Application Note 123: Calibration of Total Solids in Hommos products using the FOP-38 Fibre Optic Probe Analyser.

Introduction:

Near Infrared Transmission (NIT) Spectroscopy is a technique that can be used for real time, in process or at line analyses. NIT measures protein (N-H), fat (C-H) and water (O-H) bonds in liquids, solids or semi solids. Total Solids is measured as the residual after drying a sample and is, for all extensive purposes, the reciprocal of the water content. As such, NIT spectroscopy can be used to measure water and therefore Total Solids in virtually any product.

NIR Technology Systems' FOP-38 Fibre Optic Probe Analyser, is a novel instrument that uses a pair of 500mm long stainless steel probes to collect the NIT spectrum in a mixing tank or bucket. The probe is connected to the NIR spectrometer using fibre optic bundles up to 5m in length. Light passes from one probe through the semi solid sample to the other probe and then back to the spectrometer. Water (O-H) bonds in the sample absorb NIR energy in proportion to their concentration. A calibration is required to convert the NIT spectrum into %water and therefore % Total Solids.

This study was undertaken to demonstrate the feasibility of measuring total solids in hommos using an FOP-38 Fibre Optic Probe analyser. A trail calibration for total solids in hommos was developed.

Procedure:

10 samples of Hommos were placed in beakers and a fibre optic probe was inserted into the beaker to record the NIT spectra. The probe scanned the samples with a transmission pathlength of 10mm, over the wavelength range of 720nm to 1100nm collecting 10 scans per sample. The spectra were uploaded into NTAS (NIR Technology Analysis Software) and Partial Least Squares Regression (PLS) was used to develop a calibration for total solids.

Results:

Figure 1, below, shows the NIT spectra, over the wavelength range of 720nm to 1100nm, for the 10 samples of Hommos.

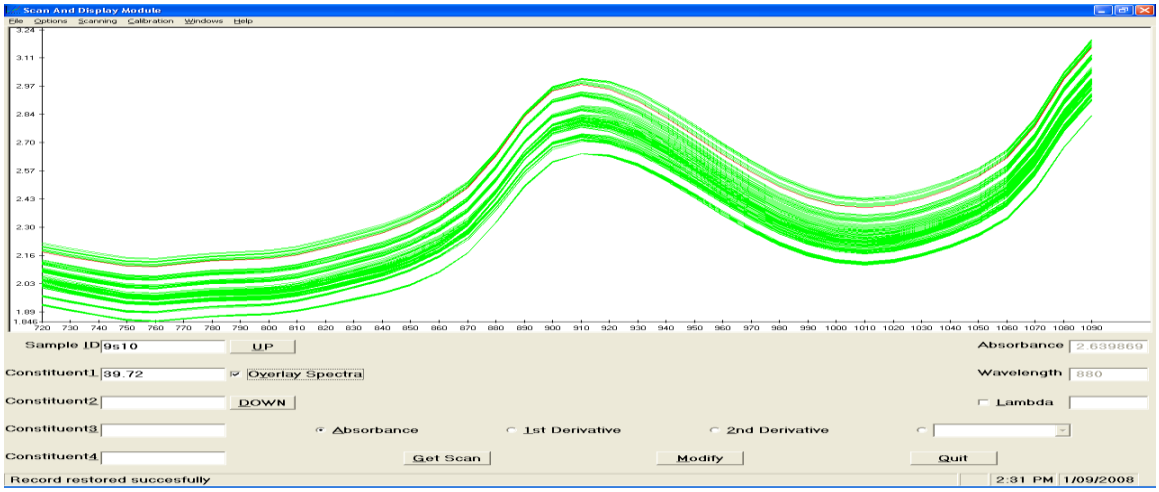

Figure 1: Plot of NIR Spectra for Hommos.

Figure 2 shows the initial trial calibration statistics for the NIT total solids values versus the reference values. The Standard Error of Prediction is 0.2% with a correlation (R^2) of 0.99.

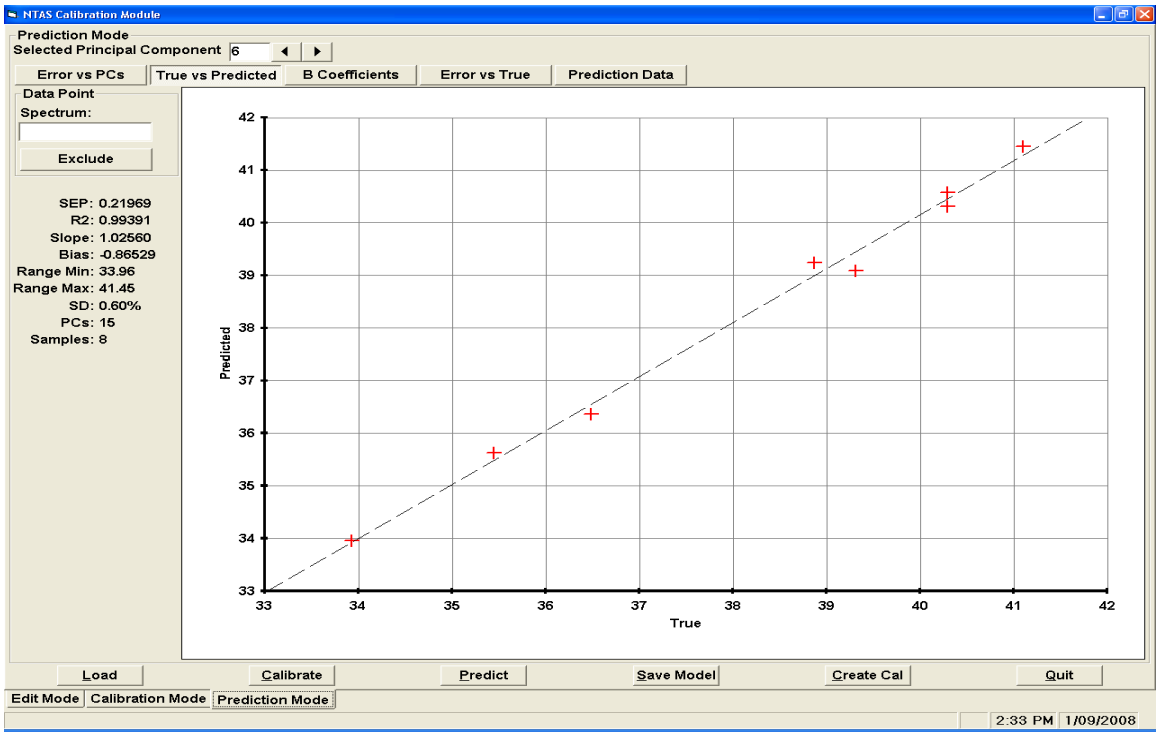

Figure 2: Plot NIR Predicted Total Solids value vs. Reference Total Solids value.

Conclusion:

It can be seen from the above details that the FOP-38 Fibre Optic Probe analyser is suitable for used to analyse hommos for total solids. As the sample sets are insufficient to develop a robust calibration, more samples need to be scanned and added to the existing calibration. This should improve the predictability of the analyser.

With development of a final calibration the inclusion of samples for temperature stabilisation would also be essential to the ongoing use of any calibration.

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