



## » Unitop® 50FY type heat pump from FrioTherm is upgrading untreated sewage of +9.6°C to heating energy of 90°C in Oslo

### Client

Viken Fjernvarme AS  
0130 Oslo, Norway

### The town of Oslo

Oslo is the capital of the Kingdom of Norway with over 510,000 inhabitants. The town covers a total of 450 km<sup>2</sup>, and only 1/3 of the area is developed.

### Viken Fjernvarme AS

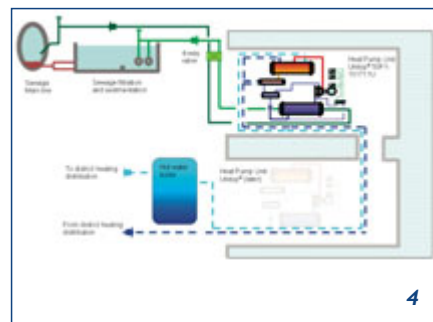
The main business of Viken Fjernvarme AS is the production, distribution and sales of heating energy to customers in the Oslo region. Viken Fjernvarme operates a total of 8 heating plants with together 36 heat generation units. The district heating network has a length of 193 km. Connected are 829 commercial clients and 2,353 detached houses. In 2003, a total of 944 GWh energy was produced for heating of which approx. 50% originated from exploiting waste energy sources.

Viken Fjernvarme is owned by the town of Oslo, Hafslund ASA and Fortum.

### Oslo's water treatment system

Already in 1848 the city council decided to construct a sewerage system in the centre of the town.

In 1973 the City of Oslo and the adjacent municipalities on the western side of the Oslo Fjord decided to build a large scale sewage treatment plant approximately 30 km from the city. Sewage tunnels had to be constructed partly under heavy populated areas.



Today, the sewage tunnel systems of Oslo transport waste water to the two treatment plants Bekkelaget (eastern part of Oslo) and VEAS (western part of Oslo). The main tunnel stretches 42.3 km along the Oslo fjord from the border between Oslo and Oppegård to VEAS treatment plant, passing through Bærum and most of Asker municipality. The total volume of the tunnel system is approximately 345,000 m<sup>3</sup>. The average sewage water flow is 2.4 m<sup>3</sup>/s.

### Waste-to-energy plants

Recycling of solid wastes has been receiving considerable attention for a long time and it is only recently that similar attention has been directed towards recycling energy from sewage.

As a matter of fact, raw sewage contains an enormous amount of energy originating from water heaters used

for bathing, showering and other domestic purposes. Usually this energy is lost to the ambient in sewage treatment plants.

In Oslo, sewage from toilets, bathtubs, sinks and rainwater from the street gullies flows into Oslo's sewage tunnel system with an average temperature of approximately 9.6°C.

Sewage treatment plants are generally located rather remote and far from densely populated areas requiring heating energy, thus making heat recovery uninteresting for economical reasons.

With the Unitop® 50FY heat pump Viken Fjernvarme takes advantage of the location of the VEAS tunnel which leads through densely populated suburbs of western Oslo, carrying already the main load of the town.



### Summer operation

The new heat pump Unitop® 50FY will reinforce the profile of Viken Fjernvarme as competent and reliable energy supplier says Lars Anders Lorvik, director of Viken Fjernvarme. The further development of the district heating system is one of the city of Oslo's most important goals in order to reduce the local impact on the environment. The heating energy produced is preferably recovered from waste burning or produced by environment friendly techniques like wood burning plants and heat pumps exploiting sewage and coastal waters as heat source. The freedom of choice between various sources for the production of the heating energy required enhances the flexibility and security of Oslo's district heating system, says Lorvik.

### Unitop® 50FY heat pump

The highly reliable Unitop® 50FY heat pump is equipped with shell and tube type heat exchangers for evaporation and condensation of the Refrigerant type R134a.

### Main features of the Unitop® 50FY

- Open-type two stage compressor
- Refrigerant: hydrofluorcarbons and hydrocarbons
- Tough industrial design with vertically split casing for easy maintenance
- Suited for all drive systems
- High efficiency over the entire range
- Operating temperatures -40°C/+90°C
- Multiple compressor units available
- Operation in series or in parallel
- Large capacity, small floor space

### Plant control system

A Siemens S7 type DDC control system supplied by Friothersm is used for local control and supervision of the heat pump unit. It is connected to the central building control system supplied by the client.

### Service and maintenance

Specialists of Friothersm are maintaining the Unitop® 50FY heat pump. They also carry out the regular service works.

### Technical data

1 heat pump Unitop® 50FY	
Heating capacity	18,400 kW
Heating water flow	527 m³/h
Inlet/outlet temperature	60/90 °C
Power absorbed	6,566 kW
Electrical motor	7,000 kW
Voltage	3 x 11 kV
Heat source capacity	11,834 kW
Sewage inlet/outlet temp.	9.6/5.5 °C

### Legend

- 1 View of central Oslo from the harbour.
- 2 Entrance to the subterranean installation. The building on top of the door houses the local control station.
- 3 The sewage tunnel scheme of Oslo. The VEAS sewage treatment plant with the 42.3 km lang connecting tunnel is located in the lower left corner.
- 4 Simplified lay out of the Viken heat pump installation.
- 5 The Unitop® 50FY compressor and gear on top of the lube oil tank. Background, left, the heat exchangers.
- 6 View of the two huge sewage pumps feeding the evaporator.

### Friothersm AG

Zürcherstrasse 12 · P.O.Box 414  
CH-8400 Winterthur · Switzerland  
Tel. +41 (0)52 262-8080 · Fax -0003

E-Mail [info@friothersm.com](mailto:info@friothersm.com)  
Internet [www.friothersm.com](http://www.friothersm.com)

