

Arena Project

Energy Retrofit Case Study

Background

The City of Toronto contracted with Optimira Energy to implement energy efficiency measures at over 100 City arenas and recreation complexes that include 126 indoor and outdoor ice pads. These energy intensive facilities range from small outdoor ice rinks to large multi-use buildings that encompass public swimming pools, community centres, theatres, libraries and gymnasiums.



The project is part of the Energy Retrofit Program that was approved by Toronto City Council in 2004. The Program was created to reduce building operating costs and deliver environmental benefits. The improvements will include installation of building automation systems, lighting retrofits; heat recovery systems; building air sealing and insulation; power factor correction equipment; and solar water heating systems. The program also includes for on going support and monitoring of results for two years after completion of construction.

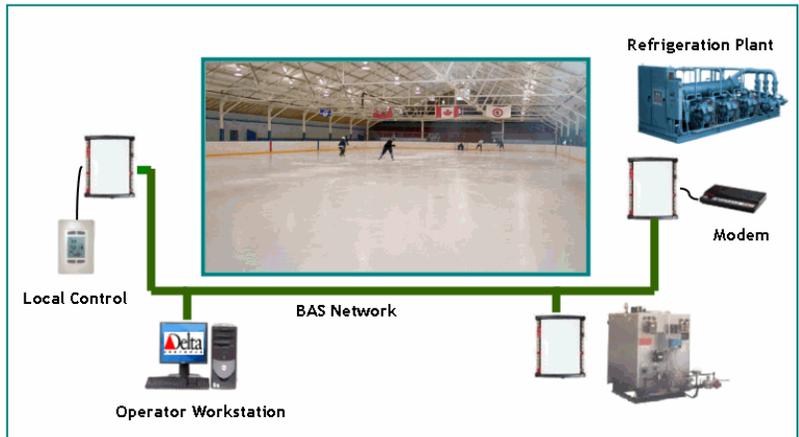
Project Summary

Building Types:	42 Arenas 3 Curling Rinks 7 Indoor Pools 27 Community Centres 45 Outdoor Rinks	Annual Energy Savings:	\$1,255,000 10,289,340 kWh 1,070,950 m ³ of natural gas 4,660 tonnes of CO ₂ per year
Total Area:	221,359 m ²	Total Project Cost:	\$9,901,620
Start Date:	January 2005	Completion Date:	May 2007

Description of the Work Implemented

Building Automation System

A building automation system was installed to control all major building functions. The majority of the work involved control of the refrigeration plant so that the system is controlled based on occupancy and activity requirements. Heating, cooling, ventilation and space temperatures are also controlled. Training to operate the system was provided in a classroom format to approximately 200 building operations staff.



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Lighting Retrofits

T8 lamps and low ballast factor electronic ballasts and LED exit lights were installed. Multi-purpose rooms and gymnasiums were redesigned with new T5 fixtures and occupancy sensors. Occupancy sensors were installed in change rooms, washrooms and offices. A dimming system was installed to control the arena HID lighting through the building automation system.

Heat Recovery Systems

An air to air heat recovery system was installed on swimming pool ventilation units. The heat recovery unit is ducted in parallel with the swimming pool air handler and serves as the primary heat recovery and dehumidification unit.



Building Air Sealing

There were areas throughout the buildings that had air gaps that were exposed to the exterior environment. Air gaps leading from interior heated space to the exterior and from interior heated space to the ice rink were sealed. This included weather-stripping of doors, caulking of windows, and foam insulation added to roof – wall gaps.



Brine Header Insulation

The brine header is a pipe that feeds refrigerated brine or glycol to the ice pad under-floor cooling system. To reduce refrigeration load, the pipe was encapsulated with 2" polyurethane foam.



Power Factor Correction Equipment

Power factor is a measure of how effectively the electrical current is being converted into useful work. For electrical large users, the utility company charges for low power factor. Power factor correction equipment was installed to minimize this inefficiency.



Instantaneous Domestic Hot Water Heaters

A new instantaneous water heating system was installed to replace a hot water heater and three 200 gallon storage tanks.



Swimming Pool Solar Water Heating Systems

The swimming pools are heated by either gas fired or electric heaters. Solar water heating systems were installed to displace some of the load. The collectors used were of an unglazed type. The unglazed collectors are made of carbon-black polypropylene. The system is controlled by the building automation system that enables operation based on solar heating available and need for heat in the swimming pool.

Energy Manager and Energy Awareness

The Energy Awareness program was designed to instill energy efficiency as a basic value for the operating staff which ensures the long term sustainability of the savings. The program includes an Energy Manager, a communications campaign and training. The Energy Manager's role includes site visits to monitor performance and provide assistance to staff.

