Kingman Regional Medical Center Reduces Electrical Energy Costs by 20% using Daikin Applied Modular Central Plant

Cooling a healthcare facility requires nothing less than 24/7 uptime, reliability and redundancy. At Kingman Regional Medical Center (KRMC) in Kingman, Arizona, the southwest heat and rural location of the hospital made chiller reliability even more imperative.

The main facility at KRMC is a three-story 450,000 ft² hospital that includes 235 beds, six operating rooms, an emergency department and a cardiovascular center. In addition, six separate buildings on the KRMC campus accommodate medical services such as imaging, wellness and cancer treatment.

KRMC turned to the Daikin Applied Modular Central Plant (MCP) solution for seamless cooling without downtime for a chiller plant replacement that serves approximately one-half of the hospital. “The Daikin Applied MCP is one of the top chiller systems available. The system helps us maintain our stability within the community as a non-profit hospital,” says Mike Van Zandt, director of plant operations at KRMC.

“We’ve been pleased with our purchase of the Daikin Applied combined unit and have calculated a 20 percent electrical savings thus far. While we face mounting downward pressure on our operating margin, we felt that this project’s strong ROI coupled with improved reliability, made the case for this project too compelling to pass up,” says Ryan Kennedy, chief operating officer at KRMC.

Innovative solution

The MCP combines chillers — in this case, two highly efficient 300-ton Magnitude® magnetic bearing chillers — cooling towers, pumps, chemical water treatment system, interconnecting condenser water piping and a refrigerant monitoring and protection system in a modular solution. “The chiller was a clear choice to replace our aging chillers to serve the original part of the hospital that was built in 1968,” Van Zandt says. What he dubs the “chiller in a box” is an innovative solution that delivers energy efficiency and reliability in a pre-engineered and pre-assembled module.
The replacement of the oldest chillers at KRMC had been on Van Zandt’s radar for some time and the hospital board gave the approval to go forward with the MCP solution by early 2012. The Daikin Applied plant, located outside the hospital, replaced four approximately 20-year-old chillers located in two crowded basement mechanical rooms.

Now, one Daikin Applied Magnitude chiller cools the same portion of the hospital. “The second chiller provides 100 percent back-up with the capability to run both simultaneously,” says Craig Young, project manager, with Phoenix-headquartered DP Air in Henderson, Nevada. “The MCP comes with about everything you need — from the high-efficiency chillers, cooling towers, variable frequency drives (VFDs) to a basin sweeper filtration system.” He also appreciates the automatic roll-up door for accessibility in bringing equipment in and out.

DP Air provided turnkey mechanical contracting on the project and currently provides the maintenance of the Daikin Applied equipment at KRMC as an independent, service alliance partner serving the Las Vegas region. “The MCP system with the oil-free Magnitude chillers is reducing maintenance needs for the hospital. With a greatly reduced kilowatt per ton consumption of power over traditional equipment, these are the most efficient chillers out in the marketplace,” says Gary Duplock, Nevada regional manager, with DP Air.

“Replacing the aging infrastructure in a mission-critical environment like a major hospital was important to achieve without any contamination inside the hospital. We really minimized disruption to the hospital,” says Barry Naegele, director of MCP solutions sales with Daikin Applied.

“Placing new chillers back in the hospital wasn’t an option,” says Dennis Westbrook, sales engineer, with the Las Vegas branch of Norman S. Wright Mechanical Equipment Corp., representatives for Daikin Applied. “The MCP ‘chiller in a box’ solution was not only convenient in greatly reducing the downtime for the hospital but also provides huge energy savings because of the increased efficiency of the equipment.”

### Putting the project together

Van Zandt explains the piping of the older section of the hospital is tied to the newer portion — as the result of an expansion in 2000 — on the building’s south side which is served by a 500-ton chiller, also with a back-up chiller — located in a remote central plant. “We have the capability to cross-connect the two systems with manual valves and feed the south plant with the new north plant. Having the Daikin Applied MCP doubled our back-up chiller capability,” he says.

