

in focus

The FOSS Group journal of technology for food, dairy and agricultural analyses

Vol. 30, No 3, 2006

Dairy manufacturing with the lights off

FOSS Wine Conference:
New tools for new tasks

How to run a million samples!



Fifty Plus

Copenhagen Opera House, June 3rd, 2006. Shoes are polished and ties are straightened as guests arrive for an event marking the high point of this year's fiftieth anniversary celebrations.

Numerous other events have also helped us to celebrate the jubilee year; events such as the customer conferences that have cemented new and existing business relations around the world. And it is not over yet, for instance, there is still a chance to win an adventure trip to Greenland through our FOSS 50 competition and newsletter.

So why not continue with a 51st anniversary celebration? Please don't worry. For one thing, as someone who has recently turned fifty, I know that 'fifty one' doesn't quite have the same ring to it. I know that as the fifty year milestone slips by, it is time to think ahead – time to get on with business and focus more than ever on the future.

I think a good clue to how that future will look can already be found in the articles in this edition of 'in focus'. Analysis in the production process is enabling a vision of fully-automated dairy plants that work perfectly on their own. Effective wet chemistry analysis is allowing thousands of trouble-free analysis operations. And through networked near infrared analysis, millions of valuable results are being collected in a powerful database.

These and other stories reveal how analysis is becoming a part of the fabric of business today. And I am convinced the trend will continue to grow. As we have heard at many of the anniversary conferences this year, analysis has a crucial role to play in addressing major issues such as quality, food safety and processing economy.

FOSS will continue to play its part in helping to meet industry challenges as we embark on a new half century of analysis innovation. We may have put away the champagne glasses, but I believe we are well on the way to the next major celebration.

Yours sincerely,

Peter Foss,
President, FOSS A/S

In Focus

"In Focus" is the FOSS Groups' journal of instrumental and analytical techniques, produced for people concerned with nutritional analysis, quality control and research in the food and dairy, agricultural and related areas.

"In Focus" is circulated free of charge upon receipt of written application. Please subscribe via www.foss.dk/infocus and you will automatically be included in our circulation.

Publisher:

Ola Johansson, FOSS,
e-mail OJN@foss.dk

Editorial Staff:

Editor-in-chief:

Elsa Claesson Lundin (ELN@foss.dk)

Main editorial contributor:

Richard Mills (RIM@foss.dk)

Designer/Co-editor:

Åsa Österberg (AOG@foss.dk)

Address:

FOSS Analytical AB
PO Box 70
SE-263 21 Höganäs
Sweden

E-mail info@foss.dk

Printed in Sweden:

CA Andersson, Malmö
Copyright 2006 by FOSS Analytical.
All rights reserved.

*Front picture: Fonterra site.
Courtesy of Fonterra, New Zealand*



Contents:



What NIR promises 4

Why is it that NIR analysis of foodstuffs and agricultural products, at the point when they enter or leave an industrial process, holds so much promise for the future?

FOSS Wine Conference: New tools for new tasks 6

More than 100 000 samples with Kjeltec™ 2300 8

How to run a million samples 9



The MeatMaster™ effect 10

Dairy manufacturing with the lights off 12

Fonterra stays a step ahead of global dynamics in the dairy industry.

Determination of total nitrogen content in fresh rice leaves using visible and near infrared spectroscopy 14

Automatic data transfer with MicroFoss™ Connectivity 16



Feed analysis founded on Fibertec™ 17

XDS Process Analytics™ at TINE dairy, Tolga 18

News & Events 20



Richard Clatworthy, Technical and Group Sales Manager at St Merryn Food Group, describes how the MeatMaster™ is reducing raw material costs and freeing up production capacity. See page 10

FOSS celebrated its golden jubilee year with a conference devoted to grain and feed, held in Bologna, Italy on 30-31 March. Among the major food and agriculture groups represented was Provimi, which operates a substantial machine park. The company's network of analytical instruments makes for excellent visibility and overview of its operations.

What **NIR** promises

Why is it that NIR analysis of foodstuffs and agricultural products holds so much promise for the future? It's because commercial transactions will increasingly be objectively based, in a world that will be becoming smaller and smaller, said Torben Ladegaard, Managing Director of FOSS. Seen in this context, anything that enhances the accuracy and transparency of analysis helps to optimize costs and margins. Or, to put it another way, "Our targets are the same as yours – reliability and accuracy." In support of his case, Torben Ladegaard recalls how, at the turn of the century, FOSS made the strategic decision that all new instrument designs must apply full transferability. This means that the same calibration algorithms can be used between instruments and in many cases, even across NIR instrument families. With this approach, customer costs for developing and maintaining calibrations are dramatically reduced, especially in a multi-instrument environment. "It was a decision that added substantially to our R&D and manufacturing costs, but it was one that was made with our customers in mind," says Mr Ladegaard. FOSS invests more than EUR 20 million a year in the development of new products. Nearly half of this amount is allocated to development of software and chemometrics.

And the results? "85 per cent of the world's dairy production, 80 per cent of grain traded and 75 per cent of beer brewed are tested using analytical solutions provided by FOSS." For example, Italian pasta manufacturer Barilla uses FOSS NIR analyzers to check its stocks of durum wheat, in its mills, in its factories, for checking finished products and even as an aid to the cereal selectors forming part of its network. In fact, NIR analysis

is right there at the crossroads where the agronomical, commercial and technological qualities of its ingredients meet, and at every stage in their transformation, said Roberto Ranieri, Barilla's R&D Manager with responsibility for raw materials. Similarly, Paul Gerardy, Director of Provimi's Research and Technical Centre, described NIR as the common denominator of all those services that go to make up feed for animals: purchasing, sampling, laboratory testing, quality control, formulating, production, sales and marketing, even management.

Provimi: a case in point

As at March 2006 Provimi's network comprised 92 NIR analyzers. 31 of these were installed at the Group's own sites, and 61 were installed at sites belonging to its customers, spread over all five continents. This impressive machine park has been growing at the rate of two units a month over the past two-and-a-half years. The network relies on 18 laboratories, each of which uses the same equipment; on centralized treatment of spectral data and corresponding chemical analyses; and on all its members using the same calibrations. Between September 1998 and July 2005, Provimi's NIR network was thus able to carry out 180 000 analyses of 43 000 raw material samples and 120 000 analyses of 26 000 feed samples, making a total of 300 000 analyses. As a result, today the Group has at its disposal 43 calibrations for raw materials, 9 calibrations for complete feeds and 2 calibrations for fodder. As if Provimi's investment on its own were not convincing enough, Paul Gerardy went on to expand on the advantages of NIR technology in terms of optimizing purchases of raw materials and minimizing



Torben Ladegaard, Managing Director, FOSS: "Our targets are the same as yours. Reliability. Accuracy. Simplicity. Speed."

the manufacturing costs of animal feeds. What is more, NIR's speed – it takes only 1-2 min to carry out an analysis – makes it possible to obtain the required information as to humidity and protein, fat, fibre, ash or starch content even before a truck has discharged its load. There are many other advantages to the technology, he added; one being that NIR makes it possible to produce objective reasons for refusing to accept a load or requiring defects to be made good when specifications have not been met. Finally, NIR makes it possible to drastically reduce the number of chemical analyses to be carried out: as a general rule, 95 per cent of samples can be analyzed using infrared techniques. According to Paul Gerardy, this is worth between EUR 0,20 and EUR 0,25 per tonne of feed per year; and explains why he has recommended that all plants producing more than 50 000 tonnes of animal feed a year should install NIR equipment. Using NIR analyzers also helps to optimize feed formulation. Where NIR is not



Provimi's Paul Gerardy recommends that all plants producing more than 50 000 tonnes of animal feed a year should install NIR equipment.

used, the finished feed is produced before the raw materials can be analyzed. In this situation, any defects will be identified by quality controls at the end of the production process – but only after the event. Whereas, with NIR, ongoing adjustments can be made to the decision process and the raw materials matrix with the result that, if a raw material proves to be richer than expected in one element or another, it's possible to limit the volume to be included. Or, as Paul Gerardy put it, "precision monitoring of raw materials makes it

possible to obtain averages that are closer to reality."

