

Case study

The Children's Hospital of Philadelphia

Philadelphia, Pennsylvania



Quaternary-care hospital saves with fuel-flexible hybrid cooling system

As The Children's Hospital of Philadelphia (CHOP) expands, it is adding fuel-flexible cooling designed for patient comfort, reliability, and cost savings.

After installing two 2,000-ton YORK® turbine-driven steam chillers, manufactured by Johnson Controls, on the hospital's North Campus, CHOP installed a similar chiller on the 3 million-square foot South Campus.

Where cooling is a necessity

"Cooling is integral to our primary mission – we're a quaternary-care hospital as well as a research and teaching hospital," says Kevin McCarthy, Assistant Director of Facilities Operation for the hospital. "We need to provide comfort cooling and process cooling."

"When we looked at the 2003 blackout in New York City, we saw that quaternary-care facilities really needed to have cooling," he adds. "We're building in the ability to provide cooling in the event of electric grid failure. If we lose electric, we'd still be able to provide cooling. That's the real reason we are doing it."

The medical center also owns a number of smaller electric chillers.

Quaternary-care facilities are those designed for the most seriously ill or injured patients in the region that they serve.



Fuel flexibility yields savings

"Mr. McCarthy has designed his facility with redundancy through the use of natural gas, oil, electric, and steam," says John Zuk, Director of Major Accounts for Philadelphia Gas Works, the local natural gas utility.

This array of fuel choices positions the hospital to take advantage of optimum prices for maximum savings, depending on the time of day and season.

The hospital requires reliable cooling for its operating rooms and data centers, and for the photon-particle-beam facility on the South Campus. The photon particle beam – one of the first in the United States – is expected to revolutionize the treatment of cancer.

"Turbine-driven steam chillers such as the YORK YST-2000 units at CHOP offer the best technology for cogeneration, fuel independence, ability to switch energy sources and reliability of supply, especially in a hospital," says Rajesh Dixit, Product Manager at Johnson Controls.

"The most efficient way to produce heating, cooling, and electrical energy for a building is by using a gas turbine with a steam turbine chiller," says Dixit, adding that the system at CHOP also yields the lowest output of CO₂ – a greenhouse gas – compared to conventional heating, power and cooling technology.

McCarthy says that besides offering reliability, the new steam chillers will displace 6 to 6.5 MW of electric load.

"If we used electricity to make chilled water for cooling, it would consume 6 to 6.5 MW of electricity to serve the North and South Campuses combined," he explains.

Several years ago, the hospital installed four 760-kW natural gas-fired Caterpillar generators to reduce electric costs and provide power to vital hospital equipment during utility outages.

Each of the steam-turbine chillers consumes 20,000 lbs. of steam per hour. Natural gas-fired boilers, including three 800-hp Cleaver-Brooks boilers installed during a recent upgrade, generate that steam. Steam is also used for winter heating and equipment sterilization.

"PGW upgraded our distribution system to supply CHOP 5 lbs. of pressure, as opposed to 2 lbs. in the past," Zuk says. "The new (800-hp) boilers require 5 lbs. of pressure."

The hospital also operates three older 500-hp boilers and a 250-hp unit, and can purchase steam from Trigen-Philadelphia if need arises. In an emergency, the new boilers can run on fuel oil from the hospital's 80,000-gallon stockpile.

Turbine-driven steam chillers such as the YORK® YST-2000 units at The Children's Hospital of Philadelphia offer the best technology for cogeneration, fuel independence, ability to switch energy sources, and reliability of supply, especially in a hospital.

- **Large, expanding quaternary-care hospital.**
- **10,000 tons of turbine-driven steam chiller cooling.**
- **Natural gas-fired boilers.**