FOSS

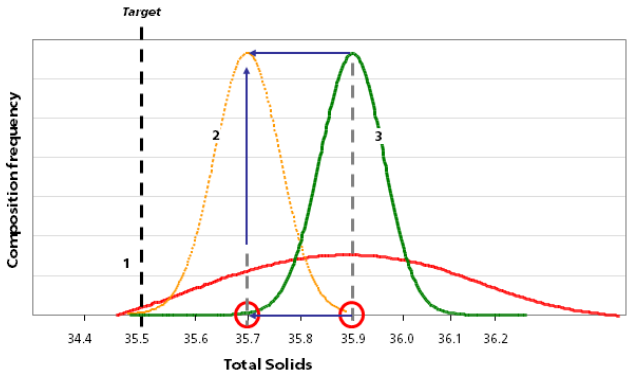
Application Note 41a

ProFoss™
In-line fresh cheese application

Continuous process monitoring in food manufacturing is becoming increasingly important. Consistent and high-quality standardized products manufactured at low cost are a key goal for competitive success in a global market.

The ProFoss™ helps you achieve this goal by reducing variation and streamlining your fresh cheese manufacturing process. The solution provides you with fast, accurate, and continuous results ´real-time' for critical process parameters like Total Solid, Fat and Protein content.

You can use the results either for *manual* process regulation control of the separator or the ultra filtration process or for *automatic* control by interfacing the instrument with your process regulation system.



With the ProFoss system, you can run production much closer to specification limits giving you both an increased yield and improved final product quality.

The operator or the automatic process regulation system can immediately react to changes in the raw material or process. Even at start-up or recipe change, there is no need for calibration adjustment. You will get correct results with the first analysis and process regulation (optimisation) can start after one minute.

With the ProFoss solution you can:

- Track exactly how your process is performing instead of waiting hours for results from standard wet chemistry analysis in the laboratory.
- Control the manufacturing process to a precision limited only by your control system
- Detect not only the actual process situation but also predict a possible future out-of-specification situation and react before it actually happens
- See what you have in the process line at any time – product type, mix of products, etc. thanks to the unique ProFoss qualification software. In-line process qualification is a 'lifeguard' to avoid production mistakes, and for stopping unreliable results getting into your process control system.

Samples used in the calibration

This application note describes the calibrations and the results that can be expected when analysing fresh cheese like cream cheese, quark, Petite Suisse, fromage frais etc. in-line using the ProFoss solution.

The calibration is based on fresh cheese data collected in-line at the outlet of the cheese separator. The calibration can be used for fresh cheese products and contains calibrations for Total Solids and Fat. The concentration range covered with this calibration can be seen in the table below.

Component	N	Min	Max
Total Solids	542	31.9 %	43.1 %
Fat	424	21.7 %	30.3 %

Performance

The calibrations for Total Solids and Fat were developed using a PLS modelling.

The performance was evaluated using independent validation sets and the results are presented in the table below.

Calibration version: ProFoss frech cheese vers 100

Component	Model	N	Acc.	Min	Max	RSQ
Total Solids	PLS	100	0.38 %	31.9%	43.1%	0.99
Fat	PLS	77	0.59 %	21.7%	30.3%	0.98

N: Number of independent samples in the validation set.
Acc.: Independent test set accuracy expressed as Standard Error of Prediction (SEP) corrected for bias (1 SD absolute)*.
Min.: Minimum reference value.
Max.: Maximum reference value.
RSQ: Linear correlation between ProFoss result and reference result.

* Accuracy of individual sets will depend on sample handling, reference method used and range. The performance example outlined in this note should only be regarded as a guideline for the expected performance of new installations. The performance of new installations will always depend on the uniformity of the flow and homogeneity of the product, as well as the reproducibility of the reference method used to verify the performance. An indication of the obtainable performance can be found as approximately 2 times the reproducibility of the reference method.

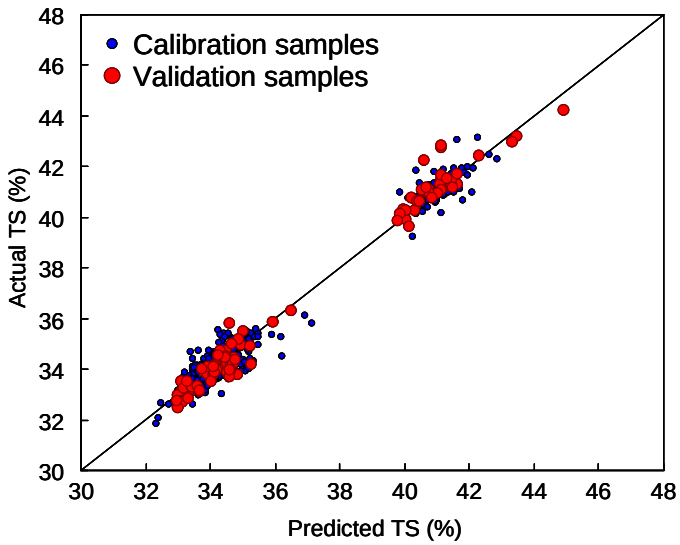
General:

