



## Climate-smart cooling

Heat pumps that conserve energy in production processes

## Introduction

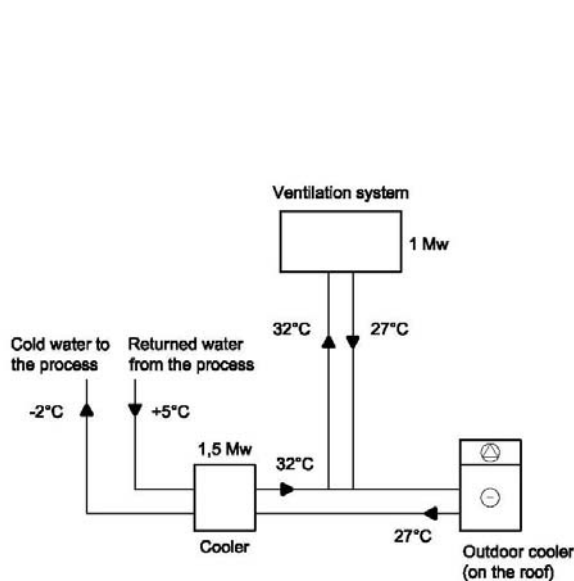
ACE Energi & Klimat in Kalmar have maintained the ventilation and plant cooling systems at Arlas cheese production plant in Kalmar, Sweden, since 1997. It was noticed that considerable savings could be made if the heat that was produced during the cooling process could be retained. This excess heat was cooled at roof level, thereby literally throwing money away. ACE suggested that the excess heat should be used to pre-heat the air for the ventilation of the working premises.

Not only do ARLA reduce their environmental load, they also save money, thanks to this arrangement.

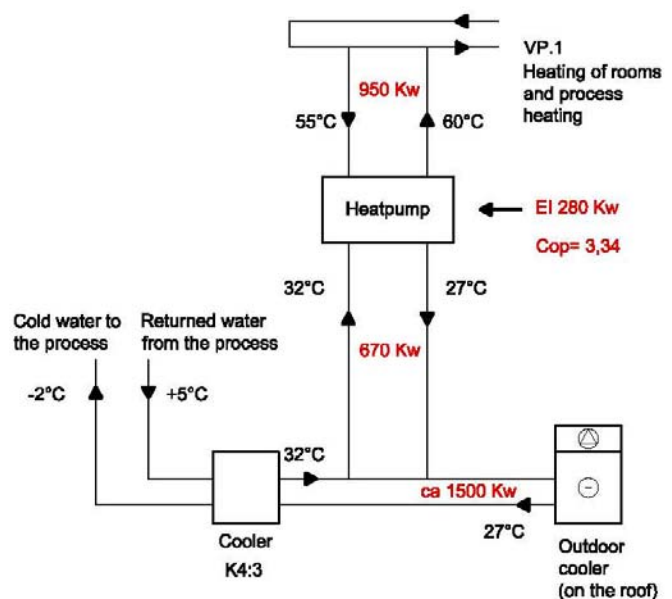
### The Process

ACE calculated the improvement that could be made and convinced Arlas management that this would be an economically viable investment. A heat recycling loop was installed in the existing cooling plant in 1999. The maximum savings that could be made with this solution at an external temperature of  $-18^{\circ}\text{C}$  was approximately 18,000 kWh per 24-hour day.

In 2004 the production of cheese was increased due to the closing of the dairy in Borgholm. Their cooling plant was moved to Kalmar. No further use for low temperature heating (water temperatures  $< 30^{\circ}\text{C}$ ) was required in Kalmar so that it was decided to "raise" the heat value so that it could be used in the production process instead. A heat pump, which can be regarded as a "reversed" refrigerator, was installed in 2007. The maximum thermal effect of this heat pump is approximately 950 kW.



A schematic showing the heat recycling loop



A schematic showing the heat pump loop

## Today

The heat recycling loop, starting with the first cooler, has saved 4.7 GWh in 6 years, which results in an annual saving of 780 MWh. At an energy price of 0.5 SEK/kWh this is a reduction in running costs of some 390,000 SEK per annum and a pay-off time of only 3 years on the entire investment. The installation has even contributed to the reduction in CO<sub>2</sub> emissions of 480 tonnes per annum!

