

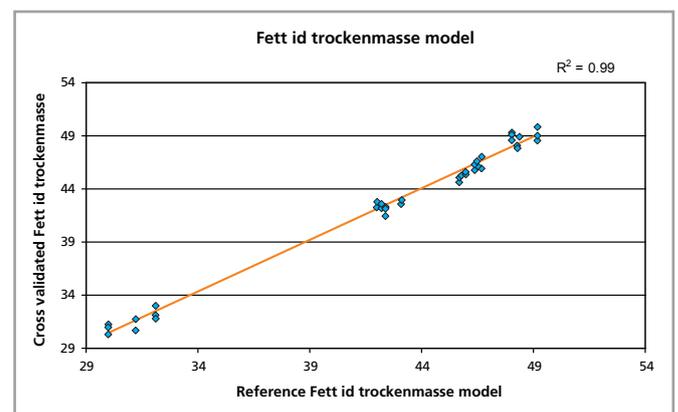
## NIR and Dairy

### The value of NIR in the Dairy industry:

- “The NIR spectroscopy has been used to measure the content of various constituents in dairy products such as milk, milk powder, whey, and cheese” (Tsenkova et al., 1999)
- “The composition of produced milk has great value for the dairy farmer. It determines the economic value of the milk and provides valuable information about the metabolism of the corresponding cow. Vis/NIR transmittance spectra of the milk samples gave accurate fat and crude protein predictions ( $R^2 > 0.90$ ) and useful lactose predictions ( $R^2 = 0.88$ ).” (Aernouts et al., 2011)
- “Contents of main components (e.g. fats, proteins, and carbohydrates) are one of the important factors for the quality of milk powder; NIR spectroscopy is a feasible way for the components determination of the milk powder based on the NIR spectra.” (Wu et al., 2008)
- “...predictors based on NIR scans are much better than predictors based on age for content of the free amino acids important for cheese ripening.” (Feten et al., 2007)
- “Governmental or other official laboratories for quality control of dairy products can use NIRS as a screening method for rapid analysis of the composition of unknown samples. Besides with NIRS, it might be possible to determine quality parameters where in the past no direct correlation with chemical or physical methods was apparent.” (Burns & Ciurczak, 2007)

### Use of Chemometrics (multivariate analysis) to develop quantitative calibrations for Dairy properties:

- Multivariate calibrations can be created to provide a variety of compositional or processing characteristics
- Real time quantitative analysis using calibrations configured to work with ASD’s LabSpec® analyzer (GRAMS/AI, PLSplus/IQ; The Unscrambler®)
- Use regression analysis to correlate various laboratory methods to NIR reflectance
- Calibrations can be created for multiple constituents, such as: dry matter, fat content (as-is), fat content (DM basis), water content of fat-free cheese (wff), total protein determination, lactose, moisture
- **Make multiple analyses with one measurement**



**Figure 1. Fat at Dry Matter Basis Model.** Fat (Dry matter basis) Fett id Trockenmasse – this cheese calibration model required 9 principle components to create a model with an RSQ of 0.991 and SECV of 0.591. The number of factors used for the model was very high for the number of samples in the model. This model was also evaluated using only 2 factors, the RSQ was 0.956 and SECV was 1.282 (ASD Inc., 2010)



ASD pioneered the science of field spectroscopy over 25 years ago and continues to lead the industry with the world’s most trusted field-portable NIR analyzers.

### The Solution:

ASD optical spectrometry instruments have the added value of being portable and with optimal signal-to-noise design for faster measurements, and wide spectral coverage of 350-2500 nm for a variety of chemical and properties detection possibilities. ASD offers different instrument configurations and many accessory options for a variety of set-up and sampling approaches for the most convenient and productive measurement scenarios.

ASD instruments are a practical solution for the determination of Dairy composition measurement and properties analysis opportunities.

**LabSpec® 4** offers laboratory-grade performance in a ruggedized, portable design suitable for benchtop analysis or transport to the sample location.



**Muglight** designed for analysis of raw materials requiring reflectance and absorbance measurements.



**Rapid Analysis Probe** designed for spectral collection of powders and other fine-grained materials.



### Ideal for Dairy applications:

- Portable solution
- Non-invasive and Non-destructive
- Simple, rapid and cost effective real-time measurement (data and analysis in the field)
- Little or no sample preparation
- Little to no sample waste

### References

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### Global and near



ASD Inc.,  
a PANalytical company  
2555 55th Street, Suite 100  
Boulder, CO 80301  
United States of America  
T+1 (303) 444-6522  
F+1 (303) 444-6825  
NIR.info@panalytical.com  
www.asdi.com