Application Note 62: Calibration of Protein and Moisture in Stock Feed Pellets using a Cropscan 2000F

Introduction:

NIR systems have long tested Protein and Moisture in Grains and other raw materials that are used in the creation of Stock feed pellets. The pellets themselves proved to be difficult to scan in their normal state due to the inconsistency in pellet size and packing density. After testing several methods of sampling, it was determined that use of a burr grinder to reduce the pellets to a powdered state, and then sampling using the 3mm flour cell of the Cropscan2000F, provided the best and most consistent method of sampling.

This study was undertaken to demonstrate the feasibility of measuring Protein and Moisture in the finished product of stock feed pellets. The Cropscan2000F was used for the purpose of this study.

Procedure:

23 samples of stock feed pellets were prepared using a burr grinder to reduce the pellets to the consistency of coarse sand. With this done the powdered pellets were then placed in the flour cell of the Cropscan 2000F and scanned over the wavelength range of 720nm to 1100nm at a pathlength of 3mm. A total of 10 scans were collected and each sample was repacked and presented to the instrument five times. The spectra were uploaded into NTAS (NIR Technology Australia Software) and Partial Least Squares Regression (PLS) was used to develop a calibration for Protein and Moisture.

Results:

Figure 1, below, shows the NIT spectra of the 23 samples of ground pellets.

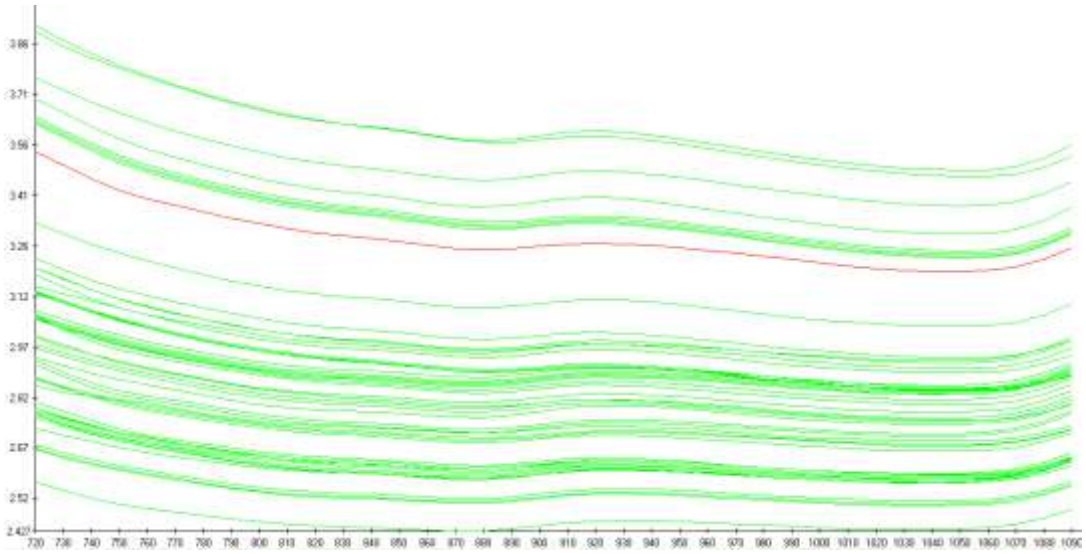

Figure 1: Plot of NIR Spectra for scanned stock feed pellets.

Figure 2 shows the calibration statistics for the NIR Protein values versus the reference Protein value. The Standard Error of Calibration is 0.58% with a correlation (R^2) of 0.98.