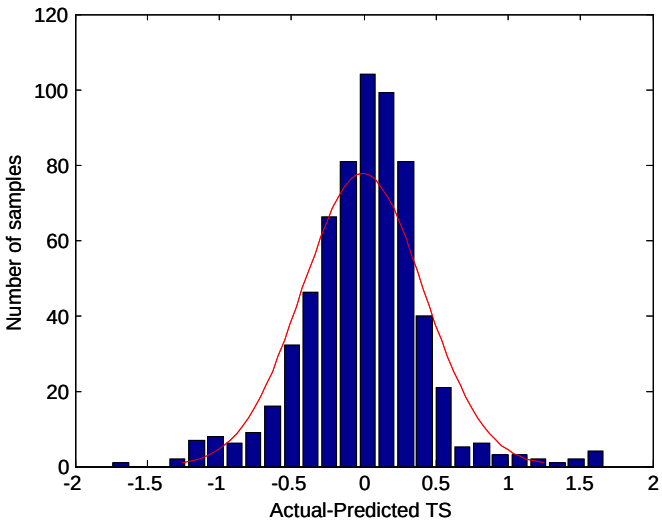
The performance of the calibration has to be validated with your samples (minimum 25 samples with reference values) according to the **International Standard IDF 201/ISO 21543 – "**Milk products – Guidelines for application of near infrared spectrometry".

If the samples you are measuring exceed the stated calibration ranges, or have non-common variations of other components, this might influence the performance of the calibrations.

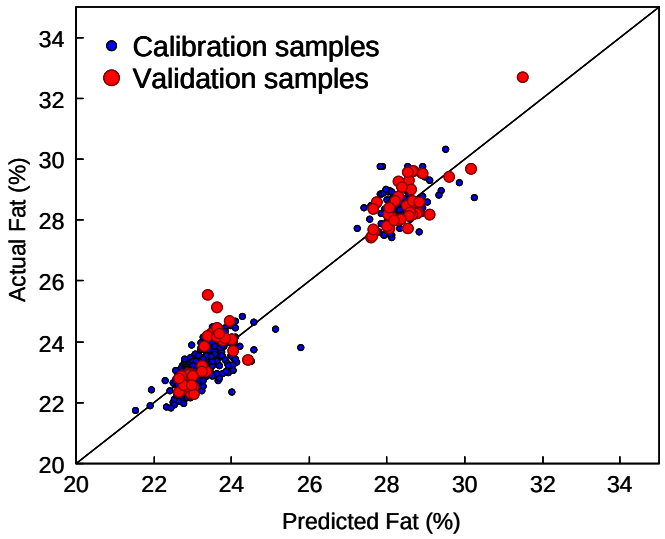
The graphs below show predicted results versus the reference ("actual") values for the independent validation sets. The histograms to the right show the individual performance of each sample in the independent validation sets, expressed by its residual (Reference results – predicted results).

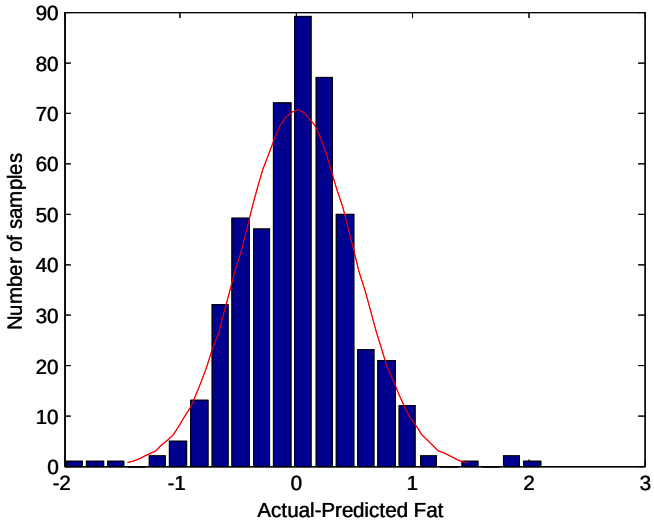
Total Solids



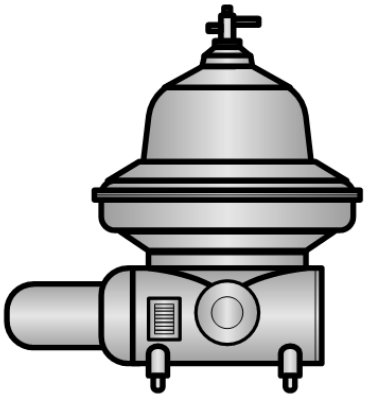


Fat





Installation, measuring point, sensors and analysis



The ProFoss should be installed at the outlet of the cream cheese separator in a place where the product is in an upward flow.

Measurements will be made with a Lateral transmittance interface directly installed into the pipe with a standard access unit from GEA-Tuchenhagen.

Sample temperature

The calibration has been established for samples at sample temperatures around 75°C. For optimum performance, the sample temperature should be kept as stable as possible.

Reference analysis method

We recommend you to evaluate the performance of the calibrations using the appropriate joint ISO/IDF standards methods according to the procedure described in IDF201.

The test sets used for evaluation of the performance were analysed by means of the following methods:

Sampling **ISO707/IDF50**. Milk and milk products – Guidance on sampling.

Validation **ISO21543/IDF 201: 2006**. Milk products – Guidelines for the application of near infrared spectrometry.

Total Solids: **ISO 5534/ IDF 4:2004**. Cheese and cheese products – Determination of total solids content (reference method)

Fat: **ISO1735/IDF 5:2004**. Cheese and cheese products – Determination of fat content – Gravimetric method (reference method)

Ordering information

P/N 60042672 ProFoss Fresh Cheese calibration for Total Solids & Fat.

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