NIR worth EUR 2-5 per tonne of feed

By way of an example, Paul Gerardy took the case of a customer with two 300 t silos of Soya 44. Depending on whether the actual protein content of soya supplied was looked at on an annual basis, a monthly basis or by 300 t batch, savings made during formulating were EUR 1,7, EUR 2,05 or EUR 2,42 per tonne of soya respectively, or EUR 0,34, EUR 0,41 or EUR 0,48 per tonne of feed. And the same considerations applied in terms of livestock performance. If poultry are fed soya with a 46 per cent protein content rather than 45 per cent, this results in a loss of unenriched amino-acids equivalent to EUR 12 per tonne of soya or EUR 2,4 per tonne of feed. Correction of protein content month by month would result in savings of EUR 1,68 per tonne of soya or EUR 0,34 per tonne of feed; while correction batch by batch would increase those savings to EUR 2,34 per tonne of soya or EUR 0,47 per tonne of feed. If savings made possible during formulating and at the zootechnological level were also taken into account, the figures in question would be very substantial – EUR 3,73 per tonne of soya or

EUR 0,75 per tonne of feed on a month-by-month basis; or as much as EUR 4,76 per tonne of soya or EUR 0,95 per tonne of feed on a batch-by-batch basis. By applying the same argument to all the raw materials included in a feed formula and to all the services in a factory, proper use of NIR would, in his opinion, be worth "somewhere around EUR 2-5 per tonne of feed per year".

The Provimi Group

Provimi was founded in 1927, as a trading company for farmers in The Netherlands. In the 1930s it started to market an animal feed product of the same name, an acronym for PROteins, VItamins and MInerals.

The Group has become increasingly international, and today has over 100 plants in 30 countries worldwide. It has almost 9 000 employees, of whom over 600 are scientists. It has been a pioneer in the feed business in Eastern Europe, and today is a world leader in animal nutrition solutions.

Shares in Provimi are quoted on the Paris Stock Exchange.

More information about Provimi can be found at: www.provimi.com

Mycotoxins: Knocking NIR out of court?

When it comes to detecting mycotoxins in cereals, at the present time it doesn't look as though NIR is a useful tool in determining content in host organisms. This is what they've been saying in professional circles for some time, and it has now been officially confirmed following the session on mycotoxins organized by Arvalis (France's Technical Institute for Cereals and Forage) in Paris on 4 April 2006. The trials carried out in partnership with ONIC (The National Interprofessional Office for Cereals) on more than 300 samples of soft wheat, harvested during 2002, 2003 and 2004 and contaminated with DON at levels of 10 to 4 500 ppb, have shown errors in prediction of between 800 ppb and 950 ppb depending on the instruments used. This is a level of


error that's incompatible with the regulatory threshold imposed by the EU with effect from 1 July 2006, which is 1 250 ppb in foodstuffs for human consumption.

A second validation project has been begun, looking at the 2005 harvest (with only very low DON contamination overall). But here, too, the results are reported to have proved unsatisfactory. In fact, host organisms in this project have shown up to 100 per cent incorrect positive results. Arvalis itself has analyzed about 90 samples assumed to have an average level of 1 250 ppb. Results showed 43-70 per cent as correctly classified according to the instrument used, but 37-57 per cent were incorrect negative results and 20-56 per cent were incorrect positives. Conse-

quently ONIC has decided not to adopt these calibrations for 2006, says Arvalis' Brigitte Mahaut.

All the same, research into the use of NIR in the detection of mycotoxins has not been completely broken off. In fact, even if NIR doesn't look particularly suitable for detecting low level contaminations or those that approach the norm, this doesn't mean that the technology won't produce better results in the case of heavily contaminated batches, at least where initial analysis is concerned. An extension of the basis of heavily contaminated batches is called for while, on the other hand, new mathematical models are to be tested.

by Benoît Contour, Contributing writer



**FOSS wine conference
June 15th, Barcelona, Spain**

New tools for new tasks



The FOSS jubilee wine conference covered trends in consumption, the political agenda in Europe and the use of new technology in the winemaking process. Specific subjects, including payment analysis, process control, quality improvement and analysis of Ochratoxin proved highly topical for an industry in a state of radical change.

Declining demand and new reforms

Mr Brian Howard, Business Development Director at Wine Intelligence, UK, referred to intelligence gathered around the world to paint a general picture of declining demand in all producing countries, except for the USA. Over production will get worse. “The lake will become an ocean,” he said.

Consumer ‘involvement’ is the key to survival and profit. “Involvement can drive prices up by twenty percent,” he says, referring to marketing success stories from Australia in particular. Large

retailers controlling up to sixty percent of the consumer trade have awesome power in deciding what’s hot in wine and what’s not.

Branding and consumer perception is crucial. For instance, in a survey performed by Wine Intelligence about UK consumer preferences, forty percent with a taste for Rioja say that they do not drink Spanish wine. Mr Howard stressed the need to make more use of marketing. “Consumers need a sense of place – what is unique about a wine,” he says.

Mr Rafael De Michelena Saval, Member of the EU Permanent Group of Consultative Committee in Wines, Spain also highlighted over production. Referring to surplus in European annual production, he said: “Thirty to forty million hectolitres do not have a destination. That is a problem.”

Mr Saval described the aims of forthcoming EU reforms. These are to increase the competitiveness of the EU’s wine producers, to strengthen the reputation

of EU quality wine and to recover old markets and win new ones in the EU and worldwide. Mr Saval said: “We need to keep our unique traditions, but improve competitiveness, adapting to the taste of consumers.”

Technology can play an important part in the future of a more competitive European wine industry, for instance in payment analysis and ensuring quality at a predetermined price decided by consumer demands. “New technologies allow us to meet new demands by being more agile,” said Mr Saval.

More information about the proposed EU wine reform can be found here: http://ec.europa.eu/agriculture/capreform/wine/index_en.htm

Quality in an age of change

Managing Director of FOSS, Mr Torben Ladegaard explained that FOSS is constantly looking ahead to demands in five or six years time and will build on the analysis technology already in use. Mr

Ladegaard said: "In Denmark we have a saying. 'When you are facing a storm, you can either build a windmill or dig a hole.' This is the time to build a windmill."

Mr Ladegaard explained that many challenges are similar to those of other areas such as the dairy industry where innovation in analysis has proven a key to improved quality throughout the supply chain. For instance, reliable payment analysis for milk has allowed payment based not just on quantity, but quality. The same can be true for the wine industry.

Representing the 'new world' perspective, Mr Eric Wilkes, Group Chemist at Fosters Wine Estates, Australia, described the modern reality of wine production on a grand scale. In Australia, eighty five percent of wine is made by ten companies. Fosters Wine Estates includes twenty four wineries, seven packaging units, 15,800 hectares of vineyards and produces around 350 million litres of wine a year.

Production on such a scale demands well controlled processes to ensure quality. "We have to let the engineers and scientists into the winery," says Mr Wilkes. FTIR testing is a valuable tool for ensuring both quality and the efficiency of the production process. "Planning ahead gives us an incredible economic advantage," he says.

Mr Wilkes draws special attention to the advantages of FTIR analysis when it is effectively combined with other disciplines. For instance, analysis results combined with satellite imaging are used to create a 'picking plan' defining which areas of a vineyard are to be picked, when. Another example is the use of FTIR analysis for fermentation control. Dynamic feedback allows real-time control of ferment conditions. This allows ferment conditions to be adjusted to tailor a product to a style with more control. "For the first time, I feel we can properly control fermentation," says Mr Wilkes.

Payment for quality and not just quantity

Professor Ulrich Fischer, from DLR Rheinpfalz – Department of Viticulture and Enology, described how a new payment model based on analysis with the FOSS GrapeScan instrument is helping to secure quality from the moment grapes are received.

"Overall, the aim is to steer the process from a market or consumer perspective," says Professor Fischer. The system

does this by providing reliable objective measurements for maturity and sanitary state of grapes. This ensures fair payment for the grower, effective segregation of grapes and the use of suitable grape processing and fermentation regimes for an optimised winemaking process. Now the focus is on quality and not just quantity as it was in the past.

A robust calibration has been essential. The initial calibration provided by FOSS has been adapted to regional conditions based on measurements made by five wine research stations from 1999 - 2004. The value of the new payment method has been demonstrated to producers by comparison of good and bad finished wines with the initial payment analysis results. "The grower has to understand how quality at reception will affect the later wine quality," says Professor Fischer.

Can FTIR be used to measure Ochratoxin?

Mr Matthieu Dubernet, Director of Dubernet wine laboratories, France, presented his research into the possibility of using FTIR analysis to measure levels of Ochratoxin A (OTA). Existing analysis methods are costly and are considered to have an accuracy of just fifty per cent.

Although it is not possible to measure actual levels of OTA with FTIR, it is possible to measure the metabolite activity of the *Aspergillus carbonarius* fungus responsible for OTA in grapes. The activity can be correlated to levels of Gluconic and Citric acid. "The aim is to target wines at risk," says Mr Dubernet.

The method is in its infancy and is based only on work in a limited geographical region. However, the method could prove important as mycotoxin management becomes an essential challenge for the food industry.

Differentiation the key to success for smaller producers

Mr Manuel García Ortega, General Manager, Bodegas Ollauri Rioja highlighted the need to stand out in a competitive market. "In the past we didn't sell, customers bought," he says. "Now we sell what we can, where we can at what price we can get."

