NORTHEAST CHP APPLICATION CENTER

combined heat & power in supermarkets

Waldbaum's Supermarket

60kW CHP Application

Project Profile

Waldbaum's Supermarket Hauppauge,

Quick Facts

Location:
Hauppauge, New York

Installation Date:
Summer 2002

CHP Equipment:
1 60 kW Capstone MicroTurbine

Generating Capacity:
60 kW

Type of Fuel:
Natural Gas

Winter Heat Recovery Application:
Space heating

Summer Heat Recovery Application:
Desiccant Drying

System Efficiency:
52% with alteration
(Peak efficiency > 60% on a winter day, based on Higher Heating Value/HHV)

Annual Energy Savings:
~ $5,300 cost reduction

Simple Payback:
~ 30 years

Project Overview

Waldbaum's Supermarket (a subsidiary of A&P Foods) is located in Hauppauge, NY on Long Island. This supermarket was originally a 35,000-sq. ft. retail facility. It was gutted to the block walls, expanded, and totally rebuilt into a 57,000-sq. ft. supermarket which opened in July 2002. The store uses energy-efficient T5 light fixtures, so the load in the sales area is about 1.2 watts per square foot. The facility electric demand is never expected to drop below 200 kW in this store. The 480-volt power generated by the microturbine is wired directly into the store's 480-volt main panel. This Capstone 60 kW microturbine CHP system was integrated in July 2002 with a 20,000-cfm Munters Drycool air-handling unit previously installed at Waldbaum's in order to use the available heat from the generator.. The Munters unit provides cooling and heating to the main sales areas of the store. The unit also includes a desiccant section to provide dehumidification.

Desiccant dehumidification is widely utilized in the supermarket sector with more than 1,000 systems in place in the United States. By integrating the Munters DryCool Desiccant Unit with the microturbine this project is able to beneficially recover the thermal energy from the generator. Hot water coils were installed in the Munters unit to provide heating, cooling and dehumidification. The microturbines have very low emissions, allowing them to operate even in severe non-attainment areas for criteria pollutants, as is the case on Long Island. Extensive third party testing has verified that with significant use of the waste heat, the microturbine based CHP system will reduce greenhouse gas emissions as well.

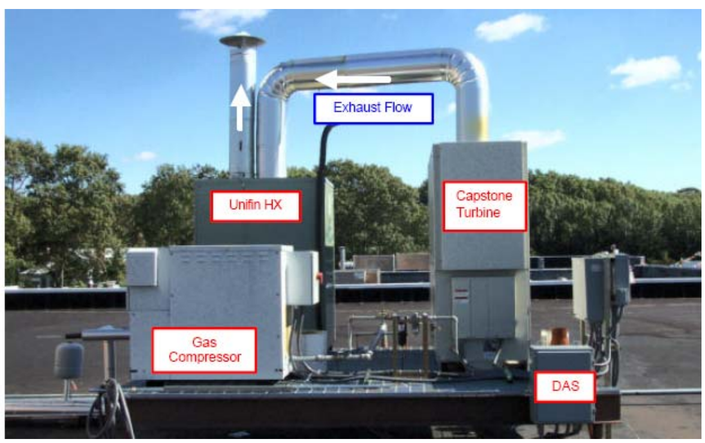
By mounting the system on the roof near the main air handing unit, the system was successfully integrated into the store design in a cost effective manner. The microturbine was added in the store's main distribution panel without need for additional transformers or other electrical interconnection hardware. A system as described here could easily and cost-effectively be integrated into a standard store design. This system has broad applicability to supermarkets across the country. Based on this configuration, energy modeling was performed to learn how well the system would run in other regions. In Consolidated Edison territory, the system yields almost $19,000 a year in savings with similar results found in Southern California.

Energy Overview

This Waldbaum's store is located on Long Island, which has some of the highest electricity rates in the country. An attractive feature of this site is the ability to use the rejected thermal energy from the generator on a year round basis. In the summer, dehumidification of the incoming air significantly reduces the energy consumption of the electric air conditioning system. In the winter there is a significant space heating load.. This system was extensively monitored for a period of 18 months. Net CHP system efficiency ranged from more than 60% based on higher heating value (HHV) on cold winter days to over 50% HHV on humid summer days. Displaced gas use due to heat recovery, after system modifications, is greater than 24,000 therms per year. Extensive environmental testing showed that the microturbine exceeded its emissions specifications. The NOx emissions from the microturbine were 3 to 5 ppmv (@ 15% O2) at full load.

Lessons Learned

Early problems with system efficiency were fixed in part with a replacement turbine engine. Space heating heat recovery was less than expected due to the small differential between the gas furnace and heat recovery coil set points. More ideal heat recovery control settings could have resulted in daily CHP efficiencies over 70%. Local utility rates are an important criteria. If the system were installed in Con Edison service territory, the annual net savings would increase by 355%. Results are similar in Southern California. Decreasing gas commodity costs by 10¢ per therm increases annual savings by $4,500 (85%).



"Recovered heat was successfully used to meet summertime dehumidification loads. Lower humidity levels allow improved customer comfort as well as more efficient display case operation."

Hugh Henderson
CDH Energy Corp.
Project Developer

Benefits

- Reduction in annual energy costs
- Improvement in store's power factor
- Free heating and air conditioning
- Partial hedge against energy cost increases
- Significant opportunity for technology transfer to other sites with similar equipment.
- >300,000 lbs. CO_2 reduced annually
- 1,300 lb reduction in NO_x emissions (11%)

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