

# REDUCING ENERGY CONSUMPTION IN ICE RINKS

Efficient Dehumidification with Liquid Desiccant Technology



BY MOOKI TALBY

## Rising Energy Costs

Rising energy costs are causing many ice rink operators to consider action. On average, energy accounts for over 30% of a typical arena's operating budget<sup>1</sup> making it one of the highest expenditure items on the profit and loss sheet.

## Reducing the Refrigeration Load

Efficient dehumidification of an ice rink can reduce the refrigeration load by 30-50%. This reduction is achieved by shifting the task of dehumidification from the refrigeration system, which is very inefficient in removing the humidity from the rink, to a dedicated dehumidification system. During the spring and summer, when humidity is high, the refrigeration system cannot handle the high humidity levels. The result is a foggy rink with condensation that is dripping

from the ceiling creating stalagmites, mushrooms and puddles that pose a major safety hazard and require manual labor to maintain.

## Solid Desiccant Dehumidification

Solid desiccant systems, also referred to as desiccant wheel systems, have been used to control the humidity in ice rinks. These systems are efficient in removing the humidity however they consume considerable amounts of energy - both natural gas and electricity - during operation. In addition, the air released into the ice rink from desiccant wheel systems is dry but also very hot. The outlet air from a desiccant wheel system is usually at a temperature of 140-150F. This hot air increases the heat load in the rink causing the existing refrigeration system to work even

1. ISI Edge Magazine, Sep/Oct 2008

harder and in many cases ice rink operators have opted to install a dedicated chiller to compensate for the increase in load.

## Liquid Desiccant Dehumidification

Liquid Desiccant dehumidification utilizes a concentrated salt solution (Lithium Chloride) to cool and dehumidify. The founders of DuCool have been pioneering liquid desiccant cooling and dehumidification for over 20 years. The technology has been applied successfully in multiple ice rinks in Europe and has a proven track record of reducing the overall energy consumption of a typical ice rink by over 35%. DuCool was established 3 years ago and has been successfully implementing its liquid desiccant solutions in commercial and industrial applications.

## Utilizing Renewable Energy

DuCool's Liquid Desiccant systems can efficiently generate cooling and dehumidification using renewable energy sources such as solar thermal and geothermal (geo-exchange). When using solar thermal, over 80% of the energy required for dehumidification is generated by the sun. A second option is to combine the DuCool systems with a co-generation unit that consumes natural gas to generate electricity on-site and provide hot water that can be utilized by the DuCool systems to create dehumidification. The overall efficiency of the system is very high since both the electricity and the heat created by the co-generation system are being fully utilized.

## Energy Savings with Liquid Desiccant Dehumidification

Overall annual energy savings for a typical twin ice rink project, in which desiccant wheels are being replaced with a liquid desiccant system powered by renewable energy, can surpass 30%. In some cases especially in hot and humid climates the savings can exceed 40%!

## The Green Perspective

Reducing the energy consumption of an ice arena is good for the environment, shows corporate responsibility, and has a direct impact on the perception of the community. Utilizing renewable energy positions the arena as a green building that is taking active steps to reduce its carbon footprint. Today, there are multiple federal, state and utility

incentives that can reduce the cost of installing a renewable energy powered cooling and dehumidification system significantly. The combined impact of the federal Investment Tax Credit (ITC) and accelerated depreciation (MACRS) can be over 45%<sup>2</sup>. State and utility rebates and incentives can further lower the cost of the project.

## Increased Safety

DuCool's Liquid Desiccant systems create a safer skating environment and provide the following important advantages: 1. Operators can tweak the ice-sheet and achieve specific conditions according to the usage i.e. ice-hockey vs. figure skating. 2. The dry conditions of the ice and elimination of fog increase ice rink safety and lead to decreased insurance cost and lower overall slippage.

## Improved Indoor Air Quality

Efficient dehumidification assures that mold and mildew cannot develop in the ice rink preventing a common health hazard that leads to allergic reactions in adults and children. With dehumidification in place ice rink operators can maintain the outdoor air intake required by code, throughout all seasons, assuring that carbon monoxide levels are kept at acceptable levels. The result is a healthier environment for skaters and hockey players.

## Lower Maintenance Costs

Efficient dehumidification prevents condensation on metal structures reducing corrosion. This leads to considerable savings in labor and materials required for preventive maintenance including rust removal painting of roof beams and other metal structures.

## Summary

DuCool systems cool and dehumidify efficiently utilizing renewable energy or heat from a co-generation system. Annual energy savings for a typical ice rink can be in the range of 30-45% depending on the location and the equipment installed. Increased safety, reduction of insurance premiums and reduction of ice arena maintenance are additional important advantages that ice rink operators and their customers can benefit from.

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2. Depends on equipment installed.