Technology in harmony with tradition is central to his strategy of creating quality wine. The newly completed winery at Ollauri is witness to this approach. Eighty percent of the facility is built into the side



of a mountain. This works on a conveyor system. It helps to treat material in an exclusive way, for example, by ensuring a very even temperature range. FTIR analysis and other technologies are used at key points in the process.

"We have experience and knowledge. Let's improve to compete against new world wines," says Mr Ortega.

The way ahead

FOSS President, Peter Foss, summed-up the conference by highlighted the importance of the useful interchange of ideas and the use of new technology.

Emphasising the FOSS commitment to the industry, Mr Foss foresees local calibrations becoming more regional or even global. This could provide the basis for networked instruments as successfully employed in the grain industry for example. Payment systems will improve quality and predictable quality will allow producers to hit target markets more accurately. More parameters such as colour will become options for routine analysis.

"The right tools in the hands of capable decision makers can make a huge difference," he said.

by Richard Mills, FOSS

Egypt:

More than 100 000 samples with Kjeltec™ 2300 in only four years



Tarek Soliman with two of CLFF's Kjeltec™ 2300s

The Central Laboratory for Food and Feed in Cairo (CLFF) is the highest inspection body in Egypt. It is located in the Agricultural Research Institute in Cairo. The protein analysis laboratory is one of the departments of CLFF.

When CLFF began life in 1980 there was only a small, one-room lab for analyzing protein for feed producers, and the sample rate was 500-600 a year. The lab gradually expanded, taking responsibility for analysis of fat, fibre, moisture and so on.

As the number of samples for analysis began to increase, it was decided to increase the number of employees so that results could be produced on time. As analysis was being carried out manually,

the lab began to face real problems, and in 1990 it purchased its first Kjeltec™ 1002. However, the number of samples now coming in for analysis began to increase dramatically, it was decided to purchase more equipment to deal with the problem, and in 1992 the lab acquired its first Kjeltec 1030.

When the number of samples increased to 200 a day Engineer Tarek Soliman, Head of the Protein Lab, decided that even more equipment was called for.

In August 2000 CLFF installed new technology from FOSS in the form of a Kjeltec 2300. This investment was made because the 2300 is fast, accurate and safe to use.

Workload continued to grow, and in

February 2002 CLFF decided to acquire a further three Kjeltec 2300s, to replace its earlier equipment.

CLFF's customers are grain importers and feed manufacturers based in Egypt. The lab's function is to inspect imported ingredient specifications parallel to inspection of end products. The latter need to be released from production onto the market very rapidly.

CLFF has found that the Kjeltec 2300 is ideal for this purpose thanks to its speed, accuracy and operator-friendliness. And there are no problems when it comes to CLFF fulfilling the requirements for its ISO/IEC 17025 approval.

The instruments are easy to maintain, and the operators feel happy with the results they produce. Customers, too, are happy as they get their analysis results very quickly, enabling rapid product release.

Due to the high number of samples to be analyzed, the lab sometimes needs to work overtime to guarantee fast results. The Kjeltec 2300s have demonstrated that they can work for 14 hours a day without any problems arising.

The counter on CLFF's first Kjeltec 2300 shows that it has analyzed more than 40 000 samples, and the other three have so far analyzed more than 70 000 samples between them. In other words, CLFF's Kjeltec 2300s have analyzed more than 110 000 samples in the course of only four years, and with very little need for maintenance; statistics that say a lot in terms of long life and heavy duty.

by Dr Mohamed Atta, Clinilab Egypt

Central Laboratory for Food and Feed

The Central Laboratory for Food and Feed, established in 1980 on an experimental basis, was initiated by Dr Akila Hamza and with the keen support of Professor Youssef Wally, Egypt's Minister for Agriculture at the time.

A qualified agricultural engineer, Dr Hamza took her Ph D in Denmark at the Danish Laboratory for Protein Chemistry.

When CLFF was established, the Danish Laboratory assisted with equipment and expertise and IFU, Denmark's Industrialization Fund for Developing Countries, participated financially by putting up DKK 2,1 million in share capital. Today CLFF has not only achieved its goal of 'national sustainability', it has also achieved financial sustainability.

"We are proud to have co-financed CLFF during the start-up and expansion period and are very pleased at its further development since we left," says Sven Riskær, IFU's Managing Director.

Today CLFF has some 400 employees.

www.clff.net

A wealth of measurement data from networked analytical instruments is improving decision-making in pet food manufacture

How to run a million samples

In September 2003, U.S. Pet food suppliers, Doane Pet Care set up a network linking near infrared (NIR) instruments in twenty plants across the USA. In February this year, the company ran its one millionth sample through the system at the Birmingham, Alabama plant.

'In focus' published a description of the network in Vol. 1, 2005. We caught up with Doane Pet Care Ingredients Manager, Scott Witt for an update on how the system is working and the effect it is having on daily operations.

The essence of the system is to capture measurement data from all the plants. This data is then captured in a central database where it provides a valuable pool of information for operational management. The network is also highly effective for the maintenance of instruments located across a broad geographical range. Individual instruments can be monitored and calibration updates can be made from a central location.

Today, there is very little that doesn't get tested at some point in the Doane Pet Care network. Scott Witt says: "All the plants are linked. Ninety-five percent of tonnage received is screened through an NIR instrument and almost every ingredient has data entered in the NIR database." In addition, the system has just been expanded to include all the wet chemistry results to give a complete overview based on all analytical methods and analysis locations. "The lab piece on its own has been huge," says Scott.

A stable, expandable network

The network is running well. "As long as temperature and humidity are reasonably stable we don't see any problems," says Scott. A number of routine programs have been put in place that keep everything on track, for example, there is a lamp change schedule for the FOSS NIR analysers that

ensures lamps are changed ahead of the expected lifetime.

Adding new instruments to the network is not a problem. At one of the plants, queues started building up at the NIR analyser. It was simple to put a new instrument in to spread the load. "It takes about a day to add an instrument," says Scott.

Management on the front foot

Overall, the network is allowing an informed response to issues based on current information rather than working on patchy retrospective data.

Scott describes how any one of the million samples can be found as long as he has a sample ID. This level of information is providing a solid base for discussions "We have no where near the push-back from suppliers we used to have," says Scott.

Most importantly, the system is being used on a daily basis to help with decision making. For instance, if a raw material delivery arrives with unusually high or low protein content, it is simple to look-up similar samples from historical results in the database. This allows a fast, but informed decision about whether or not to adjust the feed formula. "It is fantastic for trouble-shooting," says Scott.

The available reports are also helping to drive quality to new levels by creating a certain amount of competition between plants to come out with the best results.

Planning ahead

As each sample steadily clocks up the network tally of results, it adds yet more value to the knowledge base captured in the network database. In the future though, Scott would like to push sampling rates even higher.

An ambition is to do NIR analysis continuously online and use the results to automatically control processing equip-



ment. For instance, in the manufacture of dry dog food, moisture control is critical for palatability. Today, measurements are made on an hourly basis. But if measurements could become more or less continuous, the moisture content could be controlled even more precisely with benefits in terms of both product quality and yield.

"We are just starting to scratch the surface in terms of potential cost savings and quality improvements," says Scott. ■

by Richard Mills, FOSS

Background

Doane Pet Care Company manufactures private label pet food for over 600 customers around the world. Products include dry, semi-moist and soft dry foods, including biscuits.

Principal ingredients used in products are bulk commodity grains and food stocks such as corn, soyabean meal, wheat, rice, flour, poultry meal and meat and bone meal.

A comprehensive program for qualifying new vendors is maintained. This involves testing raw materials for nutritional adequacy and screening for bacteria and other harmful substances. Production at every plant is continuously tested by analysing products against specifications and regulatory requirements.

Production samples were originally tested using wet chemistry analysis in combination with some filter-based instruments. The first FOSS NIR instruments were installed in 2000. Many more followed and were linked together into a network to create a powerful source of company-wide data.

Richard Clatworthy, Technical and Group Sales Manager at St Merryn Food Group, describes how the MeatMaster™ is reducing raw material costs and freeing up production capacity.



United Kingdom:

The **MeatMaster™** effect

Richard Clatworthy has worked for St Merryn Food Group for eleven years, and joined this site on the day it opened back in 1995. He describes how the MeatMaster™ is having a positive effect on production.

I am currently the Technical Manager for the Victoria site (Cornwall) and as part of my role I look at the control of fat levels in retail packs of mince.

Over the years we have used various methods to analyze the fat most of which have been from FOSS. We started with the Fosslet™ which, at the time, was cutting-edge but required close attention and the use of chemicals to extract the fat, which is not very acceptable these days. In tandem we used the Analray, a very crude X-ray analyzer.

Due to the need to become more efficient we helped FOSS in the development of the first Meatspec™, originally using a converted grain analyzer; this proved very successful. The development of our systems has continued moving through the Infratec™ and finally the FoodScan™ Pro.

