



Wellons Energy Solutions at Perdue AgriBusiness

495 kW Biomass CHP plant

Project Overview

Wellons Energy Solutions, an alternative energy project developer, built a renewable biomass fueled combined heat and power (CHP) facility at Perdue's AgriBusiness Cofield, North Carolina feed mill that began operation in 2011. The CHP plant generates steam that is sold to the feed mill and used to process soybeans and manufacture poultry feed. The electricity produced is used for CHP plant service, with excess power exported to the utility grid.



Wellons Facility in Cofield

Wellons, a third-party CHP developer owns and operates the CHP facility, which is located adjacent to the Perdue feed mill. The CHP plant can supply Perdue with up to 42,000 lb/hr of steam at 155 psi and has a gross electrical capacity of 495 kW. Since startup, average steam demand has been around 38,000 lb/hr.

Prior to purchasing steam from the CHP facility, Perdue generated steam using liquefied propane gas as a fuel. Now the plant produces process steam at a lower cost by using biomass fuel that is locally sourced and competitively priced.

Quick Facts

LOCATION: Cofield, North Carolina

MARKET SECTOR: Food Manufacturing (NAICS 3122)

IN OPERATION SINCE: 2011

FUEL: Biomass (green wood chips, cotton gin residue, soybean and peanut crop residuals)

GENERATING CAPACITY: 495 kW

THERMAL OUTPUT: 42,000 lb/hr steam

EQUIPMENT: (2) Wellons 600 HP biomass boilers
(1) 495 kW backpressure steam turbine generator

USE OF THERMAL ENERGY: Process steam for Perdue

USE OF ELECTRICAL ENERGY: CHP plant service and export to Dominion Power NC utility grid

SYSTEM EFFICIENCY: 72–75%

OPERATION RELIABILITY: 98.7% uptime history for steam generation since 2011

JOINT PROJECT BY: Wellons Energy Solutions, Perdue AgriBusiness, LLC

ENVIRONMENTAL BENEFITS: Renewable biomass from local sources including Perdue AgriBusiness, annually avoids emissions of 18,000 metric tons CO₂ equivalents (MtCO₂e)

Reasons for Installing Combined Heat & Power

The volatility of natural gas prices in the mid-2000s and a corporate commitment to environmental sustainability led Perdue AgriBusiness to the arrangement with Wellons. By partnering with Wellons, Perdue has reduced energy costs and fluctuation risks, and greatly decreased emissions from fossil fuels.

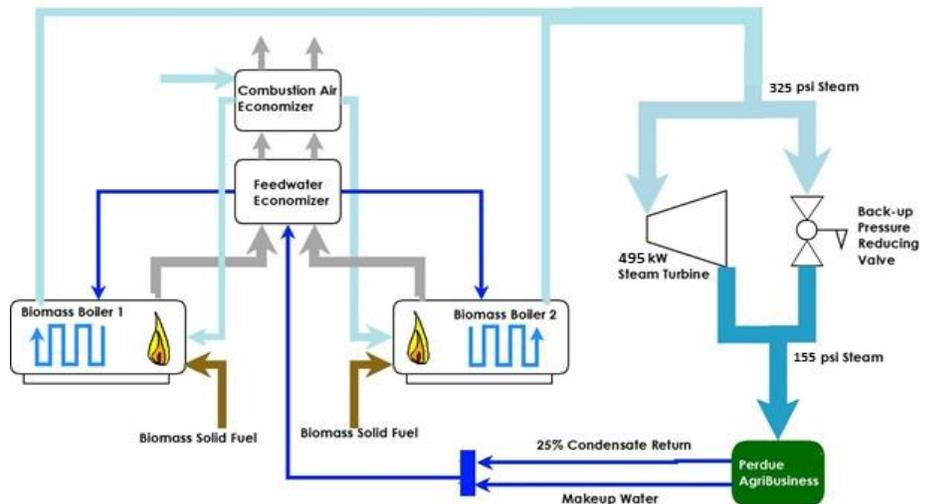
North Carolina has a Renewable and Efficiency Portfolio Standard (REPS) under which the CHP system qualifies as an eligible resource. Thus, Wellons is able to realize a revenue stream from sales of renewable energy credits (RECs) for both the net useful electric and thermal output of the plant.

Equipment and Configuration

The Wellons facility houses two solid fuel biomass boilers with a hybrid firebox/watertube design that produces 325 psi steam at a total flow rate of 42,000 lb/hr. This primary steam is run through a 495kW backpressure steam turbine which reduces the steam to a pressure of 155 psi for service to Perdue. A back-up turbine bypass pipe with a pressure reducing valve can provide extra steam capacity and ensure a constant supply of steam when the turbine is undergoing maintenance.

The woody biomass fuel is brought via truck in the form of 3–4" diameter chips, typically from local sources, and is dumped straight into an indoor fuel storage bunker. A moving floor shuffles the oldest fuel forward onto fuel conveyors that supply hoppers at each boiler. An auger in each hopper feeds the fuel into the boiler at a controlled rate to maintain steam pressure in the system. The facility is also permitted to use cotton gin waste available on a seasonal basis, as well as soybean processing residuals from Perdue's plant.

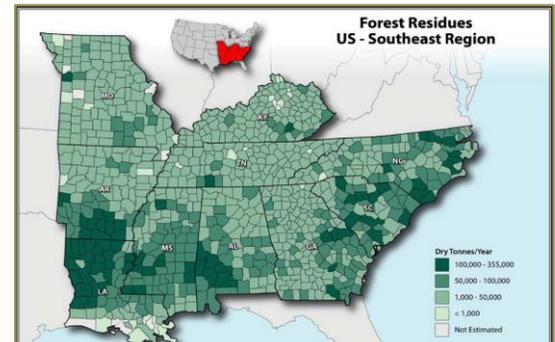
The steam system condensate and makeup water both return to Wellons from the Perdue facility. The facility is estimated to return 25% of the mass of water as condensate. Two auxiliary systems help maximize the thermal efficiency of the system; first, a boiler feed water economizer recovers heat from the boiler exhaust to preheat incoming makeup water, and second, an economizer placed in the exhaust flow preheats the combustion air before entering the boiler.



CHP System Configuration

Collaborative Business Arrangement

Perdue receives a constant supply of steam from Wellons at a fixed price, while returning the makeup water to the CHP facility. The farm also sells stick and pods that are removed during soybean processing to Wellons as fuel. The Wellons CHP system is interconnected to Dominion Power and excess power is sold back to the grid.



Southeast U. S. Forest residues available for energy production (Source: USDA)

Lessons to Share

The Southeast has abundant sources of biomass including forest, mill, and agricultural residues. North Carolina is a prime target for woody biomass facilities and there is much potential for expansion. Wellons owns and operates a number of similar facilities in North Carolina.

For More Information

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

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