Vineyard 29
120 kW microturbine/chiller system

Project Profile

combined heat & power in a winery

Quick Facts

Location: St. Helena, California

Capacity: 120 kW (two 60-kW Capstone C60 microturbine systems)

System Online: 2003

Fuel: Natural gas

System Efficiency: Estimated 82% overall efficiency

Emissions Reductions: 85%

Total Project Cost: $470,000

State Rebate: $120,000

Avoided Cost: $120,000 (backup gen.)

Expected Cost Savings: $25,000 to $38,000/year

Expected Payback Time: 6 to 8 years (with incentives)

Funding Sources:

Vineyard 29; California Energy Commission (CEC); CA Public Utilities Commission (PUC)

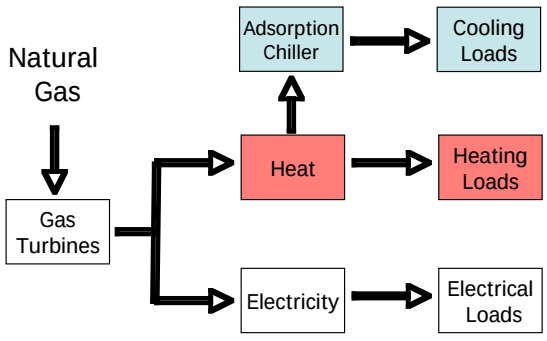
Project Overview

Vineyard 29 is in St. Helena, California in the Napa Valley wine growing region. Founded in 1989, the winery was sold to Chuck and Anne McMinn in 2000. Since then, the couple has made a commitment to sustainable practices that reduce emissions from their winery as well as toxins into the environment. Today, the winery processes 100 acres of grapes to produce about 10,000 cases of wine per year.

The winery has installed two 60-kW Capstone combined cooling, heating, and power (CCHP) microturbines that run on natural gas. With up to 120 kW of electricity produced by the systems, the co-generated heat is captured to produce hot water. To process each gallon of wine, three gallons of hot water are required. The water is also used to run the cooling system through an adsorption chiller. The chiller is needed to control the fermentation process and to run the air conditioning system during the summer time. In the wintertime, the hot water is also used to heat the building.

Vineyard 29 obtains all of its electricity from the CCHP system at half the cost it would take to power and heat their winery using conventional electricity and natural gas. The system has an overall efficiency of 82% when the waste heat recovery is included. The system has demonstrated an availability of 97% since commissioning, with only minor operational issues.

Schematic of energy flow of combined cooling, heating, and power system



Financial Incentives

The total project cost is approximately $470,000, including microturbines and chiller. Vineyard 29 received $120,000 in funding from Pacific Gas and Electric Co. through the California Public Utility Commission (CPUC) and the California Energy Commission (CEC). With these initial subsidies and the avoided costs of a backup generator (approx. $120,000) and a larger chiller ($20,000), the effective net capital cost was $210,000. The owners expect a payback of 6-8 years, reflecting an energy cost savings estimated at $25,000 to 38,000 per year.

Winery cave cooled by Nishiyodo chiller

Wine tanks heated by captured cogen. heat

Reducing environmental impacts

Among the innovations deployed at the CCHP system at Vineyard 29 is a 20-ton Nishiyodo adsorption chiller, the first of its kind to be installed in the US. Like conventional absorption chillers, adsorption chillers use recovered heat instead of electricity to produce cooled water. However, they do not require the use of lithium bromide (LiBr), an ozone-depleting coolant. Instead the cooling is achieved by using water as a refrigerant that is adsorbed onto a silica gel media. Then, under a low pressure of 7 kPa, heat is removed from the system by boiling off the water, yielding a stream of 30% propylene glycol/water mixture at 40°F for cooling the building, the cave, and the wine tanks. Not only are toxic chemicals avoided with this chiller, very little maintenance is needed. Overall, adsorption systems have a coefficient of performance (COP) of up to 75%.

In addition, a Dolphin pulsed power system is used in the EvapCo cooling tower. This advanced system disinfects water with pulsed power discharges. The process ionizes and purifies the water and prevents the buildup of scale. Unlike many water treatment systems, the Dolphin unit does not require the use of harmful germicides, which are often needed to prevent the proliferation of germs such as those that cause Legionnaire's disease. Moreover, fewer back-flushes are needed, significantly reducing water and energy demands of the system.

Nishiyodo adsorption chiller

Conduits for propylene glycol/water coolant

EvapCo cooling tower with electrostatic discharge

Further information can be found at

Vineyard 29: www.vineyard29.com
Capstone Power, Inc: www.capstone.com
Batt and Associates: www.fcs.net/batt
Axiom Engineers, Inc.: www.axiomengineers.com
PRAC: www.chpcenterpr.org

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The overall energy efficiency of the installation is an impressive 82%.

"We produce 100% of the electricity that we use here at Vineyard 29. We do that at about half the cost of buying electricity and the natural gas we would need to run our boiler. At the same time, we are seven times less polluting than a PG&E power plant."
Chuck McMinn, owner of Vineyard 29