In search of a pro-active inline measurement system

As all the above-mentioned systems are off-line and give results in retrospect, it made sense for us to look at obtaining a result before or during the process.

We tried systems from a number of suppliers and, although accurate, the calibration proved very difficult and ongoing due to drift as the system was used throughout the day.

The next logical step for us was to look at the MeatMaster™ as the latest generation in full production scanning in-line analyzers. It scans 100 per cent of product on the line for fat, giving batch weight and batch fat as well as individual crate fat and weight results. We use this information to feed back to our suppliers to ensure raw material is to the required standard. This crucial facility was not available to us before we purchased the MeatMaster.

We chose the MeatMaster because it uses Dual Beam X-ray for continuous scanning of our product on the line and give accurate results for any type of fresh, frozen and mixed meat. The meat is scanned either loose, in trays or boxed. We opted for a belt-fed system as illustrated below. This particular setup has given us the ability and flexibility to put together around 1000kg batches of crated product ahead of the production process.

Accuracy to 0,5 per cent

The MeatMaster is supplied with a calibration that allows fat content to be measured to an accuracy of 1 per cent or better. This provides a high degree of control, but still, we wanted to improve on it.

We chose to take a very scientific ap-

proach to the calibration which, in the long term, has paid off. The initial calibration was carried out on site by using the Foodscan Pro as a point of reference. This gave a known base to work from but we wanted the equipment to be better than the 1 per cent in the specification. We took two months to collect around 3 000 results across all the fat levels ranging from below 5 per cent to 28 per cent, using both the Foodscan and external lab (20 per cent of collected samples using the Werner Schmidt method). This allows us to be confident that each batch is running at a tolerance of 0,5 per cent or better. I have been impressed by the fact that the calibration has not changed in the six months we've been running the machinery.

Another benefit is that the MeatMaster detects metal, including non-magnetic stainless steel to a profile size of 3mm. This does not replace our existing metal detectors but provides additional protection from metal entering the production line and damaging equipment.

Financial gains

Our MeatMaster can help us to improve our business by maximizing fat levels and gathering information about the standard of trims and whole muscles being supplied to us. This has been evident in many ways from the better use of high value raw material, to bringing product into specification from outside suppliers. In addition,



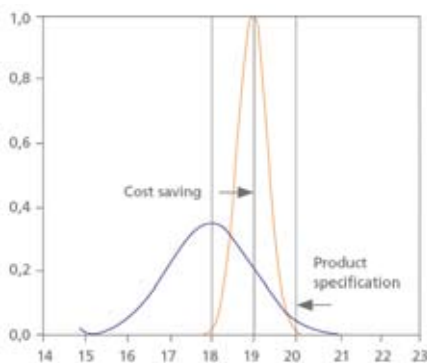


Operating the QA station

we are achieving a considerable reduction in reblends and their associated costs and loss of plant capacity.

Taking fat levels first, the loss of raw material outside the correct beef specification can be significant. Although the MeatMaster will probably not be able to eliminate this loss completely, it can significantly reduce it.

The graph below shows how the assumed annual volume can be squeezed into a narrow fat release area with the average set 19 per cent with the majority falling inside the 18-20 per cent release. Whereas the figures from the previous year's production show a much flatter line creating a high number of products released lean.



Early indications are that we are on target to realize the savings we were expecting.

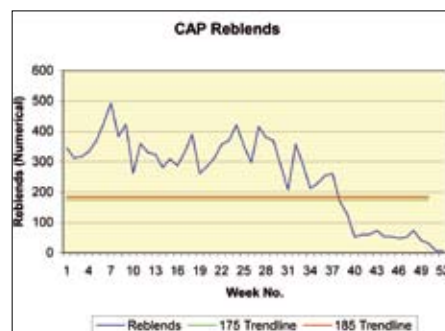
We now put around 95 per cent of production through the MeatMaster.

The other main gain at St Merryn Victoria has come from a significant reduction

in reblends by producing accurate batches of known fat and weight.

In the week studied before we acquired the MeatMaster there was an average loss of capacity of 37 per cent due to reblending failed blends of mince.

As can be seen from the graph below this loss has been significantly reduced. The major change was shown at week 38 and the increase in production potential was around 30 per cent. This could have substantial value to St Merryn if it is matched by increased orders. Obviously, there are other aspects of production that need to be considered, but if additional investment at the point of packing was initiated, it would allow us to realize the additional capacity to the full.



Overall, however, we have set ourselves on the right road to greater and more efficient production.

Conclusions

The MeatMaster has represented a groundbreaking investment in the future of the St Merryn Victoria plant, increasing our ca-

capacity, giving greater control of our products and better use of our raw material. Based on the initial broad calculations above, such an investment could be expected to provide payback in significantly less than one year and we would be more than happy to recommend this system to any plant with a similar process.

by Richard Clatworthy, St Merryn Food Group, UK

St Merryn Food Group

St Merryn Food Group was formed in 1987. The Group was acquired in 2003 by Grampian Country Food but still trades under the St Merryn name.

The operation processes on average some 250 000 cattle and 800 000 lambs a year.

The product range includes retail packs of fresh meat (steaks and joints), value-added fresh meat (burgers, kebabs and coated steaks and joints) and minced fresh meat, all packed and labelled with the retailer's own labels in shelf-ready format. The company also produces counter primal (whole muscle) for in-store butchery departments.

This equates to a total annual production in excess of 120 000,000 retail packs.

www.stmerrynfoodgroup.co.uk



Dairy manufacturing with the lights off

2020. A production manager sits at his computer. He is planning production using information from tankers still on their way to the plant. In the background, there is a quiet hum of automated machinery as the darkened plant works on relentlessly, optimizing raw material usage to the millilitre, minimising energy and making the quality of finished products a foregone conclusion for discerning customers. This is a vision already taking shape for New Zealand dairy producers, Fonterra, as the company stays a step ahead of global dynamics in the dairy industry.

New Zealand dairy producers have thrived by being ahead of the game. Since the first dairy cattle were landed in the 19th Century, pioneers such as Henry Reynolds, founder of the butter brand 'Anchor', made effective use of new tools and technologies that allowed the emerging industry to take off on a global scale.

That same pioneering spirit has helped the industry to get through challenges like the shock of losing their biggest market overnight in 1973 when the UK joined the EU. And it carries through to this day in an uncompromisingly modern outlook on the dairy industry.

Fonterra was formed in 2001 by a merger between New Zealand's two larg-

est cooperatives and the New Zealand Dairy Board. This has led to significant economies of scale. Today, Fonterra is responsible for more than a third of international dairy trade and markets products produced in South America, Australasia and the USA. The company is a world leader in large-scale milk procurement and processing.

Economies of scale

Max Parkin, Director of International Manufacturing says: "Size and a well developed supply chain allow action on an unprecedented scale."

Fonterra has 24 factories, including a monster site processing around 14 mil-



Max Parkin, Director of International Manufacturing

lion litres of milk a day. The company has 89 stores and ships to 11 ports. Through its global supply chain, Fonterra serves around 5000 customers (retail not included) in 140 countries.

Operating on such a scale presents particular challenges reflecting myriad issues currently affecting the dairy industry. For instance, demographics and changing labour markets are affecting the supply of skilled labour. Ethical business practices and environmental issues are key considerations and are an essential part of meeting customers' expectations. Resource constraints such as water supply are limiting production in some countries – it takes between 50 and 80 litres of water a day to produce 30 litres of milk. Traceability and the source of ingredients throughout the supply chain are increasingly important. The internet is changing the way business is conducted. The list goes on.

Technology and change

One of the reasons that the New Zealand dairy industry grew so rapidly back in the late 1880s was an ability to make use of new technology such as the use of milking machines in the 1890's. Fonterra has been quick to follow the tradition in response to present-day global challenges. Mr Parkin says: "As labour market changes and low cost economies challenge our business, it is critical that plant and equipment is used strategically to add value to products and services."

Mr Parkin foresees a mind shift away from sampling and testing to real-time measurements at critical control points in the supply chain. For instance, milk quality parameters will be tested on tankers and sent ahead to the receiving factory.

This will allow the factory to make the best use of incoming material as soon as it arrives, for example, information about casein will allow greater yield in cheese production. "There are only three things that matter for the dairy processor after product quality : yield, yield and yield," says Mr Parkin. However, he adds that the technology step change has not yet happened.

But changes are on the way. An example is in the use of spray drying technology. Mr Parkin explains that nowadays, the company runs 25 tons per hour milk powder drying plants, whereas 20 years ago, five tons was considered huge.

The vision of lights out manufacturing

"Our vision is to have 'Lights out Manufacturing units (LOMU): the vision of fully automated factories," says Max Parkin explaining the concept of factories that are so automated, you can turn the lights off. Strategic alliances with key technology vendors are critical to success of the vision and the LOMU project is already rallying vendor and internal resources towards the collective goal. "LOMU is our 'man on the moon,'" says Max Parkin.

