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COMPARISON STUDY OF THE ICE RINKS DEHUMIDIFICATION

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Abstract: *In this paper it is presented an energy consumption comparison of two dehumidification systems for ice rinks facilities.*
First system uses the chemical dehumidification with chemical sorbents - silica gel.
The second one has a reciprocating refrigeration dehumidification system.
The refrigeration dehumidification is 36,8% more efficient than chemical dehumidification.

Key words: *Dehumidification, Refrigeration, Ice Rink.*

1. Introduction

In the ice rink system an important problem is the dehumidification of ice rinks.

Moisture can be introduced into an ice rink facility trough sources as flood water evaporation, and spectators, code ventilation, infiltration and combustion, so it is very important to keep the air dry inside the installation.

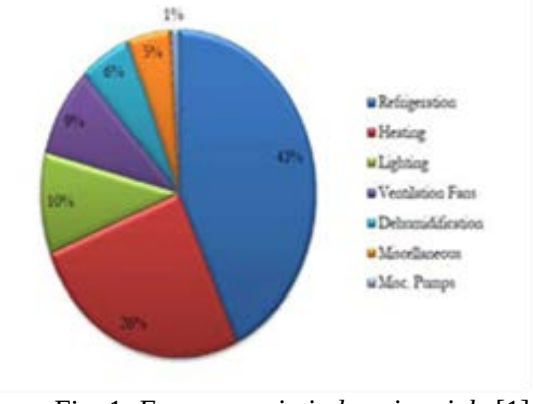

Fig. 1. *Energy use in indoor ice rink* [1]

The energy use for dehumidification of an ice rink was evaluated [1] about 6% of the total energy use of the cooling system (Figure 1*).

In this work were analysed two systems.

First system uses the chemical dehumidification with chemical sorbents - silica gel. This material absorbs the water molecules of the moisture in the air.

The second systems use refrigeration dehumidification this systems have a refrigeration with reciprocating system.

2. Analyse Of Two Dehumidification Systems [1]

2.1. Dehumidification Absorption System

The technology is based in the principle of dehumidifying using chemical sorbents – silica gel, with an absorption rotor coated with a special substance, such as silica gel that absorbs the water molecules of the moisture in the transitory air. When the air

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is saturated, the rotor rotates to a regeneration zone, where it is dried with heated air. The warm and humid air is led away out of the building, while the rotor is prepared again to take off the water molecules of the air inside the buildin

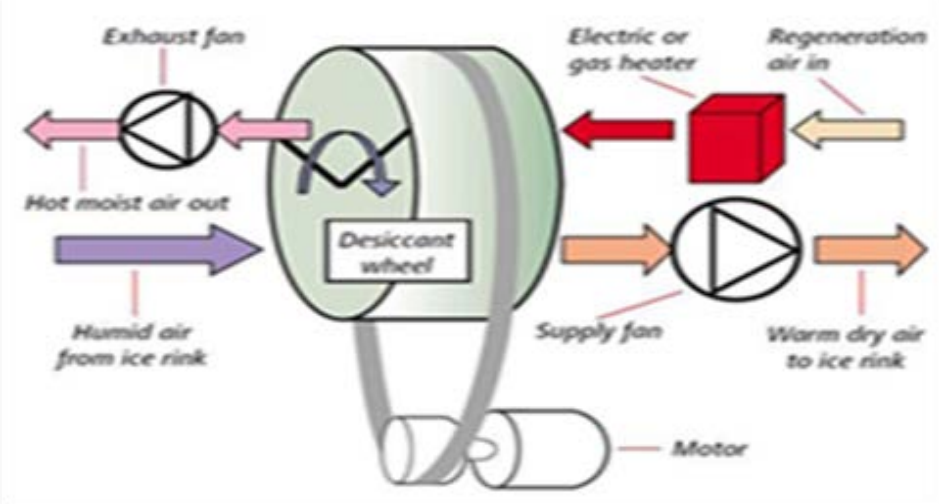

Fig. 2. *Dehumidification with desiccant*

2.2.Dehumidification With Refrigeration Plant

With this method we try to decrease moist air temperature below the dew point temperature to condense the humidity from the air.

