

APPLICATION NOTE – PIG FEED

Introduction

In the feed industry there is a need for determination of the quality of the feed comprising all the major components. Doing this by chemical analysis would be time consuming and too costly. Therefore 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 QFA flex650L

The QFA flex650 is a dual FT•NIR analyser which measures both liquid and powder samples without removing the sampling or optical accessories. When changing between liquid and solid analysis, a simple manual lever is rotated to open or close a shutter between the side port and the top bench. A procedure in the software automatically selects the appropriate configuration.

Liquid slurry samples are measured in transmission with disposable 8 mm vials. Powder samples are measured on the side port accessory, in reflectance through Petri dishes, Teflon cups or plastic bags.

Calibration

The QFA flex650 is calibrated against certified methods for the different components.

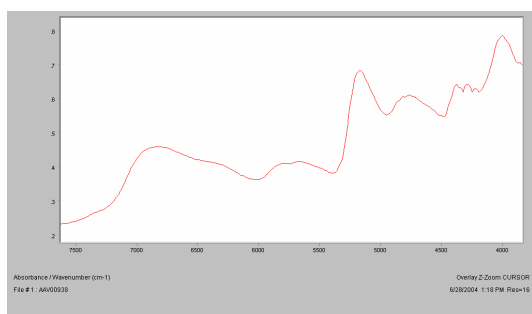


Figure 2: Typical FT•NIR spectrum of pig feed.

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 Performances

102 pig feed samples, containing various amounts of different raw material, were measured – ungrinded – in plastic bags. 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. Performance was tested using a set of 18 unknown samples calculating the SEP (Standard Error of Prediction) value.

Property	Range %	NIR SECV Ungrinded - plastic bag	Repeat- ability	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.

Some factories need better SECV values than obtained in this study. This can be done by grinding the samples and then doing the measurements in a glass Petri dish, bearing in mind that the sample preparation time will increase dramatically. A study comparing grinded and ungrinded samples has been done for soy raw material and can be seen in the application note for soy raw material.

Conclusion

The QFA flex650 is a dual FT•NIR analyser designed for solid and liquid measurements. The results are obtained in less than one minute on multiple components. This eliminates individual analysis on each constituent and saves on manpower, training and time. 50 to 60 samples can be measured each hour, allowing a thorough test of the products coming from the feed factory to be done.