So how far have Fonterra come in realising the vision?

One example is in plant mechanization. A 'lights out' packing system for packing bags of milk powder has been developed. A successful prototype will shortly be extended to full use at a number of plants. Another success is in process control.

Like your best operator having his best day

Fonterra have implemented an automatic control system (APC). The APC system is a supervisory control that sits on top of existing plant control systems to provide "smarter" control for optimal quality and minimal variations in the process. "It is like your best operator having a good day running the plant all the time," says Max Parkin.

He explains how the system 'thinks' for itself. It is linked to instruments in the plant that supply measurement information from critical control points. This is used to automatically control the process for optimum results. For instance, in milk powder plants, optimal moisture control on driers can be obtained based on information from routine measurements with infrared analysis instruments. The result is more consistent moisture content in

products. Plus, better yield efficiencies are achieved through smarter use of energy in the drying process. Around 113 applications of the system have been deployed to date.

Growing with the challenge

On the subject of the future, Mr Parkin says: "Because of external pressures we will see more technological change in the next 15 years than our industry has ever seen before. Probably though, it is only through scale that advances can be taken advantage of."

In this respect, a company like Fonterra may provide a model for others around the world in facing up to challenges such as declining European milk prices resulting from the WTO and EU reforms, shortages of qualified labour, consumer demands for product information and stricter regulatory demands. Fonterra plans to continue using technology to build-in product quality and safety throughout the supply chain. Systems like advanced process control will be made a way of life.

Above all, Mr Parkin emphasises that Fonterra will hold onto the vision of an increasingly efficient dairy process in response to changes in the global dairy business. "Our vision of having lights out manufacturing units is, I believe, a reality that is beginning to be played out," he says.

by Richard Mills, FOSS. Article originally published in Dairy Industries International



Formed in October 2001, Fonterra is co-operatively owned by more than 11,600 dairy farmers. One of the top ten dairy companies in the world, Fonterra is the leading exporter of dairy products and is responsible for more than a third of international dairy trade. Today New Zealand is regarded as a leader in large-scale milk procurement and processing.

Fonterra's global supply chain stretches from farms in New Zealand to customers and consumers in 140 countries. The supply chain consists of leading manufacturing sites, quality and cost marketing and distribution with seamless integration from cow to customer.

Nitrogen content in fresh rice leaves collected from three locations was measured by near infrared spectroscopy.



South Korea: Determination of total nitrogen content in fresh rice leaves using visible and near infrared spectroscopy

The taste of rice is deeply related to its protein content, which is affected by the nitrogen content of the soil and fresh rice leaves. Thus nitrogenous fertilizing is becoming an issue for rice cultivation. The purpose of the research was to give guidance to rice farmers.

Abstract

Nitrogen content in fresh rice leaves collected from three locations was measured by near infrared spectroscopy. Using all samples, the determination coefficients (R^2) of calibration equations were 0,879, 0,858 and 0,819 for samples collected from Iksan, Buan and Joungeup. After elimination of outliers, an improved calibration equation could be obtained. The R^2 were 0,896, 0,878 and 0,880 for Iksan, Buan and Joungeup respectively. The R^2 calculated from the combined samples from the three locations was 0,911.

Introduction

In nutrition diagnosis of rice, nitrogen content has traditionally been measured through the drying and pulverization of fresh rice leaves. To avoid those procedures, the aim is to replace conventional analysis by near infrared spectroscopy (NIRS).

NIRS is one of the non-destructive methods for analyzing the interior and exterior characteristics of samples. This technique does not normally require extraction, filtration, dilution, reagent reaction or heating, and measured samples

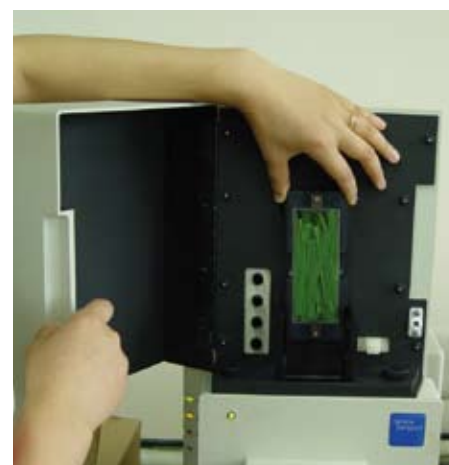
can be recovered undamaged.^{1,2} NIRS can also be used to observe changes during storage and processing of the same sample over a short period of time. Since no chemicals are used, NIRS prevents environmental pollution. In the past, some reports confirmed that nitrogen content in leaves, especially for forage, could be precisely determined by NIRS.³⁻⁵

Materials and methods

Samples Rices (*Oryza sativa* var. *DongjinIhobyeo*) and some other varieties maturing in early, mid and mid-late



Mr. Young-Rip Kwon and Ms. Ji-Sun Kim



Region	N	Mean (%)	Range (%)	SEC (%)	N1-VR	SECV (%)
Iksan	150	3,583	2,58-4,47	0,156	0,832	0,193
Buan	101	3,229	2,37-4,04	0,173	0,878	0,199
Jeongeup	116	3,748	2,91-4,80	0,170	0,813	0,206
Total	367	3,532	2,16-4,76	0,153	0,863	0,195

Table 1. Results of validation test for determining total nitrogen content by partial least squares method in different rice groups
SEC: standard error of calibration, SECV: standard error of cross validation, 1-VR: 1-variance ratio

Region	Outlier elim.	Bias	Slope	SD (%)	SEP (%)	N	R ²
Iksan	Before	-0,004	0,997	0,477	0,166	153	0,878
	After	0,000	1,000	0,471	0,152	150	0,896
Buan	Before	-0,011	1,010	0,491	0,184	103	0,858
	After	-0,000	1,000	0,484	0,168	101	0,878
Jeongeup	Before	0,004	0,953	0,473	0,202	120	0,819
	After	0,001	1,001	0,479	0,165	116	0,880
Total	Before	-0,001	0,976	0,522	0,174	376	0,889
	After	0,001	0,995	0,525	0,157	369	0,911

Table 2. Calibration by partial least squares method in fresh rice leaves

SD: standard deviations, SEP: standard error of prediction, N: number of samples



season were used. Sampling was done at three locations including Iksan, Buan and Jeongeup. Sowing was done on 30 April 2004 and transplanting on 30 May 2004. The planting space was 30 x 15 cm. Samples were collected on 1, 6, 12, 19 and 26 July.

NIR measurement and calculation
NIR spectra were measured with an NIR spectroscope model NIRSystems™ 6500 from FOSS. Spectra were measured in reflectance mode (400-2 500 nm) using half cup. A partial least squares (PLS) calibration equation was developed on first derivative spectra (1,4,4,1) using WinISI 1.5 software from Infrasoftware International.

Chemical analysis Nitrogen content in fresh rice leaves was measured by Kjeldahl method using a FOSS Kjelttec™ 1035.

Results and discussion

The spectra of various samples collected for comparison varied according to location and validation test. Tables 1 and 2 show that average nitrogen content, 1-VR and SECV values were similar for all locations. Bias, slope and R² values after outlier elimination were higher than before elimination, while standard deviation (SD) and standard error of prediction (SEP) values were low. However, average Global H values did not reveal a clear tendency. SEP limit and bias limit values were unchanged

Conclusion

NIRS can be used to replace conventional analysis of nitrogen content in fresh rice leaves. The implementation of NIRS will help reduce the amount of chemicals and labour required. Moreover, samples can be used after analysis.

References

1. B D A Roza, A Martinez, S Modrono and B. Santos, in *Near Infrared Spectroscopy: The Future Waves*, ed A M C Davies and P Williams. NIR Publications, Chich-

ester, UK, p.537 (1996).

2. P C Williams, H M Corderiro and MFT Harnden, *Cereal Foods World* 36, 571 (1991).

3. N Berardo, C Cunico, A Tava and M Odoardi, in *Leaping Ahead with Near Infrared Spectroscopy*, ed G D Batten, PC Flinn, L A Welsh and A B Blakeney. NIR Publications, Chichester, UK, p.231 (1995).

4. A Blanco, D Alomar and R Fuchslocher, in *Near Infrared Spectroscopy: Proceedings of the 10th International Conference*, ed A M C Davies and R K Cho. NIR Publications, Chichester, UK, p.299 (2002).

