

# Stockholm Kista/Akalla-project: 48 MW District cooling with Heat recovery

The district cooling system for Kista and Akalla business areas is providing Sweden's "Silicon Valley" with heating and cooling.

## Introduction

Termoekonomi constructed the production plant as turnkey consultant. This included the system design, all detailed design of building and installations, 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.

The installations were done in three stages in operation 2001 (three units), 2002 (two units) and 2003 (one unit). At that time the client did not have their organisation ready for operating the plant. Therefore, Termoekonomi was in charge of the operation during the first four years.

The plant is owned and today operated by Fortum (AB Fortum Värme samägt med Stockholms stad). Fortum is a Finnish energy company and the major supplier of heating and cooling in the Stockholm region.

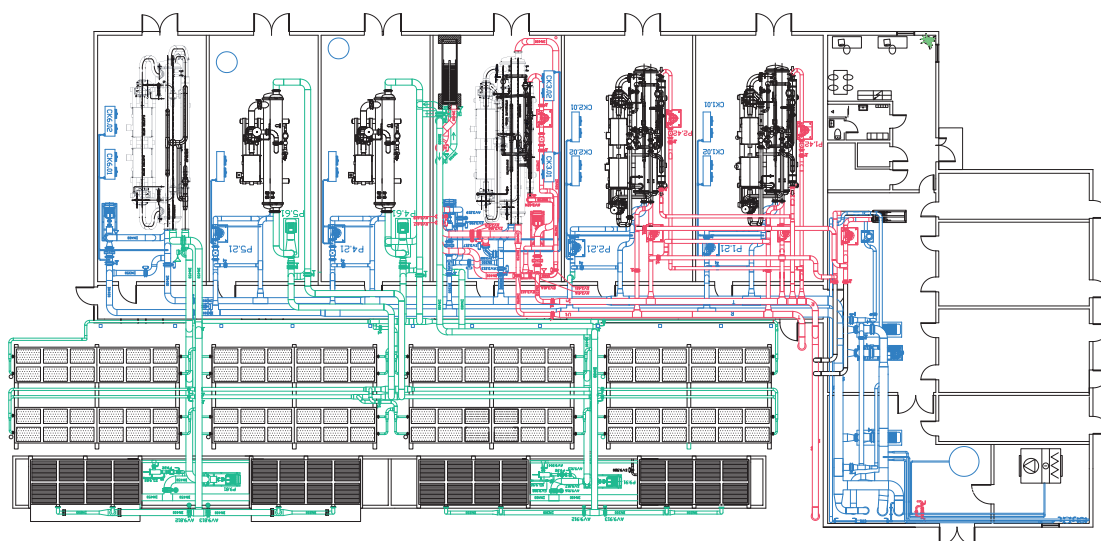
## The Kista/Akalla areas

Located 15 km north of Stockholm city, Kista and Akalla are two intense business areas. Kista is often referred to as Sweden's "Silicon Valley" including companies like Ericsson, IBM and Nokia. There are also education facilities in IT-technology supported by Stockholm's technical university. Besides different office buildings a large shopping galleria and the manufacture facility of electronic chips are connected to the district cooling and heating systems.

Many of the frontline IT companies are pleased to be connected to a modern first class system for heating and cooling.

### Facts:

- Cooling capacity: 48 MW at 5 °C
- Heating capacity: 27 MW at 80 °C
- In total six units, three designed for heat recovery and three as chillers.
- Distribution pipes 700 mm for Kista and 500 mm for Akalla
- Extent of distribution grid: ≈ 5 km



# The Kista project is a splendid example of Heat recovery

**Combining a high efficient cooling principle with heat pump operation results in a high profitability and excellent environmental performance.**

## Principles for design and operation

The clients in these business areas are very demanding. There must be no failures in the service. Since the plant is the only production facility for cooling it must be extremely reliable. Special concerns for this have been implemented in the design. In short the plant is designed as two plants located at the same place. If anything happens with any component, at least half of the total capacity is still in use. The cooling units are placed in separate machine rooms and some components are doubled.

The three units designed for heat recovery are running as base units. When the cooling demand is low during the winter season, nights and weekends no other units are needed. In this way the cooling demand is fulfilled and the condenser heat is used for district heating at temperatures up to 80 °C. As the cooling demand increases one or more chillers are started. They are chilled via cooling towers. Typically, the heat recovery units are in yearly operation 10 times longer than the chillers.

The operation is fully automatic. An advanced control system was installed from the very beginning. The personnel on charge can connect their own laptop computer from wherever they are. From remote the conditions can be checked, components started or stopped, alarms checked etc. Normally the plant is checked once a day, that is all that is needed.

## Energy savings & environment protection

Surplus heat from the buildings is distributed via the buildings internal cooling pipe system to heat exchangers in their basements. On the other side of the heat exchangers, district cooling water take up that heat and distribute it to the district cooling plant. Units for heat recovery take care of that energy and transfer it to between 60 °C and 80 °C depending on the actual demand. In this way heat from solar radiation, computers, lighting, people etc is used for district heating.

The district cooling system will continue to serve the area as a stand-alone plant for a few more years. It has been noticed that the cooling demand for buildings is lower than designed. This is a very great advantage with district cooling, you can adapt the capacity to the real demand or add more customers to the network! It is now assumed that the capacity will be enough to match the increasing demand until 2013 to 2015. After that new production and distribution capacities will be required.

Similar systems have been realized after the Kista example. Each of them is unique but takes advantage of the experience learned in Kista. The plant is also used as a reference for designers, students and potential clients. Each year students from the Royal Institute of Technology that study energy technology attend a lecture about district cooling and afterwards pay a study visit to this plant.



The first unit being installed



One of three chillers now installed



The distribution pumps are frequency controlled to minimize their power consumption