Täby heating plant: Heat Pump, Wood Powder and Oil

This medium sized heating plant produces and delivers heat using a mix of production facilities.

Introduction

This building area in Täby, 20 km north of Stockholm city, was constructed in the early 1960's. It consists mainly of residential buildings but there are also schools, a hotel, some offices and shops connected to the heating system.

In 1985 it was decided to install a heat pump in the production plant. At that time the heat was produced with oil and electric boilers. The heat pump was taken into operation in 1986 and immediately produced half of the annual heat.

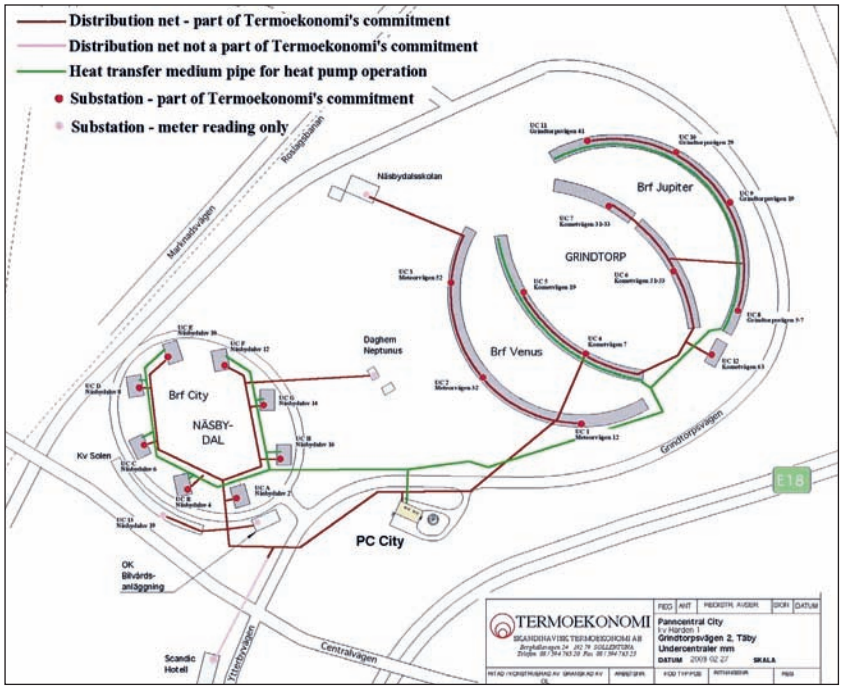
Termoekonomi realized the heat pump system on a turnkey contract. After the installation we assisted in the operation phase until 2001. That year Termeokonomi was engaged to run the plant as a district heating supplier. The engagement was prolonged for 10 years in 2005. In 2006 and 2007 Termoekonomi invested about €2 millions in the plant. The main investment was made to change one oil boiler to run with wood powder. A flue gas heat recovery system is also added.

Besides changes in the production plant we have also adapted the distribution system for a better overall system performance. The heat exchangers in the substations have been changed and a new control system has been implemented. When using heat pumps it is vital that the temperatures in the district heating network is adapted for optimal performance. The importance of a system perspective cannot be over estimated.

Facts:
- Total heating capacity: 19 MW
- Heat pump: 3 MW
- Wood powder boiler: 6 MW
- Oil boilers: 10 MW
- Yearly heat demand: 32 – 34 GWh

Two of the residential buildings.

Loading wood pellets.



In Täby the use of fossil fuels are limited to a minimum

After reconstruction oil is only used for extreme peak load conditions. About 3 % of the yearly heating is produced with oil.

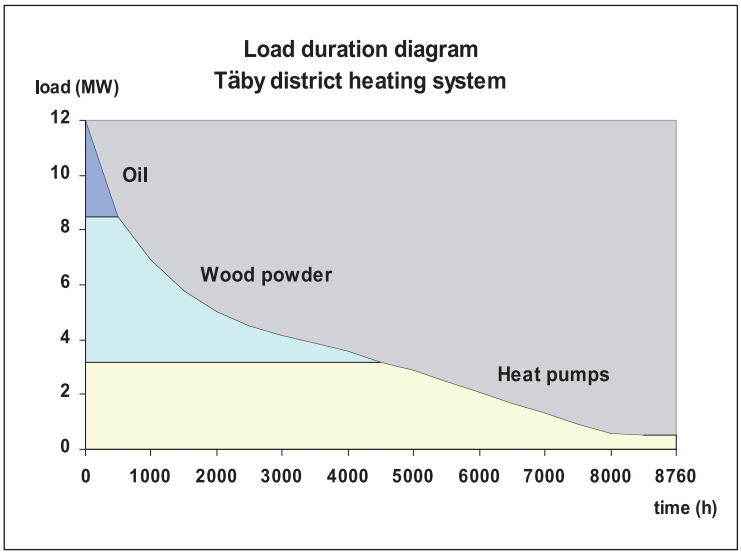
Principles for design and operation

The residential buildings are designed with a mechanical ventilation of the exhaust air. In Sweden it is quite common for domestic houses to use a heat pump and recover the heat from the exhaust air. In this project a central heat pump is installed in the boiler station and heat from the exhaust air is transported there via a heat transfer medium system.

The outlet temperature of the heat transfer medium is normally between –1 °C and +1 °C. The temperature is chosen to manage a large heat recovery and avoid frost on the heat recovery coils. 20 % ethanol is added to lower the freezing point. The total volume of the heat transfer medium system is 110 m³.

The heat transfer medium is pumped to the buildings and through 51 coils installed in exhaust air channels. Its temperature is increased about 6 °C and the heat transfer medium returns to the evaporators of the heat pumps.

Two screw compressor heat pumps take care of the heat from the exhaust air and increase the temperature up to 75 °C. The heat pumps alone manage the heating demand down to an outdoor temperature of 7-8 °C. The wood powder boiler starts at lower temperatures and at peak conditions an oil boiler also has to run.



One of two heat pump units.

An electrostatic filter has been installed to clean the flue gas from the wood powder boiler.

Energy savings & environment protection

Before the heat pump was installed all heating was produced with oil and electricity. Today oil stands for about 3 % of the yearly heat and the electric boiler is not in use at all. The heat pumps deliver 67 % of the heat, the wood powder boiler 30 % and the rest is supplied from oil boilers at peak load conditions.

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