

Optimal energy management for flexible needs

Combining scalability with efficiency at Tjensvoll Sports & Exhibition Centre



Beautifully located right on the North Sea coast lies Stavanger, the third largest city in Norway and the “Capital of oil” in Northern Europe, as it is the base for North Sea oil production. Located right outside Stavanger is Tjensvoll, a large exhibition complex with several buildings dedicated to conferences, fairs, meetings and exhibitions. It has two hotels, sport halls, tennis halls, four ice hockey rinks and four curling halls. Every second year it hosts the ONS Offshore North Sea event, one of the largest exhibitions for oil and gas drilling in the world.

In 2010, an ambitious municipality decision was initiated, which included an expansion of the centre to cater for more, larger and more varied activities. For a scalable, yet efficient use of energy, one centralized energy plant was commissioned to cater for all the buildings and their varied activities, including district heating and cooling, as well as tap water for all buildings. Björn Sollie, a consultant with extensive experience in facility energy management, was entrusted by Stavanger municipality for the construction and technical set-up of the plant. At the delivery stage, Alfa Laval was chosen as the sole supplier for all the heat exchangers needed for the plant.

“Alfa Laval has an excellent reputation and long experience with refrigerants and gasket materials. With great quality and the efficiency of their products, they live up to set requirements with complete reliability.”

A complex business with different needs

The initial assignment was to build an energy central to cater for the whole area, including existing and upcoming buildings, and to use all excess heat generated from the cooling system as district heating i.e. use all energy. A complex establishment with different needs depending on the season. The challenge, according to Sollie, was to evaluate the energy consumption and construct the central accordingly. “Since there was very little technical data about consumption in the area and to meet the criteria of being as efficient and have as low consumption as possible, there was a risk of deviation between theory and practice”, he states.

Creating synergies and reuse of energy

The plant was developed using different units from Alfa Laval - a total of 20 heat exchangers, evaporators, condensers and U-turn liquid separators. "The reliability, combined with the fact that the products live up to their expectations, ensure that the outtake could be controlled and steered towards specific needs, providing different temperatures in the diverse buildings, yet using the same system to create incredible synergy", Sollie explains.

With the use of R717, in combination with flooded evaporators and efficient compressors, it is an investment delivering low energy consumption and the best optimized energy results. "The most important thing is that the energy costs are kept down. For a plant to operate for at least 30 years, high efficiency and reliability is crucial. Temperatures are rising and the season is prolonged. The only thing we can do is to have a more efficient solution. The aim is to use as little refrigerant as possible and keep the refrigerant charge at the minimum. Alfa Laval products live up to that. They also keep the guaranteed temperatures, with no exceptions in all weather, which is impressive", continues Sollie.

Saving energy, reliable performance and great potential

The aim of the central was to create an interleaving effect to balance the energy needs, while allowing the energy to be allocated on several properties, where Alfa Laval heat exchangers play an important role. Sollie says that the result has even been above all expectations, since more buildings than projected have been added to the energy central.

Many years of operation and utilization at the appliance sizing point, shows that the Alfa Laval solutions have delivered above what the required data guaranteed. The heat exchangers can work with a smaller approach than the design values, which means great savings. For every degree higher working temperature, the savings are 3-3,5% in energy use.

Construction of the plant

The plant is an on-site constructed multi-stage refrigeration plant, handling different heat loads depending on the season, developed by the Stavanger municipality. Each primary heat load is handled by a flooded evaporator/U-Turn liquid separator. Nine months per year, the main heat loads come from four ice rinks and four curling rinks. During spring and summer, the main heat load comes from the district cooling system of the exhibition premises. Cooling capacity at ice rinks are 1400 kW. During the summer period and other operating conditions, cooling capacity is 3500 kW.

Condenser energy is utilized in three ways:

1. Plant condenser energy is led to a central heat-pump for production of high temperature water.
2. Surplus condensing energy is stored in the ground as low temperature energy.
3. During winter season, stored energy is utilized as low temperature energy for the second compression stage.

A holistic solution for the future

"To be able to have a holistic approach on a complicated assignment and follow through to the end is of great value", states Sollie. Another valuable part of its success is service, and Alfa Laval provides a close and very good service and technical department. Cooperation with Alfa Laval will now continue further, since there are some plans to extend the area with more buildings and establishments. "There is more capacity in the system", concludes Sollie "and Alfa Laval is of course the perfect partner to continue this development."

MACHINE HALL

How to contact Alfa Laval

Up-to-date Alfa Laval contact details for all countries are always available on our website at www.alfalaval.com.

Alfa Laval reserves the right to change specifications without prior notification.

100002684-EN-2020