5. P Dardenne, R Agneessens and G Sinaeve, in *Near Infrared Spectroscopy: The Future Waves*, ed A M C Davies and P Williams. NIR Publications, Chichester, UK, p.531 (1996).

by Young-Rip Kwon, Dong-Chil Choi and Jeong-Sik Choi, Jeollabuk-do Agricultural Research and Extension Services; and Sang-Hyun Seo and Rae-Kwang Cho, Kyungpook National University



Facts

Jeollabuk-do (North Jeolla) is a province in the south-west of South Korea, in the Honam region. The provincial capital is Jeonju, with a population of around 2 000 000. The province's western plain is one of South Korea's most important granaries. Besides rice cotton, barley and hemp are grown.

The province's Rural Development Administration employs 185 people. It has been focusing on development techniques for cultivating high-quality agricultural products at low cost, and on implementing the practical use of these techniques.

Kyungpook National University is in the city of Daegu. Established in 1951, it has some 24 000 students and a faculty of 825.

Sweden: Automatic data transfer with MicroFoss™ Connectivity

Swedish dairy giant Skånemejerier lies well to the fore when it comes to taking a visionary approach with MicroFoss. Its Malmö plant is one of the first in the world to install MicroFoss™ Connectivity. And now Skånemejerier in Lunnarp is the third of its plants to begin using MicroFoss for analysis purposes.

Skånemejerier is expecting to make another considerable saving in time as result of upgrading the MicroFoss system with the new MicroFoss Connectivity feature.

“The big advantage of MicroFoss Connectivity is that analysis results are automatically stored in our database system,” says lab engineer Gustavo Moyano. “We used to have to read the results from our MicroFoss and then enter them in our database manually. With MicroFoss Connectivity we save a little time on every sample. So, when there are lots of samples, we save lots of time.”

At present Skånemejerier’s Malmö plant uses MicroFoss to analyze just over 5 000 samples a year. Next year they also plan to start using MicroFoss to analyze Enterobacteriaceae in sweet products, which will bring the number of analyses up to around 15 000 a year. Following that, the company may decide to extend MicroFoss operations to include other types of analysis.

Easy access from any computer

“Thanks to MicroFoss Connectivity’s viewer function, I can sit wherever I like and check results as they come in, as long as there is a computer available” says Gustavo Moyano. “I can be at some other location inside the plant, or even outside the plant altogether, provided there’s a PC available. I can also receive a warn-

MicroFoss™ Connectivity’s viewer function allows the user to sit at any computer terminal and check analysis results as they come in. It’s also possible to be warned by a call on the mobile if a sample is above specifications.

ing message on the mobile if a sample is outside the specified value. Since MicroFoss Connectivity’s so new, however, we haven’t yet established our routines.”

MicroFoss No 3

Gustavo Moyano divides his time between the Malmö and Lunnarp plants. He was involved in the running-in of Malmö’s MicroFoss, and now he’s repeating the process in Lunnarp.

“We’re still in the start-up phase in Lunnarp, so we don’t know yet how many analyses we will be carrying out a year using the MicroFoss,” he says. “However, once the in-running period is completed, it will probably be around 20 000 analyses of Mould and Yeast, around 16 000 of Enterobacteriaceae and around 6 000 of Lactic Acid Bacteria. We prefer taking it step by step so to start with we will implement the Enterobacteriaceae.

“It’s our intention to install MicroFoss Connectivity in Lunnarp too. Automatic storage of analysis results in our database systems will save us a mass of time.”

Plant Manager Göran Nyström agrees. “The whole concept of MicroFoss Connectivity is exciting and one that we see as having huge potential,” he says.

MicroFoss in Kristianstad

At Skånemejerier’s Kristianstad plant, where cheese is produced, they’ve been analyzing with MicroFoss for nearly four years now, and with great success. MicroFoss has enabled the plant to carry out microbiological analyses in-house instead of entrusting the work to an external laboratory.

“With MicroFoss’ help we carry out around 4 000 TCV analyses, 1 500 on yeast and mould and 800 on Enterobacteriaceae every year,” says Helena Persson. “We’re not yet familiar with MicroFoss Connectivity so we don’t know about all the functions available. But the concept certainly sounds interesting, and we will probably be upgrading the system in the near future.”

by Michele Sandersen, FOSS Skandinavia





Feed analysis founded on Fibertec™

A new Fibertec™ instrument provides a reliable foundation for wet chemistry and near infrared (NIR) analysis

Havens Voeders is a privately owned feed compound company producing a range of products for both the professional and hobby sectors. Located in Maashees, the Netherlands, the company employs around 85 people. A flat organization promotes communication between staff and allows rapid reaction to changing market environments. The production facilities allow a 'customized product' service, especially for those customers buying in bulk.

While flexibility and speed of reaction are essential, quality control is also paramount.

Mr. B. Philipse, Nutritionist and Laboratory Manager of Havens, says: "It speaks for itself that nutrition and quality care are important and fundamental parts of our organization. We consider the product quality as one of the most important sales arguments, so we focus a lot on this. The work that is related to the product quality is shared amongst three full time staff."

Wet chemistry plus NIR

To meet the self imposed high standards in feed compound creation and quality care, the company long-since decided that

it needed its own laboratory. This avoids dependence on external laboratories and avoids any unnecessary waiting time for results.

Mr. Philipse describes how they perform basic analysis based on the 'Weende' method for quantitative analysis of macronutrients in feed. The wet chemistry method is indispensable for verifying quality and, as such, provides a reliable platform for routine analysis in production using a FOSS NIRSystems™ 5000. NIR measurement is an ideal way to determine batch-wise the quality of raw materials with speed and accuracy.

Mr Philipse says: "The Fibertec™ is not used for calibration of the NIR as equations from external sources are used for this purpose, but it is used to check on 'outliers' on the NIR. Next to that, we consider the Fibertec to be the internationally accepted 'gold method' to verify crude fibre data," says Mr Philipse.

Finding an approved wet chemistry solution

A problem for Havens Voeders was that, at the heart of their wet chemistry/NIR analysis system, the wet chemistry solu-

tion was ageing and in need of replacement.

Mr. Philipse says: "We had been looking forward to replace our old Fibertec for a long time, but all systems that we looked at and tested did not meet our requirements."

He explains that an important consideration was the reliability of the system. In addition, international trade still considers the traditional Weende method of fibre analysis, developed in 1860 by Henneberg and Stohmann in Germany, as the standard. For the time being at least, the method is not replaceable.

The Fibertec solution that was eventually decided on matched demands for fibre determinations according to Weende, van Soest and other recognised methods.

The main applications for the Fibertec are crude and detergent fibre determinations. With the instrument, single or sequential extractions including boiling, rinsing and filtration are performed under reproducible and controlled conditions. The samples tested range from single ingredients to complete feeds, for example: wheat, barley, alfalfa, beetpulp, sunflower expeller, finishing feed for pigs and layer feed.

"The Fibertec is easy-to-operate, reliable and a valuable addition to our routine analysis," concludes Mr Philipse.

More information about Havens Voeders can be found at: www.havens.nl.

by Richard Mills, FOSS



Wet chemistry is indispensable for verifying quality and provides a reliable platform for routine analysis, for example, for analysis of incoming raw material using NIR instruments.



Norway: XDS Process Analytics™ at TINE dairy, Tolga

The XDS project was initiated during the summer 2004 and it has now resulted in the installation and commissioning of an efficient XDS Process Analytics™ system controlling the butter production at TINE in East Tolga, Eastern Norway. This year the plant expects to produce 2 500 t of various butter types. These include unsalted, salted (1,5 per cent) and extra salted (2,5 per cent). Maximum permitted moisture content for all types is 16 per cent.

FOSS paid its first site visit to the plant early February 2005. This visit was followed up by a visit to a dairy plant in Umeå in Northern Sweden, where a NIRS Process Analytics System II has been installed.

FOSS released the XDS PA™ System in March 2005. This new version has the following advantages over earlier ones:

- New technology featured enhances performance
- XDS PA System is based on NIR scanning
- The data interval is shorter – now 0,5 nm
- The system is easier to install and maintain
- The system is more robust – environmental protection is IP65

Tolga decided to install the new XDS PA System and at the same time they ac-

cepted to become a test installation for the future butter applications. The purpose of the test would be to confirm that transmission technology was still superior to the reflectance technology in in-line butter applications.

A test plan was set up, with a duration of approx 3,5 months. Two similar measuring cells and optical fibers were fitted approx 2 m from the output of the automatic butter-making machine, with the cells immediately following one another. Measuring results from the cells were compared with each other and with the reference analyses. The results from both alternatives were satisfactory, but it was evident that transmission technology provided the best performance. The difference between the results was obviously not substantial, the set-up that provided the best accuracy was the one selected. The distance between the two probes (the windows) is 2 mm.

As the XDS PA System is a new instrument there were no ready-made calibrations that could be used, and that caused an extra workload on all parties involved. TINE had to obtain more reference analyses, and FOSS had to update/extend calibrations as more scans/reference analyses became available. To speed up the process as much as possible, samples were delib-

Jarlsberg at 50

In the early days Norwegian dairy farmers used to make cheese from soured milk, with gammalost, pultost and skjørost (this last being similar to cottage cheese) as the most usual varieties. But during the 1800s experts were brought in from Switzerland to teach Norwegians about farm management and dairy production, and thus were laid the foundations of a modern cheesemaking industry.