The hospital’s existing chilled water pump system off the original plant in the basement mechanical room was left in place for tie-in to the hydronic piping (supply and return). “Locating the (new) chilled water piping was critical in order to maintain the hospital’s chilled water requirements,” Young says, noting, “We worked closely with Pioneer Engineering, as the design engineer, to coordinate the location of new piping and to ensure the hospital would not experience downtime,” Young says.

After factory testing at the Daikin Applied Phoenix manufacturing facility, the MCP arrived on a trailer in late June 2012 and was set by crane onto a 17x55 foot housekeeping pad located on the north side of the hospital near its loading dock. “The construction documents provided by Daikin Applied were detailed and informative,” Young says.

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Duplock says, crediting the work of C.R. Wright Electric, as its subcontractor. “They’re efficient, on schedule, very professional and were already familiar with the hospital operations.”

Commissioning of the MCP was performed during Arizona’s late summer cooler ambient temperatures and the unit was fully operational in August, 2012. DP Air performed the commissioning along with the Daikin Service Group. “After commissioning, we gradually introduced the building chilled water to the new MCP Plant. We then shut down the existing old mechanical plant, one chiller at a time,” Duplock says.

Young adds, “The MCP seamlessly transferred to the hospital’s existing hydronic system. We only made minor adjustments to achieve its optimal performance capabilities.”

Removing old equipment

In late fall of 2012, DP Air oversaw the removal of the old chiller infrastructure over a two-week period. Despite the size of the two adjacent plant rooms (each about 45x50 feet) that contained the four retired chillers, the space was cramped with piping and boilers. “It was challenging to safely remove the old chillers without emission of any dangerous gases. Once the ventilation system was in place, we had to take down an exterior wall and exhaust air ductwork. We then disassembled and cut apart the chillers before craning them out from a small area in a ventilation hallway,” Young says.

Adds Duplock: “All the main power was removed to the existing equipment and terminated at the MCC panels, chilled water piping was removed and capped; and then the oil and refrigerant charge from the chillers were reclaimed.”

Controls integration

The MCP was equipped with a BACnet communication module that allowed seamless integration with the MCP standard unit control system, which controls the chillers, pumps and related equipment. A team worked together to coordinate the integration of the controls with KRMC’s Metasys® building automation system (BAS) from Johnson Controls, including making ongoing enhancements to add more control points to further ensure the optimum performance of the chillers as well as providing an alarm system that alerts the hospital’s engineering department of certain conditions within the MCP. “Assisted by Dennis Westbrook of Norman S. Wright, we coordinated closely with Daikin Applied’s controls partner, Climatex Building Technologies, the Daikin Applied project engineering group and KRMC’s contractor, Control Services,” Young says.

Saving energy with fast payback

The hospital is reaping significant energy savings with the MCP. Prior to replacing its chillers with the Daikin Applied MCP, KRMC was using an additional 175,956.20 kilowatt hours (kWh) annually. The retrofit project that covers part of the hospital qualified for the Commercial Energy Services rebate program by the local electric utility UniSource Energy. The program uses a formula of ten cents per kWh saved on an annual basis. Accordingly, KRMC will receive a rebate of $17,595, reports RealWinWin, the Philadelphia-based rebate administrator.

In addition to low energy consumption, the Daikin Applied MCP solution contributes to a more sustainable environment with these features:

• VFDs improve part-load energy efficiency and reduce demand on back-up systems
• R-134a refrigerant has zero ozone depletion potential and no phase-out schedule under the Montreal Protocol
• The Modular Central Plant is built by Daikin Applied in its Phoenix manufacturing facility, minimizing transportation costs and helping the regional economy

The combination of remarkable energy savings and the utility rebate gives KRMC even swifter payback than anticipated. “While we estimated a six-year payback for the facility, we’re anticipating achieving ROI in less than four years,” Van Zandt says.

Based on KRMC’s experience with the Daikin Applied team and the extraordinary performance of the MCP, Van Zandt of KRMC says he looks forward to further chiller retrofit projects with the manufacturer. “We’re going to be seriously looking at additional replacements following the one-year benchmark of the Daikin Applied MCP in service,” he concludes.
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