

# Search for the core

## – a key to energy savings

Viegand & Maagøe delivers new models for energy savings in the dairy industry with concrete results from two Danish cheese plants.

By Fabian Bühler and Brian Elmegaard, Department of Mechanical Engineering, Technical University of Denmark  
 Peter Kristensen, Energy consultant and Fridolin Müller Holm, Head of industry, Viegand Maagøe A/S

Most dairies worldwide are constructed with steam boilers and steam distribution as the main or only heat utility. Without a waterborne system it can be difficult to exploit excess heat in the process or utilisation of excess heat lead to minor local solutions in the plant. Water-based energy distribution systems further allow the integration of heat pumps. This article outlines an approach to optimisation of the utility system and recovering of excess heat that can provide significant savings in the dairy industry. It further presents the THERMCYC research project, which aims at making low temperature heat utilisation more efficient in the industry.

### Why? Challenge the present setup

It is important to obtain a complete overview of all the energy using processes as well as the energy supply of

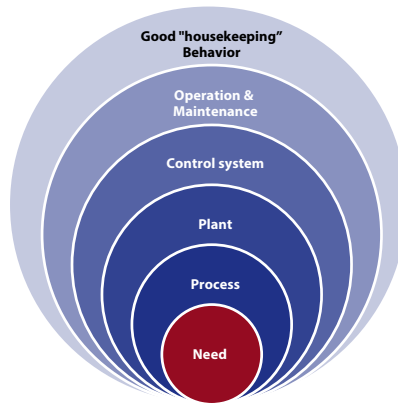


Figure 1. The onion diagram, energy savings by by work out from the actual need for processing the product.

the dairy before any decisions can be taken. A thorough energy mapping is required.

An analysis of the actual need for temperature of the product at each step in the process is the first step to be taken. It is important not to focus on present

equipment but the product to avoid that high temperature requirements from old equipment will blur the results of the analysis.

In the next step the actual temperature demands will be combined with the energy consumptions for all heating and cooling purpose. Figure 2 exemplifies an overview of the temperature needs and associated energy consumptions in a cheese factory. It can be seen that there is no cooling below 4°C and that 95% of the heating is below 90°C.

### Process integration and optimising

It must be ensured that the present operation is working as energy efficient as possible before looking at the utility systems. It may be necessary to adjust process parameters or change some equipment design.

With cooling and heating in the same temperature range the potential for



Supply circuit at 90°C – a Viegand Maagøe A/S solution.

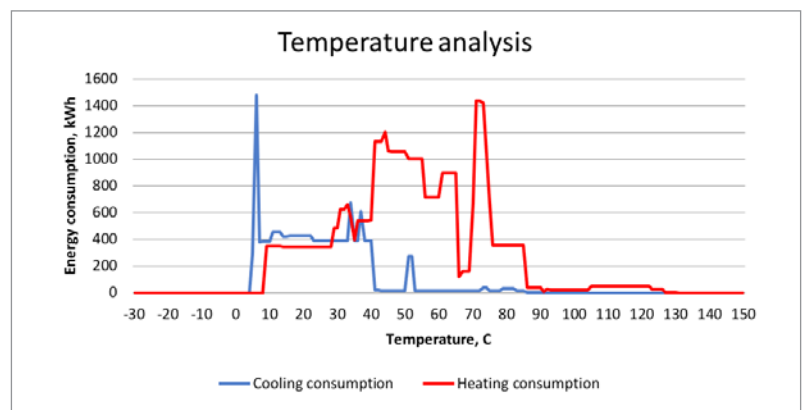


Figure 2. Temperature analysis in a cheese fabrication plant.

### THERMCYS partners

Aalborg University  
Danish Technological Institute  
TUDelft  
Technical University of Denmark  
Maersk  
Alfa Laval  
MAN  
Danfoss  
Arla Foods  
Viegand Maagøe

further internal process integration must be examined. Often a new water circuit will be needed between the two processes.

Once these measures have been completed, an update of the temperature analysis is necessary as the graph in Figure 2 has changed.

### Current research and outlook

By providing the energy closer to the actual required process temperatures,

### Two cheese plants optimising the energy supply

Viegand Maagøe has successfully generated substantial energy savings by introducing new temperature levels. Two specific cases illustrate two different ways to do it.

#### Dairy 1

The dairy produces and packs cheeses. The plant was until 2018 only supplied with steam for heating purpose. By introducing a 90°C system it is possible to utilise excess heat from a CHP-plant fuelled by biogas. First established the 90°C system can act as a catalyst for further utilisation of excess heat.

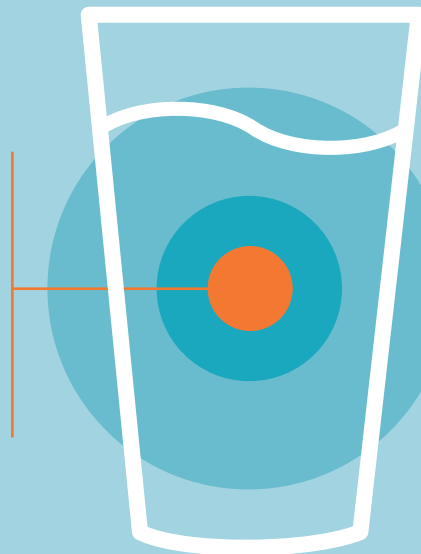
#### Dairy 2

The dairy produces and packs cheeses. The plant is supplied with icewater and 105°C hot water. A project is ongoing to utilise excess heat from the cooling compressors. The excess heat from the condensers is at the temperature range 25-30°C. With a heat pump installation, it is possible to raise the return temperature in the hot water circuit to the boiler house and providing cooling for the condensers.

the performance of heat pumps can be increased, and with a lower price ratio between electricity and natural gas new favourable business cases arise. The Danish research project THERMCYC investigates possibilities to increase the

performance of heat pumps and expands the use into new process applications.

***By looking into the core of the process, we can provide significant savings.***



viegand  
maagøe  
energy people

Energy saving in the dairy industry · [www.viegandmaagoe.dk](http://www.viegandmaagoe.dk)