Efficiency in Ice Making: A Chiller System Transformation

At A Glance

Challenges

- **Ammonia System Exceeded Lifespan**
- **High-cost Repairs, Insurance**
- **High Energy, Resource Consumption**

Results

77% **Refrigerant Charge Reduction**

42% **Reduced Daily Operational Costs**

91% **Decreased Start-up Costs**

Less than 1°F Ice Temp Fluctuations

Customer

With its array of amenities, including eight sheets of top-tier curling ice, the Sarnia Golf and Curling Club stands out as one of Ontario's premier curling facilities, providing members with the opportunity to enjoy the sport for six months annually.

Application

Curling combines strategy, precision, and teamwork but all of this is lost without quality ice. Curling clubs worldwide understand the importance of investing in high-quality refrigeration equipment to maintain optimal ice conditions. Curling ice requires specific and consistent characteristics to ensure fair play and player satisfaction. Achieving these conditions demands meticulous attention to detail, and the key lies in maintaining a precise temperature throughout the ice sheet.

Challenge

A common theme among many clubs is the aging equipment they operate with, often associated with higher risk levels and safety issues. The repercussions of high energy consumption and frequent servicing, driven by increased mechanical failures, impose crippling financial burdens on these establishments. The Sarnia Golf and Curling Club found itself grappling with such operational challenges stemming from an outdated ice-making system.

The legacy ammonia system, confined within a crowded compressor room, not only proved inefficient but also raised safety concerns while incurring substantial maintenance costs.

The antiquated reciprocating compressors dating back to the 1960s required parts made to specifications, resulting in increased maintenance expenses. Additionally, the compressors operated continuously, irrespective of the load, contributing to energy inefficiency and unnecessary operational expenditures. The lack of visibility into the system's internal performance meant that excessive supervision and onsite monitoring were the primary methods used to avert mechanical failures.

The old evaporative condenser, which used two pumps to cool the compressors and the evaporative condenser unit, led to significant water waste and costly chemical treatments, raising both environmental and economic concerns. Seasonal start-ups were tedious and expensive, and the ammonia system required regular inspections by the Technical Standards and Safety Authority (TSSA). The toxicity and flammability of ammonia posed serious safety risks to staff and patrons, necessitating additional safety measures, protocols, and specialized training, all of which had substantial financial implications.

Solution

The decision to shift away from ammonia prioritizes safety for staff and patrons and eliminates the need for TSSA inspections. The new system removes the requirement for excess piping, cooling towers, water usage, water treatment and water pumps along with the associated costs. It uses significantly less refrigerant, requires no exhaust or safety devices, and streamlines service tasks compared to previous practices.

The new complete system, comprising of compressors, condenser and plate heat exchanger evaporators, was strategically installed on an outdoor cement pad adjacent to the mechanical room. This placement alleviates crowding in the compressor room, providing valuable additional interior space. The incorporation of four Scroll compressors with variable frequency drives, electronic expansion valves, and floating head control, all managed through the Sensori™ building automation system (BAS), represents a significant advancement toward adaptive operation based on cooling needs. These compressors now respond to varying loads and ambient temperatures, which minimizes energy consumption. Additionally, the integration of multiple smaller compressors ensures system redundancy, enhancing overall reliability and ensuring continuous operations.

Sensori™ supervisory controls provide comprehensive system management, offering simplified operation and contributing to both operational efficiency and cost savings. These controls gather, assess, and convey performance data encompassing temperatures, pressures, flow, energy usage, and additional parameters. Armed with this data, technicians benefit from the ability to monitor metrics, energy use, logs, and historical trends with remote access for real-time adjustments and alarm notifications via email. They can promptly address issues that might affect ice quality, system performance or escalate operating costs.

The new system simplifies start-up procedures, eliminating the need for time-consuming tasks and extra costs associated with the old ammonia system, such as replacing shaft seals and pulling compressor heads. Changes at the beginning and end of season is as simple as touching a button on the HMI screen. The implementation of Sensori™ advanced control features has resulted in tighter regulation, with ice temperature fluctuations now reduced to less than 1°F. This precise control balances heat infiltration and removal, ensuring a stable ice temperature. Oxford's Chiller system at Sarnia Golf and Curling Club has not only resolved operational inefficiencies but has also enhanced safety, reduced maintenance costs, and provided a user-friendly, technologically advanced solution.