One product that serves as a reminder of the Swiss influence is Jarlsberg cheese. It has the same “consistency” as Emmenthal – which is to say that it has a similar hole texture. Since it was first launched in 1956, Jarlsberg has proved to be an enormous export success, and can be found on sale not just in many European countries but also in the USA, Canada and Australia. In fact, TINE predicts that some 25 000 t of Jarlsberg will be consumed during 2006, worldwide.



TINE at 125

The Cooperative Movement reached Tolga in 1856, when Northern Europe's first dairy cooperative was set up by 40 local farmers, and rapidly became the model for other cooperatives around the country. 1881 saw the establishment of a nationwide Norwegian Dairy Association. This can be said to be the forerunner of today's TINE, which operates a total of 52 dairies nationwide.

Products include milk, cream, butter, cheese, yoghurt, desserts and sour-cream based goods.

This year the TINE Group celebrates 125 years of dairy cooperative history.

erately taken when the operator knew that the results would show a proper deviation. This was easiest to do at the beginning and end of each day's production.

As can be seen from the graphic illustration below, results improved rapidly.

As the illustration shows, variations in water content were much smaller after the XDS PA System had been in use for just a short time. The results show that average water content has shifted from approx 15 per cent through 15,38 per cent and is now 15,58 per cent. Butter containing more than 16 per cent water goes to animal feed, resulting in a substantial profit loss for TINE.

One of the other major advantages of the new system is that new operators soon feel confident with it, says the production manager, Trond V. Lund. This means that they can operate the butter-making machine without the need for supervision and with optimum results.

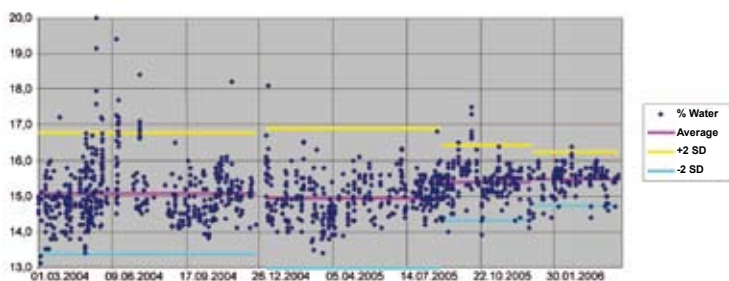
Looking back a year after the XDS PA System was installed, we consider that the project was well managed by Sven Malmberg and his team at FOSS. FOSS has visited the plant on a number of occasions. Calibrations have been updated via Internet. The PC in the butter-making department has PC Anywhere installed, enabling service personnel to connect via modem and update/modify calibrations or the system itself.

The system's software could control the water dosing pumps automatically. However, at this stage we have decided not to implement this option. Operators continue to adjust the pumps manually according to the results displayed by the system. This is to avoid operators relying uncritically on the system and leave them in control of the production process, explains Trond V. Lund. He agrees, however, that if automatic control were to be implemented, the water content of the

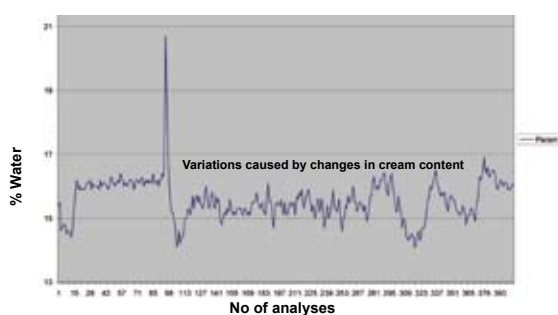
butter would be higher, and possibly rise to an average of 15,7 per cent. Whether the automatic control option will be implemented is still being evaluated.

In butter-making, the cream is temperature treated according to the summer or winter methods. As this is the first year the XDS PA System has been in use at East Tolga, it's not yet certain whether the existing calibrations will be sufficiently robust to cope with both production technologies/seasons. This year no specific "summer cream" calibration has been used and whether it will be necessary next year will depend on the results achieved.

by Trond V. Lund, Productionmanager, TINE, Tolga and Erik Eide, contributing writer, Landteknikk



Results of butter analyses carried out in the lab. The first XDS calibration came into use on 1 September 2005. Calibrations were updated with more robust ones on 1 January 2006



The graph illustrates variations in water content during the course of a day's production. The peak is the result of a production stop on the automatic butter-making machine

Jubilee Dairy conference: partnerships help to face global challenges

The FOSS Milk and Dairy conference, May 18th, Hamburg, Germany, brought together FOSS customers and experts in the field to provide a unique snapshot of factors currently affecting the industry.

Mark Voorbergen, Global Industry Specialist from Rabobank in the Netherlands outlined three main options for dairy producers today: to be highly efficient, to build and protect a strong brand or to be a niche player. Producers need to be very big to do all three and there will be more collaborative ventures.

Mr Philippe Jachnik, Head of Professional & International Affairs at ATLA (French Dairy Processors Association) highlighted the importance of strategic alliances in light of continuing uncertainty following the 2003 CAP reform and WTO pressure on EU protectionism measures. Mr Jachnik said: "Farmers will need a contractual relationship with someone with market share in the EU or beyond."

Management tools throughout the supply chain

In addition to price pressure and consolidation among retailers, changing consumer preferences and animal welfare are additional issues for the dairy industry, according to Managing Director of FOSS, Torben Ladegaard. Greater 'on-farm' control, more efficient analysis in the CMT area and tighter process control are the answer to growing profit pressure. "The challenges are coming faster than ever," he said.

Max Parkin, Director of International Manufacturing, Fonterra, New Zealand, described a large scale approach to modern day challenges. Fonterra has twenty four factories ranging in production size from 200,000 litres of milk a day to a monster plant

producing around 14 million litres a day. Making smart use of manufacturing technology and close cooperation with technology suppliers such as FOSS is as an essential factor in the global manufacturing strategy. The Fonterra set up includes a so-called 'Lights out Manufacturing' system at one of the Fonterra plants. This includes an automatic control system. "It is like your best supervisor having his best day, everyday said Mr Parkin.

Project Manager, Mr Hanno Lehmann, Sachsenmilch – part of the Müller Group, Germany, explained how analysis technology goes hand in hand with process technology. An example is a new churning unit that allows homogenous distribution of the water in butter and connects perfectly with a FOSS ProceAnalytics unit. The measurement precision achieved allows the reliable regulation of the target water content in the butter between 15.9 and 16%, the highest value permitted.

From family farm to family firm

Mr Henrik Nygaard, Advisory Manager at the Danish Cattle Federation described how proactive farm management technology will play an increasingly important role in improving output and quality at the start of the supply chain. For instance, optimising udder health and reproduction can improve economic performance by up to 1250 DKK (circa 165 Euro) per cow. Farmers in Denmark are already investing in new technology and milk quotas. The size of farms will grow dramatically but there will be far fewer of them. Mr Nygaard said: "The farmer is becoming a manager and leader constantly in touch with a team of advisors. Collaboration will be an important aspect of the business."

What about the smaller players?

Mr Poul Johannes Pedersen, Managing Director of Thise Dairy, Denmark, gave a unique view on how to survive as a small dairy producer. "We are a niche player within a niche," says Mr Johannes, giving an example of how Thise dairy has promoted not just organically produced milk, but 0.5% fat milk from Jersey cows as a higher value product to customers increasingly interested in the source of their purchases. A small supplier has to find a good partner, for example in marketing. "With our partners, we can change our small worlds together," he said.

The way ahead

Summing up the FOSS 50 year jubilee conference, FOSS President, Peter Foss, highlighted the growing role of analysis in improving efficiency throughout the supply chain from the farm to the milk testing laboratory and to small and big dairy producers alike. "Our aim is to continue our support for the dairy industry through innovation and partnership," he said.



All about amylose

A standard analysis method has just received ISO approval, but why is this parameter so important? Dr Jürgen Möller of the FOSS Chemical Analysis group explains

“Amylose and Amylopectin are the two fractions of starch,” says Dr Möller. “Amylose is the most important for the cooking quality of rice, that is, the stickiness of rice. The higher the amylose content, the lower the stickiness and vice versa.”

However, the stickiness principle is not the only consideration when it comes to rice quality.

Amylose is also the starch fraction that is more accessible for human consumption as digestible starch. It is easily converted to sugars. In some countries, rice with lower amylose content is sought after for dietary reasons. “People with diabetes would like to have rice with lower amylose content, but still not too sticky,” says Dr Möller.

Amylose is thus an important parameter for trading and processing rice and for breeding programmes in pursuit of desirable crops.

