

Case study

St. Michael's Hospital

Toronto, Canada



YORK® MaxE™ heat pump yields big savings for Toronto hospital

Like medical centers everywhere, St. Michael's Hospital in Toronto, Canada, is constantly seeking ways to pare down operating expenses in order to meet budget constraints. Improving a facility's energy efficiency can make a tremendous difference in a hospital's bottom line.

St. Michael's, a 550-bed, major acute care, teaching and research hospital that has served the residents of Toronto since 1892, found a way to save \$1.4 million (Canadian) annually through a major heating and cooling system retrofit. It centered on replacing two aging centrifugal chillers with a new YORK® MaxE™ water-to-water heat pump manufactured by Johnson Controls.

Energy-efficient unit reduces steam costs

Allan Kelly, Manager of Plant Services at the hospital, has nothing but praise for the new YORK unit. "It is very energy-efficient. It is one of the most energy-efficient units on the market," he says.

This electric-drive heat pump has reduced the hospital's steam bill by as much as \$8,000 daily during the coldest part of Toronto's winter. Usual savings range from \$2,500 to \$6,000 per day, depending on outdoor temperature. This is accomplished by repurposing heat discarded from the facility's air-handling system and water-cooled chillers located throughout the hospital. The heat pump raises the temperature of the recovered heat to warm the incoming ventilation air.

"St. Michael's was using steam, and steam is very expensive in downtown Toronto—\$23 per 1,000 pounds," says Rejean (Reg) Cormier, Sales Engineer with Master Group LP, the YORK distributor in eastern Canada.

Eco-friendly unit helps meet emissions standards

The heat pump has also made possible a 36 percent reduction in greenhouse-gas emissions by reducing the amount of steam the hospital requires. This helps St. Michael's meet Canada's

St. Michael's Hospital reduced its daily steam bill by as much as \$8,000 after installing a YORK MaxE water-to-water heat pump.


BY JOHNSON CONTROLS



The YORK MaxE heat pump uses compound compressors in series while in the heating mode.



The YORK OptiView® graphic control center eases the operation of the heat pump.

emissions-reduction requirements under the international Kyoto Accords and eliminates the equivalent of a year's greenhouse-gas output by 1,375 cars. As an added benefit, the heat pump uses environmentally responsible R-134a refrigerant. The old chillers used CFC-11 refrigerant, now banned in Canada as a threat to the planet's ozone layer.

"For us, it was a win-win situation. Not only did we get new equipment, but we got rid of equipment that was environmentally unfriendly," says Kelly. "We received a certificate of recognition from the Ontario Power Authority for reducing greenhouse-gas emissions."

Compound compressor technology used

The YORK heat pump installed at St. Michael's Hospital uses the compound technology of two centrifugal compressors in series while in heating mode and has a heating capacity of 10,237 MBH at a coefficient-of-performance (COP) of 4.2. A traditional water heater typically has a COP of less than 1.0.

Operating at full load for nine months of the year, a 62°F water stream carrying the recovered heat enters the heat pump where useful heat is created and used two ways: 40°F chilled water for cooling, and 130°F hot water for heating the 1.3 million-square-foot facility.

"We have chilled water year-round because certain areas of the hospital require cooling all year round," says Kelly.

The MaxE heat pump at St. Michael's features the YORK OptiView® graphic control center, which regulates both the heating output and chilled-water temperature by means of compressor control, anti-surge, and dynamic-override control systems. It will prioritize the heating function, which is its main purpose, and can be adjusted through several function keys on the control panel to meet the loads at all times.

Total energy plant retrofit

Installed in early 2005, the heat pump is part of a wider energy-plant retrofit designed by Ecosystem, Inc., an energy-efficiency contractor with offices based in Quebec and Ontario.

Other parts of the \$7.9 million project included:

- converting the hospital's old steam network to a hot-water heating system.
- modifying heating networks to create two distinctive loops: the first one using warm water (heat reclamation) and the second one using hot water (steam heat-exchanger).
- installing a high-pressure humidification system, including reverse-osmosis water treatment.
- switching domestic hot-water production to a central unit to benefit from the heat-reclamation network, while using the steam heat-exchanger for peak periods.
- eliminating cooling equipment that used municipal water.
- optimizing the building's automation system for maximum operating efficiency year-round.

"The goal of the hospital was obviously to save energy and, up to now, the heat pump shows that it can meet performance and reliability requirements of the system," says Stephane Michaud, Engineer and Project Manager for Ecosystem, Inc.

The MaxE chiller is attracting attention from other hospitals and organizations that are interested in its impressive energy-saving capabilities.

"We've had other hospitals in Ontario, a university in the States, and a corporation in Puerto Rico come look at it," says Kelly.