The recently installed heat pump has now been running for more than a year. The first year resulted in a saving of some 2.4 GWh which reduced the running costs by about 1.2 MSEK. Furthermore the installation has even contributed to the reduction in CO<sub>2</sub> emissions by as much as 1,500 tonnes per annum!

These projects show that it is economically viable to invest in existing plants.



The outdoor coolers on the roof



A forest of ducts and pipes carrying water of different temperatures in the cooling plant

## Quote

"Sustainability is an expression that is often used to describe the long term responsibility of a company in matters such as the environment, social responsibility and ethics. In 2002 Arla published its environmental account for its operation in Sweden. Arla work for long term and wide ranging solutions as regards environmental issues. We are getting better at coping with matters such as refuse and cooling liquids, energy consumption and the recycling and sorting of materials. We are good at identifying the potential for improvement in our cheese making process and continuously strive to improve our production processes and use raw materials as efficiently as possible so as to minimize waste and thereby reduce energy consumption. Increasing production and reducing energy consumption are overriding goals, but we often speak of our relative energy consumption. By this we mean the amount of energy that is used in relation to the quantity of goods we produce. Arla's goal is to reduce energy consumption by five per cent over a five year period with the year 2005 as our reference year. The investments described here in the plant in Kalmar will make a considerable contribution. The personell at ACE Energi & Klimat thus helped us identify further savings in our cheese production."

*Göran Bengtsson Dairy Manager, Kalmar*

## Participating Companies

**Arla Food AB** produce milk based consumer food products and aim to become the leading dairy industry in Europe. The company is jointly owned by Danish and Swedish milk producers and has its head office in Denmark. Arla Foods have sales offices in 27 countries and production facilities in 12: Denmark, Sweden, UK, Finland, USA, Canada, Argentina, Brasil, Poland, Germany, Saudi Arabia and China. The company's dairy products are exported worldwide, many of them sold under well known brands. The Kalmar facility has 120 employees and produces hard cheese.

Research and innovation are of great importance to Arla Foods. The company strives to improve the added value of raw milk by optimizing production and developing new products, concepts and dairy processes.

When producing food and transporting goods it is impossible not to influence the environment. The aim of Arla Foods is to minimize effluent and continually improve environmental prestanda in the whole production process and as such contribute to ecologically sustainable development.

*Arla Foods AB, Kalmar Dairy is certified according to:* SS-EN ISO 9001:2000 QA  
SS-EN ISO 14001:2004 Environment  
SS-EN ISO 22000:2005 Safety of foods  
SS 627750 Energy conservation

Arla Foods AB

[www.arlafoods.se](http://www.arlafoods.se)

**ACE Energi & Klimat AB** supply, maintain and operate services systems and processes for buildings in an energy efficient and environmentally friendly manner. Environmental consideration is foremost in the operation of the company, externally and internally. All processes and system solutions provided by the company shall be in consideration of our environment and for the entire life cycle of the building.

ACE Energi & Klimat was founded in 1996 and has some 60 employees who offer a wide range of expertise in ventilation, heating and cooling systems, operative supervision, pump systems and operation and control systems in buildings and even on board ships. The company has an annual turnover of 95 million SEK and has offices in Kalmar, Karlskrona, Oskarshamn, Stockholm and Lund. We intend to expand further in the near future.

*ACE Energi & Klimat AB are certified according to:* SS-EN ISO 9001:2000.

ACE Energi & Klimat AB

[www.aceenergi.se](http://www.aceenergi.se)

## Fossil fuel free region

This information leaflet is part of a series of good examples of fossil fuel free initiatives and has been produced by the Regional Council in Kalmar County in co-operation with Kalmar Energi AB.

More information on nooil and fossil fuel free region may be found at [www.kalmar.regionforbund.se/nooil-eng](http://www.kalmar.regionforbund.se/nooil-eng)

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