

## Cheese production

# Process control in the fast lane

*Rapid and continuous adjustments to the flow of milk entering production lead to huge process efficiency savings for forward-looking Arla cheese production facility.*

As any fan of the Le Mans 24 hour motor race will tell you, medals are not won on speed alone, but by finding exactly the right line around the track and sticking to it, by optimising fuel, minimising mechanical wear, choosing the right tyres and countless other details that lead to optimal performance. The same principle can be applied to process control.

Seemingly small adjustments made on a regular basis make a big difference over time – that is certainly the experience at the Arla facility in Kalmar, South east Sweden, where around 17,000 tonnes of premium quality cheese are produced each year.

Product engineer, Gert Ekelund says: “It used to be all about quantity. Now it is all about optimising the process to make it better – better cheese with lower cost.”

### Minimising economic and environmental cost

Gert explains how the cost angle is particularly relevant because making cheese in Sweden can be an expensive process. Barns are needed for cows during the long winter and feed and fodder levels are high. At the same time, dairy farms in Sweden are quite small (on average around 50 cows), but transport distances are relatively big.

Competition from imported cheese is close, but any short cuts to cheaper production must be carefully implemented. In Arla’s annual report 2008, the company states a goal of at least a 25 per cent reduction in emissions from transport, production and packaging by 2020, compared to 2005.

In such a competitive and demanding business it pays to make optimal use of milk, both in terms of the environmental resources put into it and the need to give consumers a good product to an acceptable price.

A system for monitoring and controlling the flow of milk used during cheese production is helping the plant to do just that, in fact, with substantial reductions in the cost of raw materials.

### Steering by target weight

The system called ProceScan™ FT from FOSS, automatically measures the protein, fat and lactose of all the milk entering the cheese vats and regulates the flow referring, on the one hand, to the constantly changing nature of the milk and on the other, the pre-programmed recipes. Ten recipes with different fat/protein/lactose ratios are controlled, for example 3% fat, 3.2 – 3.7% protein and 4.7 – 4.9% lactose. And just enough milk is used to meet the target production for each one – no more, no less.

Before the system, measurements were made in the laboratory. For the 60,000 litres used for each production batch, maybe three measurements would be made. With the ProceScan system, a measurement is made about every two minutes or around 120 measurements for each batch. This wealth of information allows the system to fine tune itself, just like the racing driver keeping the wheels right on track. But rather than heading for a checkered flag, the goal of the dairy

is to produce a perfect cheese each time with exactly the right size and weight.

To help us understand the principle, Gert draws a diagram of a typical process showing how the curd coming from the vats is pressed and sliced into blocks. At the Kalmar plant, the curd press has a maximum capacity of 144 cheese blocks. “We can squeeze the curd, but not enlarge it,” says Gert. The goal is to hit maximum capacity each time. The individual cheeses will then have the right size and weight for consumer packaging in pieces weighing 667 grams. In short, if you can get the big cheese right and you can get the smaller slices right with only minimal leftover cuts.



*All the same: standardization equals an effective process*



*Cheeses produced at the Kalmar plant include the popular 'Herrgård' that is matured for up to 24 months*

### Standardization for cost effective cheese

Before the system, there were more batches that fell outside the target weight of a maximum 2.5 % variation. Now the percentage of cheeses within the target has improved by 10%. This has led to savings throughout the system – a standard cheese with a standard weight flows through the process smoothly reducing costs along the way.

“There are a lot of factors involved,” says Gert referring to the many steps in the process that benefit from a standard cheese with a standard weight. For instance, when pressing cheese, when salting, when getting the right rind for waxing and packing the finished cheese.

In addition to the fat and protein parameters, Lactose is valuable. If there is too much it affects the acidity and therefore the use of process water. In turn, this affects the pH level crucial for taste and consistency. “By providing reference points the system helps you to figure out a lot of other things in the whole process,” says Gert.

### The setup

The main measurement unit is a cabinet about the size of a drinks vending machine, but with a robust stainless steel exterior that blends into the production environment. The system also includes a FOSS software system called ProcessTouch™. This interprets the continuous flow of results and automatically controls the milk flow accordingly. The ProcessTouch system has been integrated

into plant's own software system allowing Gert and others to keep an eye on everything.

A system like this does not install itself and the installation has required support from the dedicated Process team at FOSS. Gert also highlights the need for regular preventative maintenance. The system basically looks after itself and only needs monitoring to check that the process is working as it should do. But when the running of valuable production is handed over to a machine it is also important to keep it running perfectly to avoid any downtime in the process.

### More cheese from the same milk

While the benefits in terms of more consistent products are clear, it is still obvious to ask if installing such a system is it worth the time and investment. Here, the facts and figures about improved production at the plant also speak for themselves.

Since the ProceScan system was installed, raw material costs have been reduced by 30 öre per kilo, or SKK 5.1 million per year (approx €458,000.00). Gert points out that this does not come from the system alone, but the wealth of measurement data makes a huge difference in controlling the cheese production more closely. Instead of maybe one measurement every two hours, the system measures at least every two minutes. “The FOSS system is contributing and absolutely necessary,” he concludes.

Plant manager, Göran Bengtsson, agrees. “The processes can be adjusted to the optimum – the right fat content and water content,” he says. “If we can decrease the variations and go closer to the limits we can get more cheese from the same milk, and this is what we are doing now.”

*by Richard Mills (rim@foss.dk), FOSS*

### ProceScan™ FT

ProceScan™ FT is an on-line analyser providing high accuracy data for standardisation of milk and valuable liquid dairy products. It determines the content of fat, protein, lactose, solid and other components for process control.

The ProceScan FT uses a Fourier Transform InfraRed (FTIR) interferometer that scans the full infrared spectrum and it offers transferable calibrations. The design enables stable operation even in harsh environments with vibrations and temperature fluctuations. It is possible to CIP clean the unit together with CIP cleaning of the process.

By linking the ProceScan FT to the FOSS ProcessTouch™ software, the dairy gets a complete set-up for milk standardisation – a total solution that optimises both production economy and product quality for cheese, milk powder, liquid/UHT milk, WPC, condensed milk etc. ProcessTouch analyses the signals from the ProceScan FT unit and, according to the results, advanced algorithms optimise the component levels in the product by controlling regulating valves or dosing pumps.



## FOSS

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