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Case Study – Madison Square Garden

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



Innovative Retrofit Solution Helps Skaters' Performance and the Garden's Bottom Line

Project Objectives

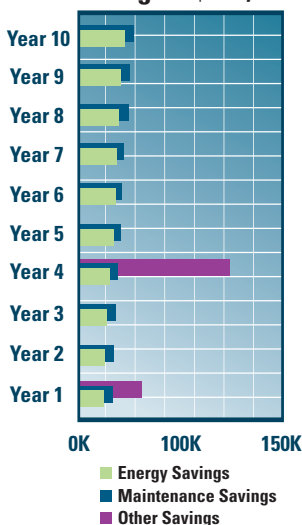
Madison Square Garden in New York City was chilling its ice rink with brine chillers that were consuming more energy than necessary. The 30-year-old R-11 units were part of a constant volume pumping system unable to effectively vary the flow of brine to meet requirements alternating between skating-quality ice and covered-ice downtime between events. Lack of temperature monitoring made it difficult to adjust the chiller system to maintain optimal ice conditions. Facility managers needed engineering experts to get to the root of the problem. And the project would have to be completed before the start of the hockey season – a missed game would mean a loss of \$1 million.

Solution

Carrier met the rink's unique challenges with expertise and ingenuity, determining that the root problems were flow and heat transfer, and offered a total engineered solution. Replacement of two of the existing chillers improved efficiency from 1.35 Kw/ton to 1.22 Kw/ton. A new pumping system using high-efficiency motors and variable frequency drives (VFDs) matched brine flow with varying requirements, saving about \$40,000 in annual energy costs. New temperature monitoring and control ensured top-quality ice conditions. Space and access limitations were overcome with custom-designed, bolt-together chillers. And the project was completed in time for the first game of the season.

Carrier's innovative use of VFDs contributed significantly to the \$40,000+ annual energy savings; and the more efficient chillers, pumps and motors reduced maintenance costs by \$25,000+. With the utility rebate (Year 1) and the avoided cost of a cooler bundle repair (Year 4), 10-year projected savings total nearly \$1 million.

Projected 10-Year Savings = \$934,000





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Case Study – Madison Square Garden continued

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“Combining innovation and attention to detail, Carrier Corporation overcame the challenges of shoe-horned, close-fitting conditions to successfully replace our existing chillers. We were very pleased with their performance, and that of all their support staff, throughout the project.”

Jerry O’Shea,
chief engineer,
Madison Square Garden

Project Synopsis

New York’s Madison Square Garden, one of the most famous hockey venues in the world, keeps its ice rink chilled 6,000 hours each year. With top athletes’ performance literally riding on the quality of the ice — and a \$1 million price tag for a cancelled game — it’s imperative for the system that chills it to be reliable.

As a long-time service provider to the Garden, Carrier knew that the 30-year-old brine chillers were not delivering optimal efficiency. One factor was the many “down” hours between skating events, when the ice was covered and didn’t need as much chilling. To demonstrate, Carrier’s Strategic Partnership Group conducted an innovative flow testing experiment, revealing that as much as twice the brine needed to maintain ice quality was being pumped through the system. Another problem was that rink personnel had no way of knowing whether the ice was being under- or over-cooled until deteriorating ice conditions alerted them.

Carrier’s technical systems expertise addressed the root cause of the problems and enabled a complete engineered solution. Carrier proposed not only replacing two of the three existing chillers, but using variable frequency drive (VFD) technology to more precisely match brine flow with actual conditions. “With this outside-the-box solution, we were able to reduce annual energy costs by about \$40,000 and save about \$25,000 in annual maintenance expenses,” said John Benedetti, Senior Technical Consultant for Carrier. The project earned nearly \$63,000 in incentives from the New York State Energy & Research Development Authority (NYSERDA). New brine pumps with higher-efficiency motors also contributed to the savings. And with the new chillers, an upcoming cooler bundle repair was avoided, saving \$125,000. In all, the project is expected to reduce operating costs by \$934,000 over ten years, a significant return on investment.

Temperature monitoring and control systems were installed both above and under the rink, ensuring proactive and automatic adjustments to maintain top-quality ice conditions. A mechanical equipment room safety upgrade rounded out the project.

The Carrier team and rink personnel worked together to overcome two significant challenges: space and time. Because mechanical room space and building access were limited, the chillers had to be custom-designed to come apart. “The new chillers were assembled on-site and the old ones removed in wheelbarrows,” said Ernie Biron, Carrier Account Executive. “Meanwhile, normal activities continued. There was a circus at the Garden during the installation. One hour we were using the elevator for HVAC equipment, and the next it was carrying elephants.” And the fast-track project had a non-negotiable deadline — the date of the season’s first hockey game. It was met with time to spare.

Project Summary

Location: New York, NY

Building Age: 33 years

Project Type: Retrofit

Building Type/Size:
Concrete/steel, 10-story
1.4 million sq. ft.

Building Usage: Sports arena

Objectives: Replace older

equipment; reduce operating costs; improve ice temperature control

Major Decision Drivers:
Carrier reliability; project team expertise & innovative approach

Design Considerations:
Limited space and access to mechanical room; multi-use facility alternating between ice and non-ice use; need for consistent ice temperature across the rink

Total Cooling (tons)/Type of Refrigerant: New chillers: 400/R-22

HVAC Equipment: Two custom-built 200-ton brine chillers; brine pumps with high-efficiency motors & VFDs; ice temperature monitoring & control

Unique Features: Non-negotiable deadline; project completed with no interruption to arena activities

Project Cost Range:
\$1 million to \$5 million

Installation Date:
October, 2000

Consulting Engineer:
WASA Engineering

For more information, contact your nearest Carrier Representative, call 1.800.CARRIER or visit our web site at www.carrier.com