

## HÖGBO BRUK PAY & SKI

Sandviken - Sweden

Artificial cross-country ski track

Total length 2 km

Hydronic System

**Year 2007**



Pay & Ski is located 180 km from Stockholm and is the world longest artificial cross-country ski track. It is two-kilometre long, all in the open air, and allows cross-country skiing on real snow even in summer.

### The challenge

Pay & Ski creators wanted to keep the snow consistency suitable for cross-country skiing all year round, regardless of snowfalls and external temperatures, that in summertime can exceed 20°C.

For this reason they immediately excluded traditional snow-making solutions based on snow generators.

Reliability was clearly a decisive constraint: accidental snow melting would cause the immediate closure of the track, with a long and expensive reopening.

They also required entry prices within the reach of a large number of sportsmen: therefore operation costs needed to be low.

Since the whole track would be in open air and in a valuable woodland, the environmental impact should be as low as possible, in harmony with a sport *ecological*/by nature.



Högbo Bruk Pay & Ski – Aerial view and track plan  
<http://www.sandviken.se>

### The size

- 2.090 metres long
- 3 metres large
- 10 metre difference in height

### The team

- Design and plant contractor Huurre Sweden AB
- Chiller supplier Skiab AB

### About cross-country skiing in Sweden

Known in Scandinavia since the earliest times to move on snow in an easier and faster way than on foot, in 1800 cross-country skiing officially became a sport. Today there are several solutions that allows sportsmen to practice even in summertime, from skiing on alternative surfaces such as grass and asphalt, to artificial tracks.

## The solution

Pay & Ski track is kept covered in snow even during the summer season by means of an hydronic cooling system laid underground.

Under the whole circuit there is a thick grid of plastic pipes with high resistance and thermal conductivity. This grid is laid with gravel and with an asphalt surface protection carefully levelled and afterwards covered with snow.

In order to keep the snow undamaged and with the right consistency, a stream of water at  $-10^{\circ}\text{C}$  temperature constantly passes through the pipes. To avoid freezing, the water has a glycol additive.

The solution of water and antifreeze is kept at the right operating temperature by four air cooled chillers placed along the track, 500 metres apart.

The chillers have double screw semi-hermetic compressors that offer maximum efficiency at full load operation. All units are soundproofed and equipped with evaporators expressly sized for applications with outlet water at low temperature, complete with increased thermal insulation to minimize dispersions.

The condensing section is complete with the Ecobreeze option, including high efficiency fans and brushless motors with electronic control.

## The results

For many amateurs and professionals Pay & Ski is today the best way to train before the winter season and before events such as the famous Vasaloppet, the 90-kilometre ski marathon that usually attracts over 10.000 participants.

The accommodation facilities arisen near the circuit are now among the most popular destinations for summer holidays and week-end trainings.

The use of chillers suited for this particular application and produced industrially speeded up the plant construction and has maintained the requested reliability during operation.

The high energy efficiency in this application has lead to a 20% reduction on energy consumption and therefore on direct  $\text{CO}_2$  emissions. Also the use of ecologic refrigerant R134a has helped in raising the environmental compatibility of the plant.

Finally, the noise reduction obtained thanks to the Ecobreeze solution allowed an excellent integration between the system and the surrounding natural environment.

*For further information on Clivet systems:*  
**[www.clivet.com](http://www.clivet.com)**

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*Högbo Bruk Pay & Ski - Placing of underground piping and installation of one of the four chillers. (Photos by ScanRef-Olle Dahlberg)*

### The System

- Four air cooled liquid chillers WDAT by Clivet, with double screw compressors and Ecobreeze device for consumption reduction, suited to water and glycol cooling down to  $-10^{\circ}\text{C}$
- More than 2.100 kW of overall cooling capacity
- 80 km of underground cooling piping

### About chillers with screw compressors

Chillers with semi-hermetic screw compressors offer the maximum efficiency in applications at full load or with a low stepping. They are typically used in large buildings and in several industrial applications. The delivered power control is continuous and, in models equipped with economiser circuit, the improvement of the thermodynamic circuit implies a further efficiency increase.