Case Study Kingsborough Community College

Brooklyn, New York

Total Efficiency Improvement Key to College System Upgrade

"We have to be practical. So when we looked at upgrading our chilled water plant, we stepped back and looked at the whole chilled water plant."

That was the approach taken by Willy Krapf, facilities manager for Kingsborough Community College. The college is located in the Manhattan Beach area in south Brooklyn. It is a unit of the City University of New York (CUNY).

Serving a wide range of students
The college is one of the true jewels in the CUNY crown. Its roomy, oceanside campus and its ample parking and meeting facilities make it a favorite location for university-wide functions. But the primary role of the school is to provide a quality college education for a wide range of students. The college has innovative

Constant speed chilled water pumps optimize efficiency of the plant.

"The original system was no longer adequate. We needed to do something."

educational offerings including a Weekend College for nontraditional students and a wide range of two-year curricula leading to an associate degree or to placement in a bachelor's program in a four-year college.

The campus overlooks Rockaway Inlet and includes 16 academic and administrative buildings. One of the signature buildings for the college is the Marine Academic Center; a recent building topped off with an actual operating lighthouse. This building houses the business, secretarial science and nursing departments as well as many computer labs. As an example of the progressive thinking of this college, the building also houses a child day care center for students. Other prominent buildings include the Administration Building, library, gymnasium, and the Arts and Science Building.

Central Plant Serves Entire Campus
All of the campus buildings are heated and cooled using hot or chilled water from a central plant located in the Powerhouse Building. Because of concerns about operating costs and cooling tower limitations, an evaluation of the existing chilled water plant was done in 1996 by Krapf and his staff. The existing chilled water plant consisted of two 1,650-ton steam turbine-driven

Three 1,100-ton Trane Model CVHF two-stage centrifugal chillers running on HCFC-123 with new piping, pumps and remote indicator panels to monitor status replaced the old steam chillers.

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centrifugal chillers. These machines operated on 220 psi saturated steam and used R-11 refrigerant. Krapf also points out that the cooling load for the central plant had increased with the addition of new academic buildings. "The original system was no longer adequate. We needed to do something."

There were four cooling towers, each with three 50-horsepower motors operating in a split configuration. The towers were used for system steam condensing as well as heat exchangers for the chiller condensing water. They were in reasonably good condition, though somewhat undersized given the steam condensing load from the turbines. According to senior engineer Anthony Corazza, "The steam turbine machines put an extra load on the cooling towers, especially on warm, humid days. We were running at tower capacity on those days, even though the chillers weren't fully loaded."

Oceanside Humidity a Factor

Corazza points out that, with the steam turbine system, the chilled water plant was occasionally limited by head pressure, sometimes as high as 16 pounds. Because of its oceanside location, the campus has a good share of high-humidity days. On those days, the system was limited by tower capacity and could not keep up.

For these reasons, Krapf performed an economic analysis of system options. The decision was made to replace the two 20-year old steam turbine chillers with higher efficiency electric centrifugal machines. The proposed project also involved replacing the original condensate and chilled water pumps with newer, more efficient variable speed designs. "Good variable speed pumps are a real advantage in a situation like this," says Krapf.

Trane chosen for HVAC Upgrade

The machines chosen to replace the steam chillers were three 1,100-ton Trane Model CVHF two-stage centrifugal chillers running on HCFC-123. "We wanted to stay with a low pressure system," says Krapf, "because of the efficiency advantage as well as the fact that we were comfortable working with this type system." The system was shut down at the end of the cooling season in November 1996 and work on replacement began immediately. The mechanical contractor was Roy Kaye, who coordinated all of the work on the site.

Trane New York City commercial sales office district manager, David Fruetel, notes that the project involved more than a chiller replacement. "It involved the new pumps and replacement piping and, in addition, a new chiller and pump control system with remote indicator panels to annunciate system operation status." The new units were ready to go into operation by the following April. "The focus here was on maximizing system efficiency," says Fruetel. "The college emphasized that in their design parameters."

Chillers were ordered with gantries to facilitate removal of waterbox covers for inspection and tube cleaning.

The college wanted to be able to generate chilled water in the 44 F range to achieve maximum dehumidification. According to Corazza, "We wanted to get the humidity levels down to improve the comfort of building occupants. The best way to do that was to keep the chilled water temperature down." Corazza and Krapf indicate that the new system is accomplishing that goal, while also reducing system energy use.

Krapf notes that, because of the reduced need for tower capacity for steam condensing, tower water use has been cut from 80,000 gallons per day to 50,000. The number of operating fans on the cooling towers has typically been reduced from 12 to 8. And because of the lower temperature chilled water, the typical chilled water flow has been reduced from 6,400 gpm to 4,400. "All of these translate into energy savings." says Krapf.

Surplus Chilling Capacity for Future Growth

In 1997, the college peak load was about 2,400 tons and could actually be carried by two of the three new electric machines. In addition, the goal of more effective dehumidification was achieved as well. For the time being, Kingsborough Community College finally has surplus chilled water system capacity. Krapf says "It's good to know we have that. It allows for future growth."

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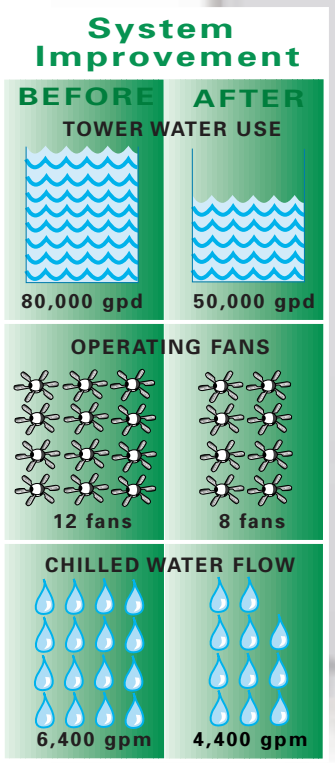

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