ARLA OPTIMISED HEAT RECOVERY IN ITS PROCESSING PLANT AND GAINED LARGE SAVINGS

Arla Foods in Rødkærsbro, Jutland, analysed the dairy's pasteurisation processes and redesigned the facilities. This resulted in increased heat recovery, saving both cooling water and steam.

Rødkærsbro Dairy, Arla Foods

Production
Milk and dairy products

Initiative
Expansion of heat exchangers

Result
Energy savings of 2,578 MWh of natural gas and 901 MWh of electricity

Economy

2,578 MWh
Annual natural gas savings

1.4 M DKK
Annual savings

901 MWh
Annual electricity savings

1.4 years
Simple pay back period

The result

- Annual savings of approx. 2,600 MWh of natural gas and 900 MWh of electricity
- Annual financial savings of DKK 1.4 million (EUR 187,000)
- CO_2 emissions reduced by approx. 213 tonnes per year

How much did it cost?

Total capital investment was DKK 3.25 million (EUR 433,000). After energy subsidies, this results in a simple payback period of 1.4 years.

Why was the project carried out?

In recent years, Rødkærsbro Dairy has carried out comprehensive and systematic work to map its energy consumption and identify energy saving projects in all parts of factory processes and systems.

Among other things, the company has achieved good results by increasing existing heat recovery in the dairy's pasteurisation lines.

How was the project carried out?

The purpose of pasteurisation is to heat a product to a specified temperature, around 75°C, for a fixed duration of time, and then cool it down. This process extends the shelf life of the product without affecting quality.

The process uses energy, first to heat the product and then to cool it down. However, the process has the advantage that the energy used to cool the finished product can be reused to heat new milk entering the system. This is by designing the pasteurisation line in a number of regenerative zones which, together, ensure that the product is heated and cooled in a highly energy efficient way.

The amount of energy that can be reused depends partly on the size of the heat exchangers in the regenerative zones, but also on the volume of milk flowing through the pasteurisation line.

Expansion of heat exchangers yields considerable improvements

The regenerative efficiency can be ascertained by comparing the temperature difference at each end of the pasteurisation line. In the example in Figure 1, the product can be heated to 69°C at the hot end, and the temperature then has to be raised to 75°C by means of steam in order for the product to be pasteurised at the right temperature, i.e. a further temperature increase of 6°C. At the cold end, ice water is used to refrigerate the product from 22°C to 10°C, before it is sent to storage, i.e. a further temperature decrease of 12°C.

As the regenerative zones in pasteurisation lines are typically built up of plate heat exchangers, it is relatively easy to add more plates. This allows for increased heat recovery and reduces the need for external steam and cooling. Arla in Rødkærsbro opted for this solution.

After modifying the regenerative zones, the product is now heated to 72 °C before steam is used to increase the temperature by another three degrees. At the cold end, the finished product only has to be refrigerated from 16°C to 10°C, i.e. by 6°C against previously 12°C.

The result is that the dairy saves both natural gas for boilers and electricity for cooling systems.

What were the results of the project?

Prior to the modification, the five pasteurisation lines in Rødkærsbro used around 5,750 MWh of natural gas and 2,200 MWh of electricity for heating and cooling every year.

After the expansion of the heat exchangers in the regenerative zones, savings of around 2,600 MWh of natural gas and 900 MWh of electricity have been achieved, leading to total annual financial savings of DKK 1.4 million (approx. EUR 187,000).

When energy subsidies are taken into account, this results in a simple payback period of 1.4 years. Furthermore, the company's CO_2 emissions will be reduced by 213 tonnes per year as a result of the modification.

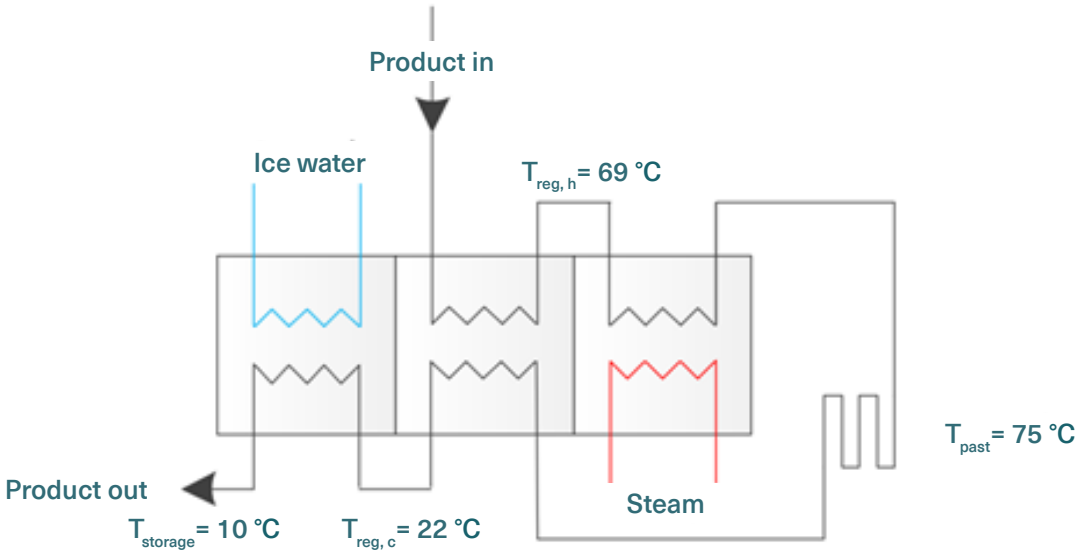

Figure 1: Pasteurisation temperature prior to modification

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