

Stockholm-Arlanda international airport

A district cooling system that uses a lake for free cooling and sink for condenser heat has been serving the airports terminal buildings since 2001.

Introduction

Termoekonomi constructed the production plant as a turnkey consultant. This included the system design, the layout design of construction works and detailed design of installations, assistance in purchasing, co-ordinating the installation works, commissioning and initial operation. The only difference from a turnkey contractor performance was that the client signed the contracts with the suppliers.

Luffartsverket, a state authority responsible for Swedish airports, owns and operates the plant.

The airport

Arlanda airport is the biggest in Sweden, located 45 km north of Stockholm city. Stockholm's specific location in the north of Europe makes the airport very suitable as a transfer spot for flights to eastern countries such as China, Korea and Japan. The amount of travellers is steadily increasing.

Like most airports Arlanda is more or less continuously undergoing changes. The construction areas with terminals have to be used in an optimal way. Lots of people and new design with large glass facades is increasing the cooling demand. It is very difficult to put in more cooling capacity in the existing buildings or to construct more machine rooms. The district cooling idea enables the airport authority to take away machinery from the terminals. When more cooling is requested or new terminals opened, it is very easy to add them to the distribution network.

This flexibility offered with district cooling was highly appreciated. Like in all projects the additional space set free in the buildings can be used for other purposes.

Facts:

- Cooling capacity: 9 MW at 5 °C
- Three identical chillers of 3 MW each
- The system is prepared for 25 MW
- During winter and early spring the lake is used for free cooling
- Distribution pipes diameter: 600 mm
- Distance to terminals \approx 1.5 km



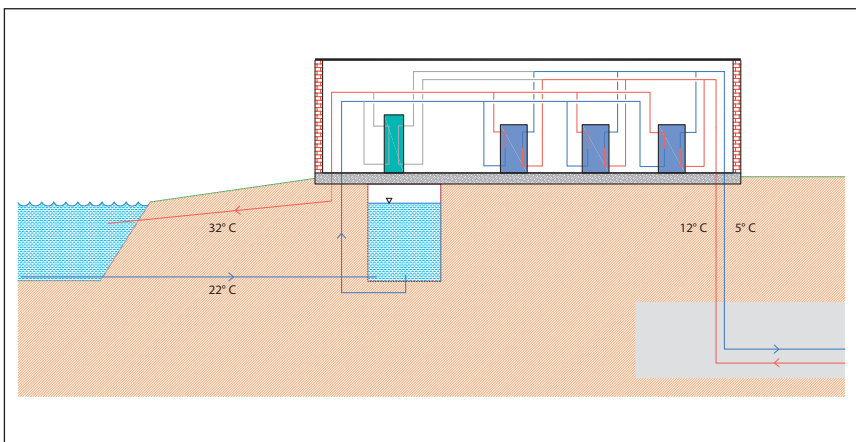
The production plant by the lake.

District cooling for Arlanda is good for the environment

The new district cooling system uses a lake for free cooling and as a sink for condenser heat. In this way the electric power consumption is much lower than before.

Principles for design and operation

More people and new terminal buildings called for a higher cooling capacity with better performance. To use the nearby lake Halmsjön for district cooling showed to be the most economic alternative. In addition there are also other benefits. The higher flexibility has already been mentioned. The risk for spreading Legionella bacteria via cooling towers close to the terminals where so many people pass each day was also considered.



The water temperature in the lake is low enough to use for district cooling via a heat exchanger during winter and early spring. In other seasons chillers are used. Their performance is increased using the lake water instead of cooling towers as sink for condenser heat.

Energy savings & environment protection

The district cooling system for Arlanda airport reduces the energy consumption for cooling with more than 50 %. Saving this energy is economic and environmentally friendly.

The lake that is used for free cooling and as heat sink for condenser heat is rather small and very shallow, 3-4 m. Its ecologic system has been observed for many years. Before a permission to use the lake for district cooling, studies were made to check whether this additional heat could have a negative impact of the lake. The result showed that the temperature increase of the lake water should be small and limited in distance, therefore no significant impact would occur.



The district cooling plant is 1.5 km away from the terminal buildings.



One of three chillers now installed



The distribution pumps are frequency controlled to minimize their power consumption