Skatetown: Model of Energy Efficiency

by Scott Slavensky, President/General Manager

I was your typical "hockey dad" on a mission to bring new ice to our community. Unlike most hockey dads, my dream came true. Skatetown opened in Roseville, CA, just outside Sacramento on December 24, 1997. Our region has a population of approximately 2,000,000, and Skatetown opened as the only full-size ice arena in the area.

Skatetown opened with one sheet of ice and plans and infrastructure for a second sheet in place. During Christmas of 1998, the second surface was under construction. The concrete floor for the expansion was poured and since the refrigeration system was complete, we decided to operate the second rink as an outdoor rink for one month. It was a big hit.

With the completion of the second rink, Skatetown is a 61,679-square-foot facility located on five acres with 220 parking spaces. The facility houses eight locker rooms with showers, four party rooms, a snack bar with seating for 75, and a 1,400-square-foot pro shop. Each rink has seating for approximately 400.

The rinks' refrigeration system is by Cimco and utilizes calcium chloride and R22. Both surfaces are 85 feet by 200 feet. The first rink's surface is a sand floor and the second is concrete. The dehumidification system is by Munters and the control system is by Delta Controls. The ice resurfacers are a 1997 and a 1998 Zamboni 500, propane powered. Dashers are by Aimcon with tempered glass. The rinks offer over 1,200 pairs of rental skates.

How to Achieve Energy Efficiency in an Ice Arena

During two years of research, prior to designing our facility, I discovered that lots of ice arenas cut corners during construction and many others spend money thinking they're doing the right thing but make big mistakes. There are huge opportunities in ice arenas to improve the quality of the ice, increase comfort, reduce energy costs and increase the longevity of the buildings and mechanical systems.

With 20 years of experience as a mechanical contractor specializing in retrofitting buildings for improved energy efficiency, I knew there were energy efficiency measures that I wanted to incorporate into our project. Since we went over budget during construction, I was tempted to cut out some of these measures but after thinking it through, elected to keep everything in the plan.

Since the vast majority of the energy used by lights is emitted in the form of heat rather than light, and 40 percent of a typical building's energy is consumed by lighting, we paid attention to lighting. The light fixtures we selected for our rinks use six Sylvania Biax lamps and three electronic ballasts. The lighting circuitry allows us to operate two, four or six lamps in each fixture. For hockey, we operate all six lamps in 43 fixtures and maintain 50 foot-candles at the ice surface. These fixtures use half the energy of the typical 400-watt metal halide fixture.

When all six lamps are on, they look great (like a snowflake) and they maintain their output for most of their 20,000-hour rated life. The payback on this upgrade, not counting the reduced heat load on the ice making equipment, was about one year.

For the rest of the building we use T8 lamps and electronic ballasts in all the fixtures. The lights were placed in switched zones so we could turn off lights in parts of the building when the facility

was only partially occupied. Motion sensors were installed in all the smaller areas such as restrooms, party rooms, storage closets, electrical room and offices.

Sensors $ave Money

A sophisticated control system operates virtually everything in the building, including the chiller plant, parking lot lights, illuminated signs, air conditioning system's exhaust fans, dehumidifier, etc. The control system monitors the rinks' air quality with several sensors. If more outside air is needed, based on CO2 levels, the dampers open and the exhaust fans come on. This compares to the traditional method of setting outside air dampers at a fixed minimum position. With summer temperatures over 100 degrees, we can't afford to bring more outside air into the arena than needed. When the CO sensors detect high levels of CO from our Zambonis, the exhaust fans in the rink and mechanical rooms come on until the CO levels drop.

The humidity sensors operate the dessicant dehumidification based on two sensors in each rink. If one rink has just been resurfaced and the humidity levels are high, all the air is diverted to the rink that needs to be dried out. This prevents over drying one rink and excessive running time on the750,000 Btu dehumidifier.

All data from the sensors is archived and stored. If there is a question about indoor air quality, we can print out an historical log of our sensor readings for every 15-minute period of every day that we've been open. If any of several "emergency" situations are realized, such as high ice temperature or compressor failure, a strobe light at the front counter is turned on, a page is sent to the manager's pager, and an alarm message is displayed on the computer system server.

Infrared sensors over each ice surface give us immediate feedback when the ice temperature changes so the chiller plant can react. The sensors also enable us to change the temperatures based on events. We let the ice warm up to 28 degrees at night, drop it to 24 degrees for figure skating, and 22 degrees for hockey. The ice temperature automatically changes, based on the main schedule entered into the computer. As with anything connected to the computer, we can easily override the ice temperature settings.

The exhaust fans and air conditioning for the locker rooms will only operate if there is a hockey function scheduled for the adjacent rink and only if the light motion sensor detects motion in the room. Electrical circuits to the video games are turned off if the building evacuation system goes into alarm. To save energy, we turn this circuit off at night so the video games shut down.

Heating and Cooling at Skatetown

The common areas are heated and cooled with 10 high efficiency, rooftop heating/cooling units. Several zones are created with these units, so certain areas can be turned off when heating or cooling isn't needed. The temperature of any of the air conditioning units can be adjusted from anywhere on the arena's computer network.

Hot water for the Zamboni resurfacers is heated via a heat exchanger through which hot refrigerant is routed. Not only is the water pre-heated to approximately 130 degrees, but the refrigerant is pre-cooled as well. The gas-fired hot water heater for the resurfacing water rarely runs, since the pre-heaters do most of the heating.

The water for resurfacing the ice is recycled. The snow from the resurfacers is dumped into a pit. The water is filtered, pre-heated, heated and put back in the Zamboni to be used for resurfacing. This measure saved over $50,000 in sewer connection fees a well as $300-$400 per month in water and sewer costs.

To insulate against the high summer temperatures, as high as 110 degrees, the ceilings were

insulated with Celotex R-30 foam insulation panels with aluminum facing on both sides. The insulation was placed directly over the purlins, which created a high reflectance surface that increased light levels and allowed downsizing of the lighting system. The aluminum facing created a low emissivity barrier that eliminates the radiant heat transfer that passes through anything other than aluminum.

The building was constructed utilizing a urethane core architectural panel system. This meets the very strict architectural standards of the community while providing a high insulating value.

Gas fired radiant heaters were installed above the spectator bleachers. The radiant heaters only operate when a bypass button connected to the control system is pushed or if the interior rink temperature is less than 50 degrees. The length of time the heaters can operate and the temperature at which they operate can be easily changed at the control system operator terminal.

Safety Features

In order to create a safe environment, Skatetown has two video surveillance systems with a total of 24 cameras. Each rink has four cameras on the ice surface. Cameras are positioned over each cash register, in the pro shop, on the building's exterior for viewing the parking lots, and throughout the facility. Two recorders capture everything that the camera sees, seven days a week, 24 hours a day.

Using approximately 200, eight-hour videotapes, one month's worth of tapes is accumulated before we rerecord. If there is an incident, we pull the tape and keep it in a file for future reference.

All exterior doors have 100-decibel alarms so the only way to go in and out of the building is through the front doors. The front lobby has three cameras, so it's very difficult to enter or exit the building without being caught on video.

Conclusion

At Skatetown, we went above and beyond what most facilities do to ensure energy efficiency. Our ice is second to none; we pride ourselves on the cleanliness of our facility and the quality of the programs and services we offer; and we have the advantage of lower lifetime operating costs, due to built-in energy efficient technology. We estimate that the added expense for the optional technologies will be returned in less than three years.

For more information on energy efficiency in ice arenas or the programs and technology at Skatetown, contact Scott Slavensky at 916-783-8550, extension 106.