It was used a mechanical one stage compression refrigeration plant.

Moisten air goes through an evaporator, where the air is cooled and the moisture is condensed; the dry air is heated in the refrigeration plant and is discharged to inside ice rink (Figure 3).

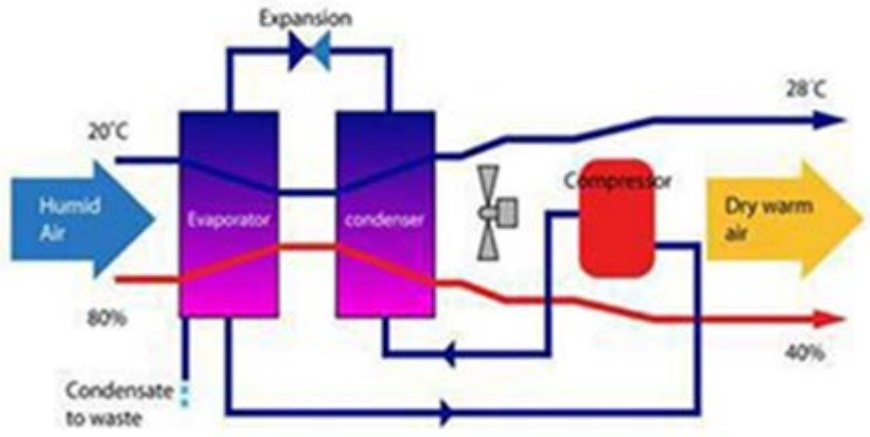

Fig.3. *Dehumidification with refrigeration plant [1;7]*

Examples of COP values for ice rink with chemical dehumidification and refrigeration dehumidification are present in table 1.[1].

Examples of COP values Table 1

Ice rink	COP
Chemical dehumidification	2,41
Refrigeration dehumidification	3,64

Energy use to remove a kilogram of water from the moisture air in the both systems dehumidification studied is exposed in table 2 [1].

Energy use Table 2

Ice rink	kWh/kg water
Chemical dehumidification	0,335
Refrigeration dehumidification	0,216

In figure 4 is presented the energy consumption regarding these two methods of dehumidification. It could be observed that the chemical dehumidification is lower than refrigeration dehumidification.

3. Conclusions

Ice rinks need to be considered as complex systems building. There are problems of optimization and it should provide different inside temperature ranges, which require highly energy systems and could benefit from energy saving measures.

It is known [1] that the energy consumption in ice rinks is divided into five main categories: refrigeration, heating, ventilation, dehumidification and lighting.

In this paper it is presented an energy consumption comparison of two dehumidification systems for ice rinks facilities.

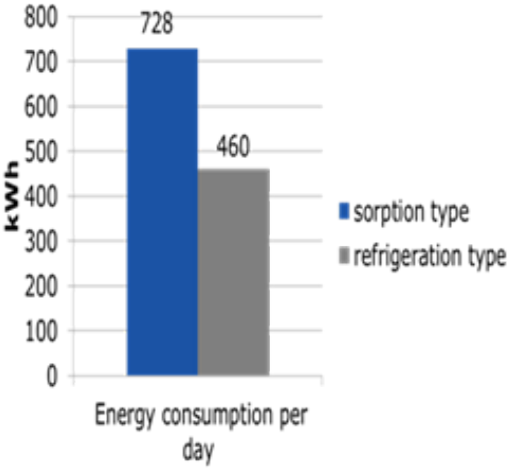

Fig.4. *Daily energy consumption of sorption type and refrigeration type dehumidifiers*

First system uses the chemical dehumidification with chemical sorbents - silica gel.

The second one has a reciprocating refrigeration dehumidification system.

After different evaluations [1], [2] it could be concluded that the refrigeration dehumidification is 36,8% more efficient than chemical dehumidification**.**

In the design of dehumidification plant it is necessary to take into account that the humidity is depending on the weather and season.

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