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Case Study – Gaston County Medical Building

EDUCATION / HEALTH CARE / LODGING / MANUFACTURING / OFFICE BUILDING / RETAIL / SPECIAL



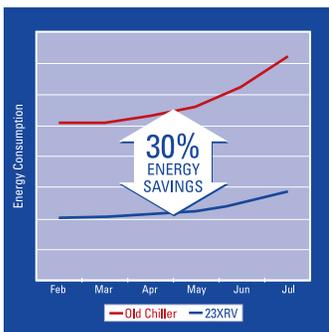
Carrier 23XRV Evergreen® Water-Cooled Chiller Provides Full-Load and Off-Peak Energy Savings

Project Objectives

The Gaston County Medical Center is a multi-use facility that includes health clinics and offices. The building serves over 63,000 patients a year during normal business hours, but is only partly used or is completely closed on nights and weekends. Because of the occupancy schedule, the existing R-11 chillers were running lightly loaded and at very low efficiencies for a majority of the hours during the week. The maintenance staff had to dramatically improve efficiency of the chilled water plant.

Solution

Gaston County installed one Carrier 23XRV Evergreen® variable speed screw chiller. The use of this highly-efficient chiller allows the county to save substantial energy during all hours of building operation, including many hours when the building is operating at very low loads. And because the 23XRV is positive-pressure, the chiller plant controls easily switch to a waterside economizer when conditions permit, further reducing energy costs. The new fully automated system consumes 30% less energy in hot summer months and consumes even less in cooler months. The system has proven to be extremely reliable and uses R-134a refrigerant, an HFC that is not subject to phase-out.



Carrier's 23XRV screw chiller consumed on average 30% less energy than the chiller it replaced.



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“The variable speed screw chiller gives us the flexibility to efficiently reduce the load when the center is either closed or in limited use.”

Barry Styers
Facilities Supervisor
Gaston County

Project Synopsis

The Gaston County Medical Center, located in Gastonia, North Carolina, is a multi-use facility that incorporates the county’s health and medical department offices. The center is also home to a number of important clinics and related services for the residents of Gaston County, serving more than 63,000 people each year. While the center is in heavy use during weekdays, only a small portion of the 91,000 square-foot facility is used in the evenings and over the weekend. This substantial difference in usage and loads resulted in a great deal of wasted energy consumption by the existing chiller plant during off-peak hours.

After analyzing the local weather data and cooling tower capabilities, astute Gaston County staff determined that a water-side economizer could eliminate chiller operation for hundreds of hours per year. However, the existing R-11 chiller encountered problems with its purge unit when started with cold condenser water, making the transition from free cooling using the economizer to mechanical cooling using the R-11 chiller a maintenance problem. Using the water-side economizer with the existing chiller was therefore an unacceptable solution, given that the county staff maintains over 140 widely scattered buildings for the county and has a need to reduce equipment down-time without increasing the number of maintenance events.

To take advantage of operating with cold cooling tower water, and to provide excellent performance at both peak-load and low-load conditions, a new 23XRV variable speed screw chiller was installed. Controls for the new system were configured to automatically transition from free cooling to nearly free mechanical cooling. “It likes cold water,” advised Barry Styers, facilities supervisor, noting the success of the implementation. The 23XRV chiller also delivers the superior peak and off-peak energy savings desired by the county. “The variable speed screw chiller gives us the flexibility to efficiently reduce the load when the center is either closed or in limited use,” said Styers. Even during the extremely hot weeks in the summer, the 23XRV chiller continues to use less energy. The chiller provides efficient, reliable operation to below 25% load even if entering condenser water temperatures rise to more than 95°F, a full 10 degrees above design. Overall, the chiller plant experienced a substantial energy improvement with more than a 30% reduction in energy usage observed during the spring months.

A compressor design that has only three moving parts, no slide valves, purge unit, or shaft seals makes the 23XRV very easy to maintain, a critical feature for any facility manager who maintains a large number of buildings. “The 23XRV has certainly worked well for us. I don’t have to do anything to it; it just runs,” remarked Styers.

Project Summary

Location: Gastonia, NC

Project Type: Retrofit

Building Age: Built in 1989

Project Cost Range: \$120,000

Project Contact:
Barry Styers, Facilities Supervisor,
Gaston County

Building Type/Size: Offices and medical clinics/91,000 square feet

Building Usage: County health department offices and public health clinics

Objective: Energy savings during all hours, environmentally sound refrigerant

Major Design Drivers: Energy efficiency, operation with cold condenser water, increased reliability, flexibility and automation

Installation Date: January 2005

Design Considerations: Variable speed water-cooled chiller using HFC-134a

HVAC Equipment: One Carrier 23XRV Evergreen® variable speed screw chiller

Unique Features: Efficient operation across a wide range of condenser water temperatures and loads

Total Cooling (tons): 300