PROJECT PROFILE

Chabot College Olympic Pool

300-kW CHP System

Quick Facts

LOCATION: Hayward, CA
MARKET SECTOR: College Athletic Facility
FACILITY SIZE: Two buildings, 50 meter pool
FACILITY PEAK LOAD: 2 MW
EQUIPMENT: Four 75-kW Tecogen reciprocating engines
FUEL: Natural gas
USE OF THERMAL ENERGY: Pool heating, space and domestic hot water heating
CHP TOTAL EFFICIENCY: 81%
ENVIRONMENTAL BENEFITS: CO_2 reduction is in excess of 30% compared to power plant
TOTAL PROJECT COST: $894,000 before SGIP
ANNUAL ENERGY SAVINGS: $70,000 electrical, $50,000 thermal
PAYBACK: 4.9 years (including $300,000 SGIP incentive)
CHP IN OPERATION SINCE: 2003

Site Description

Chabot College serves Alameda County and the surrounding East Bay area. More than 15,000 students, staff and faculty utilize the 94 acres and 800,000 square feet of facilities at Chabot College. To meet the electrical and thermal energy demands of the campus pool, gymnasium, and physical education classrooms, Chabot College started operating a combined heat and power (CHP) system in 2003. In 2014, the swimming pool area was renovated with a state-of-the-art scoreboard and electronic timing system.

Reasons for CHP

Prior to the project, Chabot College was facing budget deficits and needed to reduce operating costs. Capital funds were available to invest in the CHP system, which would reduce the operating budget and supplement the aging pool heating equipment. The CHP system provides enough waste heat for the Olympic-size pool year around. The decision to install CHP was motivated by the following considerations:

- The campus has large, continuous need for domestic hot water
- Use of CHP technology for pool heating and supplemental space heating is well-proven and reliable
- Cabot College was looking to reduce carbon emissions compared to grid-sourced electricity consumption

CHP Equipment & Configuration

The four 75-kW reciprocating engines were purchased from Tecogen, Inc. The associated thermal equipment involves conventional heat exchangers (plate/frame or shell and tube) sized to match thermal aspects of the CHP system and site requirements.

The system configuration is based on delivering hot water from the engines to one or more of the heat exchangers that preheat the boiler water needed for space heating, domestic hot water usage and pool heating. Sensors direct the valving and flow of the hot water as needed. The CHP water gives up its heat and returns to the CHP units to be reheated and re-dispatched back into the system as required.

CHP Operation

The CHP plant at the Chabot Swimming Pool produces about 25 percent of the power used for the gymnasium and connected physical education classrooms. The recovered heat is used to heat the Olympic-size swimming pool. Excessive heat is also sent to the Central Utility Plant heating loop, reducing the requirements of firing a boiler.

Although the operating schedules can play a role, the main control logic is dependent upon demand for thermal energy. If there is no demand for heat, the engines shut off. Decisions for control changes are made by Chabot College's operational staff.

> *"With the proper maintenance, the system has proven to be reliable. Aside from lower utility costs to power the gym and classrooms, we have waste heat to heat our pool all year with excess heat going to our central plant. The decreased boiler run times have increased utility savings, prolonged equipment life, and led to fewer break downs"*
>
> *- Jim Soles, Director of Maintenance*
> *Chabot College*

There are no cases where any CHP-created electric power is dispatched to the grid. Since the units are induction generators, they do not operate in the event of a utility power outage. The CHP system has been in operation since 2003 and uses low cost auto derivative engines that must be changed out every 3 to 4 years as part of the standard O&M agreement. In recent years, maintenance records show an average of the system running about 7500 hours/year, resulting in annual savings in excess of $100,000.

Lessons Learned

- Coordination with the local utility is critical. There are requirements to make sure the system is safe for operations near site employees. Allow enough time for utility to permit the CHP system for interconnection and for site development team to coordinate installation and start up.

For More Information

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Date produced: September 2015