

Tecogen

Advanced Modular CHP Systems



CH-400x - DTx Series Water Cooled Chiller

Case Study



California Capital East End - The State of California, ever mindful of past problems with electric power shortages, requires cooling plants in its new state government buildings to be capable of operating on more than one energy source.

cooling even in the event of electricity brownouts.

So when state engineers wrote the specifications for a new, four-building complex to house the California Department of Health Services, they chose a hybrid utility plant that combines natural gas cooling with a conventional electric air-conditioning system. The hybrid system is capable of providing

Hybrid plants alternate between different energy sources, such as natural gas and electricity, using whichever is more cost effective at a given time. Benefits of hybrid plants include increased energy efficiency and flexibility

“They did not want to rely solely on electricity to provide cooling,” says Benjamin Sun, Vice-President of Flack & Kurtz San Francisco, the

engineers of record for mechanical and electrical systems in the California Capitol East End project. “The positive point is that the [TECOCHILL® units] give

them a diversity of energy sources for cooling. If it's summer and they want to curtail electricity use, they can do it at the central utility plant level."

The central utility plant, attached to Building 173, provides heating and cooling for all four buildings, which together constitute about one million square feet of space. More than 5,000 state employees work in the complex. The buildings occupy four square blocks of land immediately east of the State Capitol building in downtown Sacramento, and opened in December 2003.

Hybrid plants alternate between different energy sources, such as electricity and natural gas, using whichever is more cost-effective at a given time. Benefits of hybrid plants include increased energy efficiency and flexibility to schedule chiller operation depending on the season and cooling load. During the winter, cooling is needed only for computer rooms, which operate around the clock, 365 days a year. The winter cooling load is 10% to 20% of the peak summer cooling load, according to Sun. "The large chiller cannot operate at that low range," he points out. "The TECOCHILLs, at 400 tons, can easily operate with a partial load."

John Muñoz, State Chief Building Engineer II, says one electric chiller usually operates during the summer, supplying 12,500 tons of cooling. As the cooling load increases, the TECOCHILL units are used to provide additional comfort cooling.

All three water-cooled TECOCHILLs run year-round. In addition to cooling the computer room, heat from the TECOCHILL engine jackets is sent through a heat exchanger to provide domestic hot water and supplementary wintertime space heating at no additional cost, according to Muñoz.

Summer days in Sacramento can reach 105°F, with an average summer high of 95°F. Average winter temperatures range from a high of 53°F to a low of 37°F. The state energy code requires a cooling plant to offer energy recovery, or to operate using a renewable energy source. "We were able to meet that code requirement by using the hybrid plant," Sun says.

He explains that the state originally planned to cool the East End complex with steam from an off-site steam plant that supplies some other state buildings. However, a cost analysis showed that the cost of installing an underground steam line to the new buildings was prohibitively high and would have required installation of additional equipment in the central steam plant.

Although not originally designed as LEED (Leadership in Energy and Environmental Design) structures, the four buildings that constitute the Capitol East End received LEED certification from the U.S. Green Building Council in 2004. The LEED Green Building Rating System® is a voluntary national standard for developing high-performance, sustainable "green" buildings.

The buildings include features such as intensive use of window glass to increase natural daylight in the working environment, heat-reflecting "cool roofs" created with a white rooftop coating, and photovoltaic panels that generate 150kW of electricity, a small percentage of the total power load.

"The overall plant includes numerous, very stringent 'green' criteria," says Bill Martini, Western Regional Manager for Tecogen, Inc., manufacturer of the TECOCHILL units. "In part, these green benefits stem from the TECOCHILL units' very high efficiency with heat recovery (resulting in lower greenhouse gas emissions), their use of an environmentally friendly non-CFC refrigerant (R-134a), and their optional low-emissions controls."



For more information about Tecogen's CH-400x—DTx Series Water Cooled Chiller or our other Natural Gas Engine-Driven Products please email us at products@tecogen.com