FOSS initiated a project to develop standards for amylose analysis in 2002. This has involved twenty three expert laboratories in five continents. The developed standards have now received ISO approval:

ISO/DIS 6647-1:2005 Rice – Determination of amylose content – Part 1 : Reference method

ISO/DIS 6647-2:2005 Rice – Determination of amylose content – Part 2 : Routine methods

An analysis option mentioned in the standards is the FOSS FIAstar™. Other FOSS equipment that can be used includes the Cyclotec™ for sample preparation. This allows the direct use of the ground rice, without any sieving and control of particle size. For the reference method, the Soxtec™ can be used for the defatting step.

A solid base for indirect methods

The new ISO method will lead to more consistent determinations and therefore a base for a calibration of an indirect analysis method such as Near Infrared. Dr Möller says: “An important possibility is to make an Infratec™ calibration for this and being able to use it directly at receiving and trading stations for fast payment-based analysis.”

Further information can be found at www.foss.dk and in In Focus no 2, 2005, Evaluation of FIAstar™ for determination of amylose in rice. ■

Improving customer satisfaction

Customer Satisfaction is in focus in FOSS; we have recently carried out the annual FOSS customer satisfaction survey. The overall customer satisfaction score is 4.02 on a 1-5 scale – an improvement from last year’s score of 3.85.

A total of 1449 customers from many countries participated in the survey. The survey included questions about products, sales and application support and service. As well as indicating a generally high level of satisfaction, the results of the survey also show areas where FOSS can improve. We will focus on improving the performance here, while maintaining a high level of customer satisfaction.

We would like to thank all of you who participated for taking the time to evaluate the performance of FOSS. Your input is highly valued and will help us to continuously improve customer satisfaction. If you have any comments or feedback, please do not hesitate to contact FOSS. ■



Great success at the 9th Pan-American dairy congress – FEPALE

The federation of milk producers in Latin America meets every second year to discuss the development in the industry across the continent. As FOSS considers the Latin American market very important, we were present together with our distributor in Brasil, Polimate in Porto Allegre with a 25 m² exhibition stand as well as a speech by Market Manager Trine Andersen on “Improvement of milk quality through application of payment incentive schemes and herd recording”.

The FOSS exhibition was well visited by many of the 1.730 participants from 36 different countries on the congress. The stand was used to launch the MilkoScan™ FT2 into the Latin American market and in total six FOSS instruments were displayed. MilkoScan FT 2 and also FoodScan™ were up and running for live demonstrations. This was well appreciated by the participants, who found it very interesting to see the instruments in action.



Even though this Dairy congress took place during the Finals of the World Cup Soccer/Football Tournament we managed to attract clients to the FOSS Stand even during the playoffs.

Bacteria analysis moves with the times

FOSS announces the enhanced BactoScan™ FC, an update of the successful BactoScan™ FC bacteria analyser.

Pressure on milk prices, fewer farms and a growing trend towards de-centralised milk testing throughout the supply chain are some of the concerns for central milk testing laboratories today. The enhanced BactoScan FC offers a flexible response in terms of new functionality and flexibility in pricing and support.

New performance

New features like an automatic data conversion facility for forthcoming EU/IDF requirements help laboratories to prepare for 2007. Flexibility in configuration of product features such as the conveyor and in-line filter allows laboratories to get exactly the solution they need. A new software function allows reductions in the use of sheath liquid by up to 75% when the analyser is standing idle.

Fair and correct grading is ensured by tightened specifications for repeatability and reproducibility. The superior cleaning system prevents contamination of samples.

Flexible payment models
New flexible payment models allow laboratories to ob-

tain top quality and performance at economic entry price levels. This allows FOSS customers to obtain unique performance and support at a price that fits with today's competitive CMT climate. Head of the FOSS Milk and Dairy Business area, Trine Andersen says: “We have already introduced a flexible pay-per-sample scheme in some countries.”

Extended warranty and optional service levels

The warranty on the enhanced BactoScan FC has been extended from one to two years and customers can choose the level of service ranging from a full ‘Platinum’ service to a basic level. FOSS has over 50 service and support staff worldwide dedicated to BactoScan alone.

About FOSS and the dairy industry

For decades FOSS has helped dairies and milk testing laboratories to keep pace with their analysis demands. For instance, FOSS dedicated analytical solutions have proven significant for dairy-herd-improvement, raw milk testing, standardisation in dairy production and verification of end-product quality.

Using approved measuring principles, FOSS dedicated analytical solutions provide convenience, speed and labour savings, while delivering high analytical capacity and low cost per sample. Solutions include compositional analysis, somatic cell count, hygienic quality control of raw milk and compositional and microbiological testing of finished products.



New MilkoScan™ FT2 promises continuous success in dairy production

FOSS announces the MilkoScan™ FT2, a new analyser that allows dairies to improve analysis operations with significant benefits to business, including the ability to save thousands of kilos of raw material in annual production.

The MilkoScan FT2 offers a 20% improvement in accuracy for main parameters in milk compared to the existing and highly popular FOSS MilkoScan FT 120. This allows dairies to push standardisation of key parameters even closer to production targets. For instance, in dairy powder production, a plant producing 300 tons per day can save around 12,600 kg of protein or 16.6 tons of protein per year.

Among other advantages offered by the new MilkoScan FT2 is the opportunity to get faster results closer to the production line. A highly stable FTIR interferometer avoids any worries about vibration and the instrument also has a splash proof and dust proof enclosure. Instrument stability also means reduced costs in calibration because it delivers consistently accurate results over long periods.

Improvements in instrument design speeds up analysis of viscous dairy products such as condensed milk that can now be measured directly without dilution. The durable design also allows significant reductions in maintenance work by up to 30% compared to the MilkoScan FT120. The Foss Integrator software keeps an automatic record of everything that goes on, giving dairy producers an answer to growing demands for product documentation.

The new MilkoScan FT2 builds on the success of the groundbreaking FOSS MilkoScan FT120 analyser. Input gained from existing MilkoScan users, together with decades of experience in developing dairy analysis solutions has provided the basis for the new analyser. The MilkoScan FT2 thus provides a logical next step in dairy analysis for dairies looking to secure their analysis strategy against unrelenting pressures for improved production efficiency and product quality.

The original MilkoScan FT120 will continue alongside the MilkoScan FT2 in the extensive FOSS dairy product portfolio – now in a more affordable price version.

About FOSS and the dairy industry

For decades FOSS has helped dairies and milk testing laboratories to keep pace with their analysis demands. For instance, FOSS dedicated analytical solutions have proven significant for dairy-herd-improvement, raw milk testing, standardisation in dairy production and verification of end-product quality.

Using approved measuring principles, FOSS dedicated analytical solutions provide convenience, speed and labour savings, while delivering high analytical capacity and low cost per sample. Common issues such as the need for analytical results with minimal operational concerns about calibration, usability and instrument uptime are constantly kept in mind in the design of any FOSS solution.

Solutions include compositional analysis, somatic cell count, hygienic quality of raw milk and compositional and microbiological testing of finished products. Instruments are specifically designed for use in the laboratory, at the production line or for continuous process monitoring, for example, with some instruments available either as a laboratory model or as an at-line production model designed to withstand the production environments.



Notes for contributors

Manuscripts should be submitted to the Executive Editor. Submission of a manuscript is considered to be a representation that it has been neither copyrighted nor published, and that it is not being submitted for publication elsewhere.

Papers should be written in English, be headed by a concise but informative title, by the name(s) of the author(s), preferably with one forename in full for each author, and by the name and address of the establishment where the work was performed.

An honorarium of US\$ 1000, will be paid for every published article.

Make sure the files are clearly and separately identified when shipping material by e-mail, diskette or on CD.

Images should be in TIFF format with high resolution 300 dpi, colours CMYK or B/W.

Somewhere new to explore



Sign up now and win an adventure holiday for two to Greenland

For 50 years, FOSS has explored ways to improve analysis through the innovative development of analysis technology – a principle that holds true more than ever today. How better then to celebrate 50 years of innovation than with a competition offering the chance to win a free holiday to a land rich in opportunity for discovery - Greenland.

simply sign up with your e-mail address on the FOSS 50 area on www.foss.dk. You will then receive our FOSS 50 newsletter twice a month throughout 2006. The newsletter will reveal the scope of dedicated analytical solutions in application areas that you may never have thought about, plus some interesting facts about your potential holiday destination.

A holiday for two will be awarded each month during the jubilee year, 2006. To enter the competition,

Join us as we continue our journey during the next 50 years of FOSS. There's a lot more to discover!

FOSS

FOSS
69, Slangstrupgade
DK-3400 Hilleroed
Denmark

Tel.: +45 7010 3370
Fax: +45 7010 3371

info@foss.dk
www.foss.dk

Local distributor