



Franciscan Sisters of Perpetual Adoration

295 kW District Energy CHP Application

Project Overview

The Franciscan Sisters of Perpetual Adoration (FSPA) are a community of vowed Franciscan women whose headquarters consist of offices, living quarters, a retirement home as well as meeting space. They operate a district heating plant located in La Crosse, Wisconsin. The plant has been in operation since 1905 and today provides heat to Franciscan Skemp Healthcare Medical Center, Viterbo University, and St. Rose Convent, totaling over 1.7 million square feet of building space. In 1996, FSPA began implementing a Combined Heat and Power (CHP) application to the district heating plant to take advantage of the high pressure steam and its potential to generate on-site electricity for the convent, university, and medical center. In 2002, a 150 kW backpressure steam turbine was installed followed by another 100 kW turbine installation in 2003. The system was further expanded in 2014 with a 45 kW backpressure steam turbine and a 210 ton absorption chiller to provide cooling water to the Convent.

Adding Electric Generation to District Heating Plant

During a major upgrade to the steam plant in the early 1990's, consideration was given to the installation of a backpressure steam generator to produce on-site electricity. The CHP notion was well received by the FSPA since the Order places a high value on efficiency, conservation and environmentally friendly concepts:

- Environmental Impact**
 CHP system reduce annual plant emissions by 400 tons of CO₂ (500+ tons of CO₂ with the expanded system)
- Leadership Role in the Community**
 FSPA desires to take a leadership role in the community, using a CHP installation as a model for other local businesses.
- Energy Savings**
 FSPA has decreased their electric costs by reducing the amount of electricity that needs to be purchased for cooling as well as by generating nearly all of their electric demand on site.

Quick Facts

LOCATION: La Crosse, WI

MARKET SECTOR:

Medical Center, University, Convent

PRIME MOVERS:

- (1) 100 kW Turbosteam Backpressure Steam Turbine
- (1) 150 kW Turbosteam Backpressure Steam Turbine
- (1) 45 kW Turbosteam Backpressure Steam Turbine

GENERATING CAPACITY: 295 kW

OPERATING PRESSURE: 135 PSI

HEAT RECOVERY APPLICATION:

Building Heat, 210 Ton Absorption Chiller

IMPLEMENTATION COST:

\$450,000 for 100 kW and 150 kW turbines in 2002 and 2003;

\$175,000 for 45 kW turbine in July 2014

TOTAL ENERGY AND OPERATION SAVINGS:

\$40,000 for cooling loads alone

FACILITY SIZE: 1.7 million square feet



The Chapel of St. Rose Convent



150 kW Turbosteam Backpressure Steam Turbine

What is Combined Heat and Power?

Combined Heat and Power (CHP) refers to an integrated system that is located at or near a building or facility. CHP systems provide all or a portion of the a site's electric load and utilizes the thermal energy from the electric generation equipment to provide space heating, space cooling, domestic hot water, dehumidification, sterilization, and/or process heat.

What is a backpressure steam turbine-generator?

A backpressure steam turbine generator can replace a pressure reducing valve in a steam system. The generator reduces the pressure of incoming steam and the reduced pressure steam can

then be utilized for site heating needs. The energy from this process is captured by the turbines within the generator to produce electricity.

In this situation the reduction of steam pressure from 135 PSI down to 25 PSI for the campuses' medium pressure steam demands, such as heating and hot water, through a backpressure steam turbine is used to generate electricity. The high pressure steam is utilized in the medical center autoclaves for disinfection, but has a few other uses.

What is an absorption chiller?

An absorption chiller can utilize steam to drive the cooling process. Like a standard chiller, it utilizes a refrigerant with a very low boiling point. Unlike a standard electric chiller, the absorption chiller uses a liquid medium to absorb the gaseous refrigerant into a liquid after the evaporator rather than using a compressor.

At this facility a 210 ton absorption chiller was added in part to extend the life of the two electric chillers that were being used. The old electric chillers were nearing the end of their useful life and rather than replacing them outright, the facility elected to add the absorption chiller for primary use and utilize the two electric chillers as backups.



Control Room at St. Rose Covent

Additional Facts

First Cost ... 10% of the installation costs for the 100 kW steam turbine-generator were supplied by Wisconsin's Focus On Energy fund, a state public benefits program that promotes energy efficiency, reliability, renewable energy and environmental energy benefits.

Benefits... The system serves 100% of the heating needs of the convent, medical center and university and up to 90% of the three campuses' electrical power draw. The facility is working on quantifying these savings to establish a better idea of annual cost savings.

For More Information

U.S. DOE MIDWEST CHP TECHNICAL ASSISTANCE PARTNERSHIP

1309 South Halsted Street (MC156), Chicago, Illinois 60607-7054

Phone: (312) 996-4490, Fax: (312) 996-5620

www.MidwestCHPTAP.org