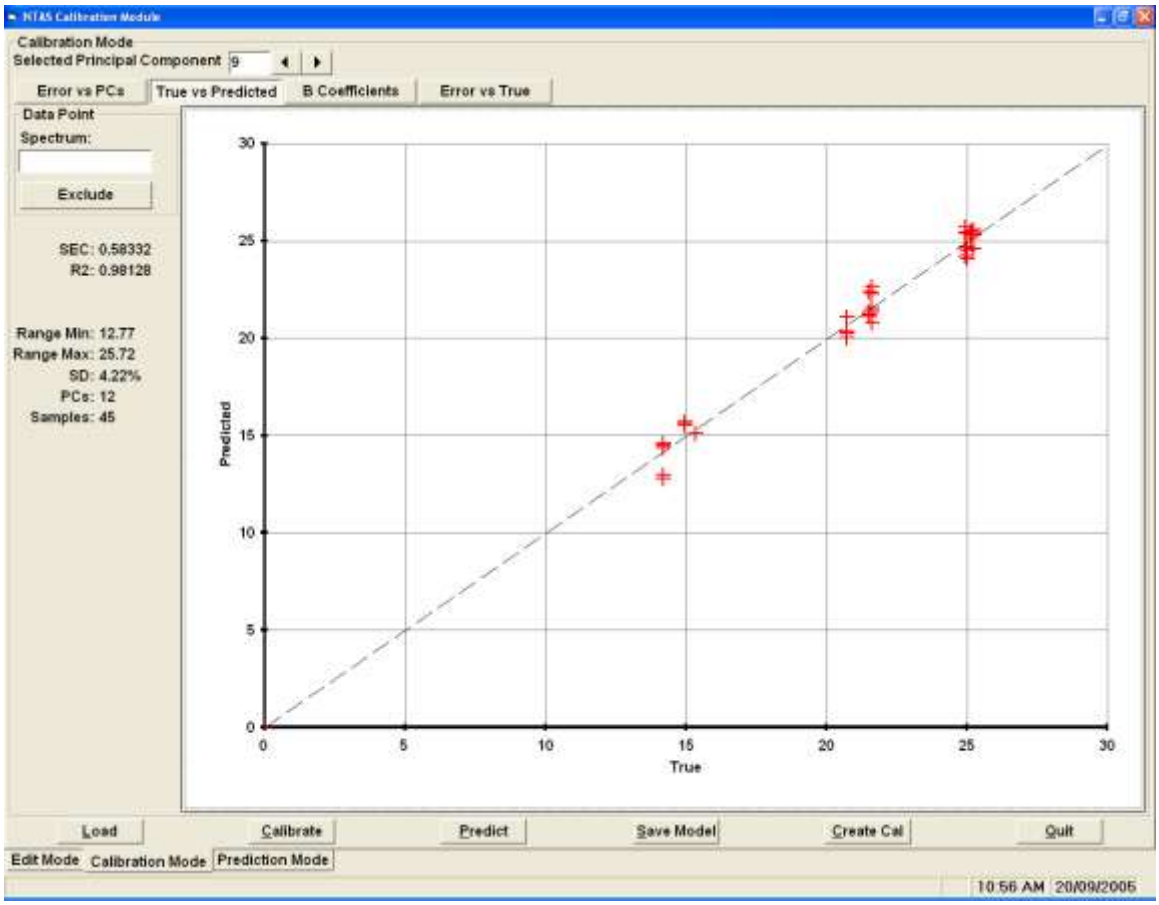

Figure 2: Plot NIR Predicted Protein value vs. Reference Protein value.

Figure 3 shows the calibration statistics for the NIR Moisture values versus the reference Moisture values. The very small range in the moisture values for the available samples results in a calibration with a low correlation (R^2). i.e. 0.37.

