



Colby College

600 kW CHP Application

Project Profile

combined heat & power in educational facilities



600 kW turbine installed in 1999

Quick Facts

Location:

Waterville, Maine

Installation Date:

January 1999

CHP Equipment:

600 kW Marathon generator
Elliott DYR Turbine
Lufkin gear reducer

Additional Equipment:

500 kW Caterpillar diesel generator, for emergency power

Type of Fuel:

#6 0.5% sulfur oil

Winter Heat Recovery Application:

Building heat

System Efficiency:

84%

Annual Energy Savings:

15% of electric bill

Simple Payback:

2.3 years

System Design and Installation:

Turbosteam Co., Turners Falls, MA

Project Overview

Colby, a liberal arts college in Maine, was chartered in 1813, making it the 12th-oldest independent liberal arts college in the nation. In 1998, an ice storm that knocked out power at several other Maine colleges spared Colby, but gave the people at Colby's steam plant pause.

"We thought: what would we do if we lost power?" said Gus Libby, assistant director for operations and maintenance.

Cogeneration was the obvious answer. Fortunately, the previous steam plant manager had thought ahead to cogeneration when he designed the campus steam plant that was built in 1993. The three new 860-HP boilers that were putting out 150 psi steam with help from a pressure reducing valve were capable of producing 300 psi steam.

In the winter of 1996, Colby performed a feasibility study that predicted a 560 kW turbine would carry a simple payback of 2.3 years at a cost of \$353,000. Colby could generate its own electricity, reduce its demand and consumption from the local electric utility, and be able to keep running in a power outage. Libby said the college also hoped to reduce its electric rates.

Colby officials brought their proposal to the local utility, Central Maine Power Company, in 1998, and CMP came back with an offer to build and install the cogeneration system with the promise of a future rate reduction. Colby opted to build the plant itself, however, and in the end paid only slightly more, or \$366,000, than expected.

"We wanted total control over the plant for scheduled outages, and it was also much more attractive to build and run ourselves," said Libby.

Today campus employees do most of the maintenance and repair work on the system, which generates 15 percent of Colby's electric use. Most of the steam, which leaves the plant at 35-50 psi, is for building heat, and the rest is for use in the kitchens and science buildings.



Colby also installed a 500 kW diesel generator for backup power, and in the spring of 2005 tested the system to see whether the two turbines could keep the campus running in the event of a power outage.

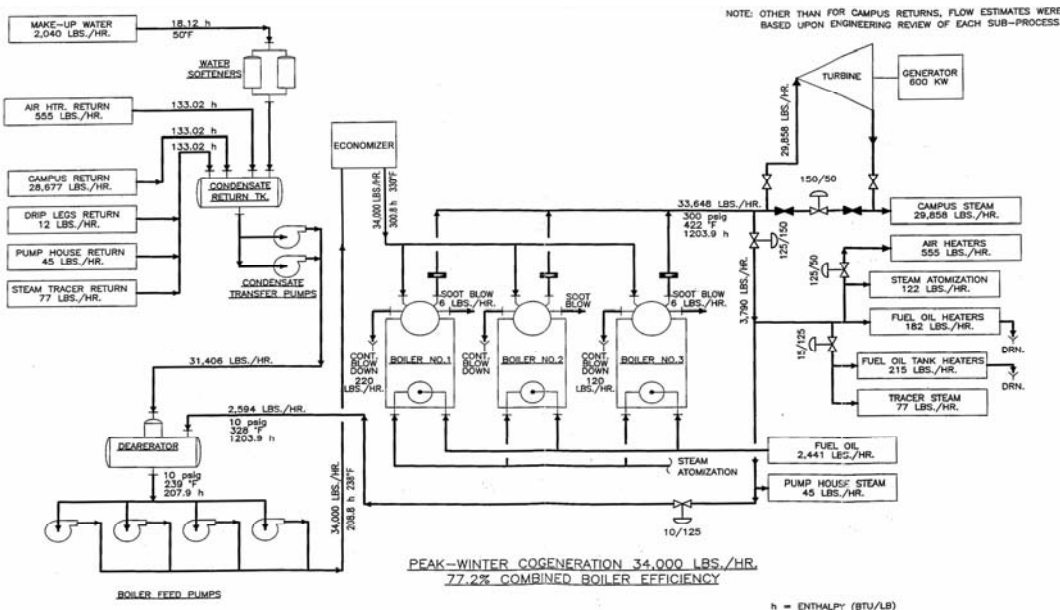
“We put about 800 kW on, and the system worked flawlessly,” said Libby.

Energy Overview

Colby runs three B-style FM-9 Babcock & Wilcox boilers that together produce 34,000 pounds an hour at 300 psi with a combined boiler efficiency of approximately 84%. The boilers are fired with 0.5% sulfur #6 fuel oil. Nearly all of the steam, or almost 30,000 pounds, is sent through an Elliott backpressure turbine, whose output steam ranges from 35 – 50 psi depending on the outside temperature. The plant has generated an average of 1.3 million kilowatt-hours a year for the past three years, at a cost of \$0.03 per kWh, and purchases additional electricity from the local utility, at a cost of \$0.095 per kWh.

Challenges

The rising price of #6 fuel oil in recent years has caused Colby’s fuel costs to increase from \$450,000 to \$1 million since the turbine went online in 1999. The college is searching for other ways to reduce energy costs, such as installing solar collectors. Libby said he would also like to run gas turbines, but the nearest natural gas line is too far away for that to be cost-effective.



“I listen for its humming sound when I get out of my truck in the morning because I know it's the sound of money!”

Gus Libby, steam plant manager

Benefits

- The college can stay open if it loses grid power
- Peak electric demand has dropped to about 2.5 MW
- The college now generates 15% of its electricity consumption
- Removes some of the uncertainty of deregulated electrical costs

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