ICE RINK REFRIGERATION SYSTEM WITH CO2 AS SECONDARY FLUID

JÖRGEN ROGSTAM
Laboratory Manager, IUC Ref Centre, Katrineholm, SE. jorgen.rogstam@iuceducation.se

SAMER SAWALHA
PhD Student, Royal Inst. of Tech., Stockholm, SE. samer.sawalha@energy.kth.se

PER-OLOF NILSSON
Laboratory Engineer, IUC Ref Centre, Katrineholm, SE. p-o.nilsson@iuceducation.se

ABSTRACT

CO2 as a phase changing secondary fluid has advantages compared to traditional secondary fluids where the low pumping power required is the most dominant. This technology has won much ground in the supermarket field in recent time. Among energy consuming refrigeration applications ice rinks can be mentioned as a significant example, therefore this application is of potential interest for a pumped CO2 solution.

A miniature ice rink has been built to evaluate CO2 as secondary fluid. In a few reference plants CO2 has already been used in a steel pipe system. Steel pipes have an inherent high installation cost, so this study proposed to evaluate the use of copper tubes in the ice rink floor.

The copper tube circuits were 60 m and covered in concrete according to the standard construction method. The system was instrumented to evaluate the pressure drop and heat transfer in the tubes.

The investigation has proven that the copper tube concept can be used in full scale plants, and a significant cost saving can be achieved compared to a steel pipe installation. The pump power is significantly less compared to a traditional ice rink and the yearly energy saving for a full scale indoor ice hockey facility is about 150 000 kWh.