Dalian-Xinghai: Environment-friendly heating and cooling for a business district in China, with 3 Unitop® 33/28 units

Client
Dalian Xinghai Bay Development and Construction Administration, Dalian Municipal Government

System Consultant
Skandinavisk Termoekonomi AB

Cooperation Partner
Dalian Bingshan Group

Dalian City

Dalian is one of China’s most vibrant and modern cities with a population of 5.7 million and a land area of 12,574 km². It is located in the southernmost part of the Liaodong Peninsula in northeast China.

The municipal government of Dalian paid great attention to the city’s environmental development for the last 20 years. As one of the most liveable cities in China, Dalian is recognized by the Chinese Central Government as “National Model City in Environmental Protection”. The state government chose Dalian as a demonstration city for heat pump applications in China.

Xinghai Bay Business District

Located at the coast, the Xinghai Bay Business District is a rapidly developing area around the 110,000 m² Xinghai Square, Dalian’s scenic tourist attraction. The idea of the city government is to develop the Xinghai Business District into a conglomerate area that integrates exhibition centres, office buildings, recreational facilities, shopping malls and high standard apartment buildings. Xinghai Bay Development & Construction Administration (XBA) is the management body designated by the city government to carry out the area’s planning and development, infrastructure construction and real-estate management, as well as the environment protection and state-asset management.

District Heating and Cooling

Centralized district heating schemes in China were initiated in the 1950’s, while district cooling is yet a new concept to the country. The question how to generate and use energy more efficiently along with economic growth became a new, important issue that is crucial to the country’s sustainable development.

Following intensive studies of successful heat pump applications in Sweden and Norway, XBA decided in 2005 to use this technology in Dalian.

Friotherm’s Unitop® type heat pump units providing high efficient dual function in heating and cooling generation met the city’s special demand for a reliable and environmentally friendly solution.

Since early 2007, 3 Unitop® 33/28 heat pumps provide heating and cooling energy for an initial floor space of 300,000 m². The heat pump plant is located in the basement of a commercial two-floor building. Within the first buildings connected are the Dalian World Exhibition Centre and the City Natatorium (indoor swimming pool).

“Free of charge”-energy reclaimed

Heat is reclaimed from treated sewage water of the adjacent sewage treatment plant. During winter, the units work in heat pump mode and the compressors operate in series. In summer, the units are used as AC-chillers with the compressors operating in parallel. Excess heat is rejected to sewage water. The installation of the heat pump/chiller units was completed in early
2007 and followed by an instantly successful trial operation period in heat pump mode. The Dalian Software Fair and the Davos World Economic Forum held in the Xinghai World Exhibition Centre were the first events taking advantage of the very reliable performance of the 3 Unitop® 33/28 units.

Sea water will be used as heat source in winter for further extensions of the heat pump plant. During summer, excess heat will be rejected to the sea.

Let our customer speak...

“This is one of the efforts made by the Dalian municipality to promote a 'green Davos' in Dalian,” says Mr. Xia Deren, mayor of Dalian. “We would like to take this opportunity to show our experience in environmental protection and energy saving as an effort to build a sustainable and environment-friendly society.”

The high expectations of the client regarding COP were met at all times: “The income has outranged the investment and we are making profit. Now we save more than 30% of energy compared with conventional solutions”, says Mr. Lin Hao, director of XBA.

Main features of a Unitop® 33/28

- Open-type single stage compressors
- Tough industrial design
- Planetary type gears
- Suited for all drive systems
- Series & parallel operation
- Refrigerants: halocarbon/hydrocarbon
- High efficiency (COP)
- Operating temperatures -40°C/+80°C
- Suitable for almost any heat source
- Large capacity, small floor space

Customized Plant Control System

A Siemens S95 PLC-Type control system is used for local control of the heat pumps. Its main advantages for the customer are the high grade of customisation and its exceptionally high reliability, combined with the industry-specific standard and worldwide availability.

Technical data:

<table>
<thead>
<tr>
<th>Operating mode</th>
<th>Summer</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chilled water in/out (°C)</td>
<td>+10/+3</td>
<td>+7.5/+2.5</td>
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<tr>
<td>Heating water in/out (°C)</td>
<td>+23/+33</td>
<td>+55/+65</td>
</tr>
<tr>
<td>Cooling capacity (kW)</td>
<td>10,000</td>
<td>–</td>
</tr>
<tr>
<td>Heating capacity (kW)</td>
<td>–</td>
<td>8,323</td>
</tr>
<tr>
<td>Power absorbed (kW)</td>
<td>1,882</td>
<td>2,485</td>
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<tr>
<td>COP</td>
<td>5.31</td>
<td>3.35</td>
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</tbody>
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