EPRI | ELECTRIC POWER RESEARCH INSTITUTE

CASE STUDY

THE CURE FOR WASTED HEAT: RECOVERY

CHALLENGE

The University of South Alabama Medical Center in Mobile, Ala., the region's only designated Level I trauma center, sought to reduce overall energy expense in order to more cost-effectively serve their patients. In 2012, USA Medical Center began a three-part facilities upgrade. It installed a direct digital control building energy management system to lower utility peak demand charges and replaced existing parking lot and street lighting on the hospital campus with LED and modern metal-halide fixtures. The most substantial upgrade involved a retrofit of its hot water heating system, which is the subject of this case study.

OLD WAY

The center's old hot water heating system relied on two gas-fired hot water boilers installed in the early 1960s. The system's age, together with wear and tear, reduced efficiency to less than 50%.

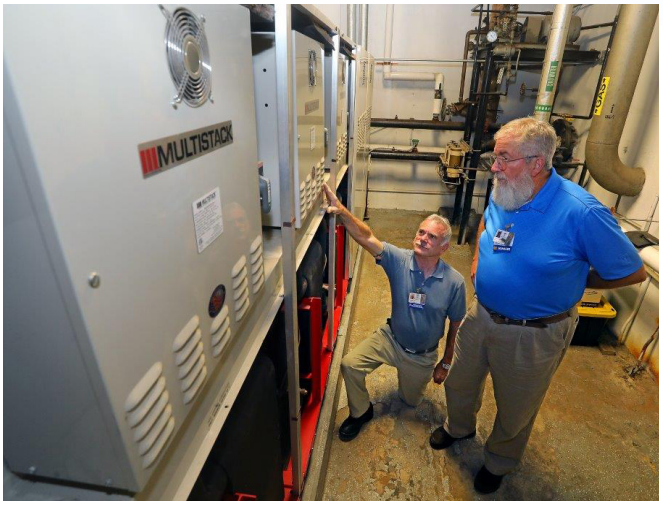
NEW WAY

The solution was to recover and capture low-temperature heat rejected from evaporated cooling tower water to produce higher-temperature hot water. USA Medical Center replaced its gas boilers with a 350-ton Multistack modular heat recovery chiller heat pump and energy management system comprised of five 70-ton, dual-compressor stage modules. At the time, a maximum of 200 tons was needed from the new system. It was sized at 350 tons based on historical heating and cooling demands that have been lowered through energy efficiency measures.

The project was funded in part by a U.S. Department of Energy grant awarded in conjunction with the Alabama Department of Economic and Community Affairs Energy Division.

RESULTS

The new system produces 170°F water, supplementing and thereby offsetting much of the load on the vintage gas boiler water heater system.



Tim Morris, Assistant Director for Facilities Management (left), points out operating features of the Multistack Heat Recovery Chiller unit at the USA Medical Center to Lawrence Gardner, Director for Facilities Management.

During the system's first year of operation, Alabama Power and its affiliate, Southern Company, collected and analyzed data, which demonstrated the effectiveness of the heat recovery chiller system. The operating power of the heat recovery chiller ranged from 40kW to 120kW throughout 2013 (averaging 75kW) with its condenser at 134°F on average, contributing close to 800,000 Btu/hr. to hot-water needs. Heating coefficient of performance (COP) averaged 3.3. The heat recovery chiller operated at a minimum load of 25% in the summer but close to 90% in the coldest period (January).

The vintage gas boiler has been used only once since the system was installed, when outside ambient air temperature dipped below 20°F and the hospital needed the additional gas-fired boost. Administrators are considering installation of supplemental package boilers, which could be gas-fired or electric, to boost the heat recovery hot water from the 170°F range up to and over 190°F.

Before installation, it was estimated that the system would eliminate 1,114,660 lbs. of carbon-dioxide emissions annually.

BOTTOM LINE

During 2013, the first year of operation of the heat recovery chiller, the USA Medical Center saved nearly $300,000 in natural gas costs. Based on the first year's heating season compared to the previous year, the overall return on investment for the heat recovery chiller project was estimated at 1.2 years. The Medical Center had calculated that the cost of all the upgrades could be recouped in just over three years. The hospital is reinvesting its savings into patient care, allowing them to hire and retain additional employees to serve patients more efficiently.

FOR MORE INFORMATION

For more information, contact the EPRI Customer Assistance Center at 800.313.3774 (askepri@epri.com).

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3002014679 October 2018

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