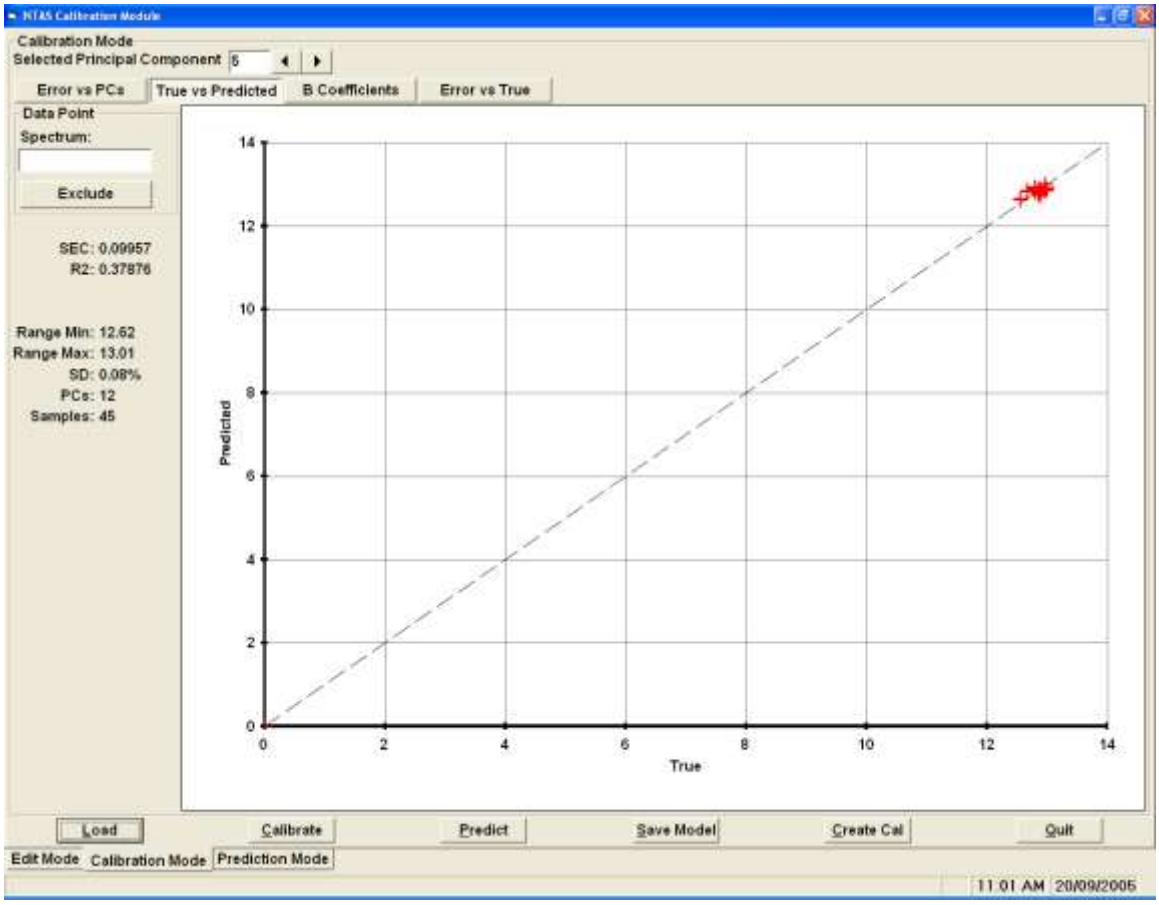

Figure 3: Plot NIR Predicted Moisture value vs. Reference Moisture value.

Conclusion:

It can be seen in figure 2 that the Cropscan 2000F can be calibrated to measure the Protein values of Stock Feed pellets. Whilst the sample set is sufficient to develop a calibration for Protein it is still recommended that the sets be expanded to improve the robustness of the calibration in future.

Due to the very small variance of the moisture values of the available samples (less than 0.5%) it is not possible to produce a good calibration for moisture using these samples. It will be necessary to collect additional samples, with a good boxcar distribution for moisture, to develop an acceptable moisture calibration.

However, the available samples clearly demonstrate the ability of the Cropscan 2000F to measure Protein and Moisture in Stock Feed Pellets. Whilst the sample set is currently too small to develop a robust calibration, it is still sufficient to demonstrate the feasibility of the technique.

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