue installed a 999 kW CHP system that is fueled by biogas from an on-site anaerobic digester. They sell the electricity they generate to TVA through their local rural electric cooperative and use the thermal energy to heat water for poultry processing. The system saves the company about \$914,000 in annual energy costs by displacing purchased power and natural gas previously used to heat water. Sized to use the available biogas, the CHP system provides about 20% of the electric power and 20% of the thermal energy Perdue uses annually.

A year earlier, in an effort to reduce energy costs and improve the site's wastewater operations, Perdue covered their three-acre lagoon, part of the wastewater treatment process where the organic load (COD) is reduced by 95%, in order to capture the methane and CO₂ emissions and pipe them to the CHP system. Because biogas from poultry waste is a renewable resource in North Carolina, which is also served by TVA, the site sells the renewable energy credits (RECs) to TVA for additional income. CHP systems in Colorado that use eligible energy resources can generate RECs as well.

If your facility ...

- Heats
- Boils
- Ferments
- Dries
- Cures
- Renders
- Pasteurizes
- Rapid cools
- Refrigerates
- Stores
- Cleans
- Sterilizes
- Ventilates

... then CHP may be the right solution for your company!



About CHP for the Food and Beverage Industry

CHP is a great solution for energy intensive food and beverage manufacturers such as bakeries, dairies, breweries, animal and pet food makers, and vegetable and meat processors.

CHP systems provide thermal energy and electric power for food and beverage processing while improving energy efficiency, lowering operating costs, and reducing emissions associated with power generation and heat production. The thermal energy generated in the CHP system can be used for heating and/or cooling, hot water, chilled water, dehumidification, equipment sterilization, and cleaning. Importantly, CHP systems can operate independently of the grid when electric service is interrupted, powering critical processes to protect health and safety and prevent damage to equipment and facilities.

While this system runs on biogas created from on-site waste, helping to lower the cost of purchased fuel and power, decrease costs associated with waste management and disposal, and generate renewable energy credits (RECs), similar systems could be designed to run on natural gas or other fuel source and provide similar energy efficiency benefits. Nearly 300 food and beverage processing facilities in the U.S. use CHP to meet their thermal energy and electric power needs.



COLORADO
Energy Office

For more information:

Susan Brodie | Heat is Power Association | susandbrodie@gmail.com | 630-292-1304

Lindsey Stegall | Colorado Energy Office | lindsey.stegall@state.co.us | 303-866-2594

Gavin Dillingham | U.S. DOE Upper West CHP TAP | gdillingham@harcresearch.org | 281-216-7147