



REFERENCE/CAPITAL COOLING

CITY

Stockholm, Sweden

DISTRICT COOLING STOCKHOLM CITY

A preliminary study pointed to the possibility of using an existing heating pump plant with sea water as the resource for simultaneous heat and refrigeration production for district cooling in Stockholm City. After eight years' operation, district cooling has demonstrated its superiority in large-scale cooling solutions and the result is: greater availability, better environment and better operating economy.



POWER PLANT – VÄRTAN



VIEW OVER STOCKHOLM CITY

FACTS/District cooling in the City

■ INSTALLED POWER	170 MW
■ ENERGY	240 GWh/annum
■ MAINS	8.6 km
■ DISTRIBUTION NETWORK	12 km
■ OPERATING PRESSURE	10 bar
■ FEED TEMPERATURE	+6 C°
■ RETURN TEMPERATURE	+16 C°
■ NUMBER OF CUSTOMERS	300



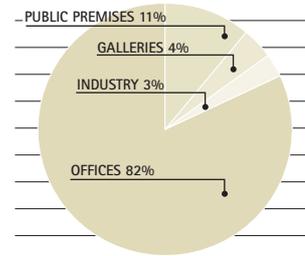
AREA

Stockholm City consists of a wide variety of properties serving different purposes, for example offices and commercial centres. The demand for cooling in the city is high and is growing in pace with increased trade, more stringent comfort requirements and increasing computerisation. Stockholm City was the first area to be provided with environmentally friendly district cooling produced by means of heating pumps and free cooling from cold sea water.

CUSTOMER SEGMENTS

	kW/Contract	MWh/Contract	Number of contracts
■ PUBLIC BUILDINGS	300	300	35
■ HOSPITALS	1,000	1,500	5
■ UNIVERSITIES AND SCHOOLS	2,000	3,000	5
■ BUSINESS CENTRES	1,500	1,500	15
■ INDUSTRY AND PHARMACEUTICALS	500	500	10
■ OFFICES	500	500	330

DISTRIBUTION OF CUSTOMER SEGMENTS



CUSTOMERS

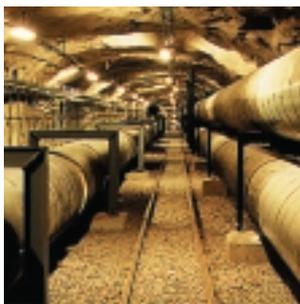
Since 1995 around 300 customers have subscribed to the district cooling network in Stockholm City. The typical customer is an office block with a demand for 500 kW of cooling, but the variation is considerable, ranging from as low as 100 kW to 3,000 kW.



WELDING WORK ON DISTRICT COOLING PIPE

DISTRIBUTION

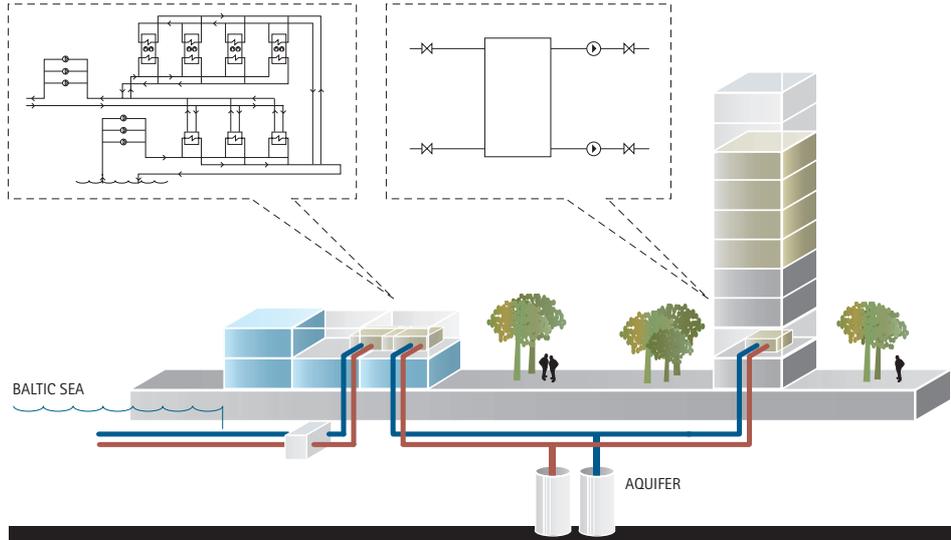
District cooling is transferred to the City area in a mains which is 8.6 km long and has a diameter of 800 mm. The mains is installed in existing pipe tunnels and in the ground. In the City area a distribution network has been established with a total length of 12 km. The distribution network is also installed both in tunnels and in the ground.



PIPE TUNNEL FOR DISTRICT COOLING PIPE

COOLING PRODUCTION HEAT PUMPS

HEAT EXCHANGER SUBSTATION



EXPLANATORY DIAGRAM of the production and distribution plant for the district cooling system – Stockholm City.



HEAT PUMP PLANT

PRODUCTION

When district cooling was launched in 1995 a new 60 MW cooling production plant was built adjacent to the existing heat pump in Värtan, and the production plant for district cooling was established and commissioned in 1995. The combination of free cooling and heat recovery create the conditions for very good environmental performance and economic profitability.

In 1998 the production plant was supplemented with an aquifer for energy storage in Brunkebergsåsen, which is a sand ridge. The store is dimensioned to supply the system with 25 MW for a couple of hours, and is an excess-power plant for high load. The aquifer store is initially charged in the spring with free refrigeration from the cold sea water and is maintenance charged during the summer months at night when the power demand in the system is low.

In 2000 the system was supplemented by an additional excess-power production plant consisting of refrigerators with heat recovery and an additional transfer pipe with a diameter of 700 mm to the City area. The excess-power production plant is dimensioned for supplying the system with 50 MW during the day in the summer months. The plant can also be used at other times of the year with heat recovery to the district heating system.

THE CONSTRUCTION PROJECT

The first preliminary study for district cooling in Stockholm City was initiated in 1992 and the first sod was cut for the extensive construction projects as early as 1994, right in the heart of Stockholm. The distribution network has been laid in existing tunnels and culverts and in buried pipe trenches. The extensive construction work was planned and carried out with the minimum disruption to road traffic by the use of special building methods, ramp arrangements and night work.

TIMETABLE

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
■ DESIGN AND PLANNING										
■ PRODUCTION PLANT				COOLING PRODUCTION			AQUIFER		PEAK LOAD	
■ DISTRIBUTION NETWORK				STAGE 1			STAGE 2			
■ FIRST DELIVERY				★ 1 MAY 1995						



Capital Cooling has developed a business concept which provides cost effective, low energy, environmentally friendly cooling solutions for property and energy companies. Our business concept is creating wholly new opportunities in the energy field, the objective being the establishment of long-term, stable and developing businesses.

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