



Pig Feed

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.

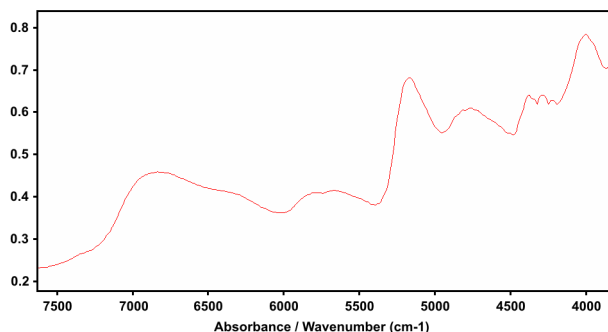


Figure 2: Typical FT-NIR spectrum of pig feed

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 Performance

102 pig feed samples, containing various amounts of different raw material, were measured **unground**. Table 1 shows the performance of the calibrations developed for all the components with chemical reference analysis available. Repeatability tests were performed measuring the same sample 10 times. Validation was performed on a set of 18 unknown samples calculating the SEP (Standard Error of Prediction) value.

Property	Range %	NIR SECV Unground - Plastic bag	Repeatability	SEP
Protein	13 – 21	0.60	0.20	0.60
Fat	2.5 – 8.5	0.39	0.13	0.48
Starch	17 – 45	1.70	0.70	2.2
Sugar	3.5 – 12	0.50	0.20	0.60
Ash	4 – 8	0.26	0.14	0.41
Raw Cell Matter	2.5 – 11	0.54	0.28	0.36
Moisture	10.5–14.5	0.20	0.10	0.30
Density	0.53 –0.67	0.02	0.01	0.02
Phosphorus	0.3 – 0.75	0.04	0.02	0.04

Table 1: Performance of the pig feed calibrations

Higher SEP figures can be obtained by milling the samples. However, this will increase the sample preparation time and hence overall analysis time. A study comparing ground and unground samples has been performed on soy raw material and can be viewed in the soy application note.

Conclusion

The AgriQuant is a FT-NIR analyser designed for solid sample measurements and can analyse ground or unground pig 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.