Soy Raw Material

Introduction
Production of animal feeds requires precise control over the different constituent components based on the final product specifications.

Relying on traditional wet chemical analysis is not feasible as the time taken is too great. Therefore rapid multi-component NIR analysers have replaced most of the traditional methods. These analysers can be placed directly in the production area and can be operated by plant personnel. The analysis time is less than one minute.

The Analyser

Figure 1: The Quant FT-NIR analyser with large bottle sample holder accessory (right) - AgriQuant Configuration

The AgriQuant FT-NIR analyser system is a revolution in FT-NIR technology and user friendliness. Designed around new FT-NIR interferometer technology the AgriQuant requires preventative maintenance at only 5 year intervals (source replacement), has a small footprint, no hygroscopic optics, incorporates a modular design allowing rapid detector changes and allows the development of unique sample handling accessories.

Calibration
The Quant is calibrated against certified methods.

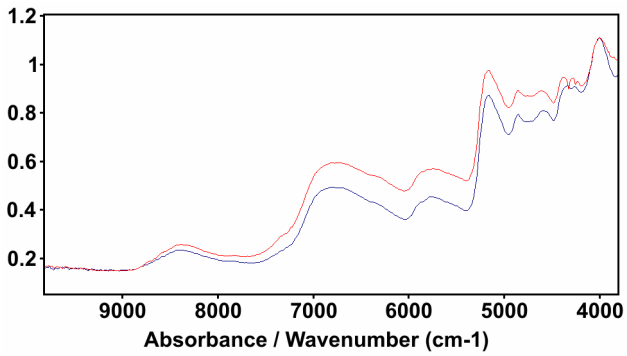

Figure 2: Typical FT-NIR spectrum of soy raw material. Red: Unground. Blue: Ground.

The NIR region contains both combination and overtone information. The most sensitive bands are those derived from the O-H, N-H and C-H stretch regions. In order to compensate for pathlength changes due to scattering effects from the sample, all spectra were pre-processed using Multiplicative Scatter Correction and mean centring. A Partial Least Squares (PLS) model was developed based on the analytical and spectral data.

Calibration Performances
29 soy raw material samples were measured unground and ground. Table 1 shows the performance of the calibrations developed for all the components with chemical reference analysis available for the different physical states.

Repeatability test and test with an unknown set of samples have not been done in this project but have been done for pig feed and can be seen in the application note for pig feed.

Property	Range %	NIR SECV Unground	NIR SECV Ground
Protein	36 – 49	0.70	0.50
Fat	2 – 25	0.63	0.40
Ash	4.2 – 6.8	0.29	0.33
Raw Cell Matter	2.5 – 7.0	0.72	0.67
Moisture	8.50 – 13.0	0.30	0.20
Density	0.57 – 0.74	0.02	0.02

Table 1: Performance of the soy raw material calibrations

As expected there is an improvement in the SECV value by grinding the samples due to increased homogeneity. However milling samples is time consuming and extra labour is required. Therefore it is a decision of the technical site management to decide if the increased accuracy obtained using ground samples outweighs the extra sample preparation.

Conclusion
The AgriQuant is a FT-NIR analyser designed for solid sample measurements and can analyse ground or unground feed samples. The results are obtained in less than one minute on multiple components. 50 to 60 samples can be measured each hour, allowing direct feedback for the mill operators to optimise production.

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