MIDWEST

U.S. DOE

CHP TECHNICAL ASSISTANCE PARTNERSHIPS

Adkins Energy LLC

5.0 MW CHP Application

Project Overview

In August 2002, a 5.0 MW Combined Heat and Power system was installed at Adkins Energy LLC plant to provide electricity and steam to the facility. The CHP system offered energy independence and security to the facility. The CHP system consists of a Solar combustion turbine fueled by natural gas with a maximum steam generating capacity of 25,700 lbs/hr when duct-fired. Today the CHP system provides $903,000 in annual energy savings.

Quick Facts

LOCATION: Lena, Illinois
MARKET SECTOR: Ethanol Plant
PRIME MOVER:
(1) Solar Gas Turbine
FUEL: Natural Gas
GENERATING CAPACITY: 5.0 MW
HEAT RECOVERY EQUIPMENT:
(1) Victory Heat Recovery Steam Generator with thermal capacity of 25,700 lbs/hr at 125 PSI
HEAT RECOVERY APPLICATION: Building Heat, Process Heat
IMPLEMENTATION COST: $3,000,000
TOTAL ENERGY AND OPERATION SAVINGS:
$903,000/yr in energy costs
Simple Payback: 3.3 yrs
SYSTEM Online: August 2002

Reasons for CHP

Energy Independence

During the conception of the ethanol plant project, feed mills in the surrounding area were paying as much as $0.17 per kWh (electricity and demand charge combined). Faced with these high electric rates, Adkins Energy evaluated the installation of an on-site electric generating system, and concluded that a CHP system would provide the perfect fit for its energy needs.

Energy Savings

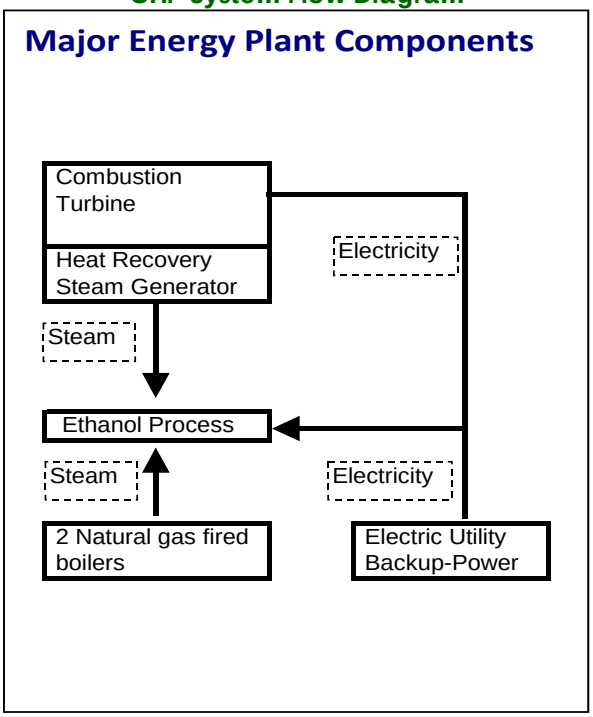
Based on its current natural gas cost of $5.50 per million Btu, Adkins Energy is able to save approximately $903,000 per year. Adkins Energy estimates its break-even point for total energy savings from the CHP system to be at a natural gas price of $8.10 per million Btu. As the system has already paid for itself since being installed in 2002, the facility is able to take advantage of fluctuations in fuel prices and operate the system for approximately 46% of the year to save money.

Adkins Energy LLC Ethanol Plant

Energy Reliability

In addition to high electricity prices in northwestern Illinois, the facility also experiences grid outages. Although the CHP system can supply up to approximately 95% of the plant's electrical power needs, it is parallel connected to the grid to allow the plant to draw electrical power from the grid when needed. When blackouts or grid outages occur, the CHP system is designed to automatically disconnect from the grid and continue to supply the plant with the electricity needed to continue vital operations. This avoids any plant shut down during utility grid outages.

CHP System Flow Diagram



Incorporating CHP into Ethanol Production Process

The combustion gas turbine and heat recovery steam generator system utilized at Adkins Energy LLC is capable of producing up to 95% of the electric load and 32% of the thermal requirements of the facility. The system is interconnected with the grid to ensure undisturbed electrical power supply as well as interconnected with the steam system to ensure uninterrupted steam supply. As the ethanol process requires constant electricity and heat, any interruption caused by a grid power outage or loss of steam supply would cause the entire process to shut down.

Facility personnel understand these benefits of a CHP system:

"The CHP system has been a very reliable and cost effective energy solution for our ethanol plant. I would install the same energy system again."

–Mert Green, Adkins Energy LLC

"The CHP system provides stability for our electricity supply regardless of electricity grid failure."

–Ray Baker, Adkins Energy LLC

Heat Recovery

One of the benefits of operating a combustion turbine within a CHP system as opposed to other prime mover technologies is the large capacity for heat recovery which can be used in multiple applications (steam, chilled water and domestic hot water) to dramatically increase net Btu efficiencies. A combustion turbine is capable of producing a high volume of high pressure steam, in this case 25,700 lbs/hr at 125 psi utilizing a heat recovery steam generator (HRSG).

Heat Recovery Steam Generator

The steam is used for process heat and works in conjunction with the facility's boilers to drive the ethanol process. As the facility receives corn from local farmers and operates year round, it is feasible to run the turbine and generate steam all year. Steam is fed to various heat exchangers throughout the facility to drive various portions of the ethanol process.

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.

Version 0315