Application Note 111: Analysis of Fat content in Cream using a Series 3000 Food Analyser.

Introduction:

Determining the fat content of cream prior to processing and packing is important throughout the entire dairy industry. A quick, reliable and non-destructive means of testing the fat content of the cream would allow for prompt and focused processing for a more uniform finished product.

This study was undertaken to demonstrate the feasibility of measuring fat content in cream using the Series 3000 Food Analyser.

Procedure:

Samples of cream were taken from a processing plant and measured to a fixed quantity of 60mls. The samples were placed in a petrii dish and scanned over the wavelength range of 720nm to 1100nm collecting 10 scans per sample. The sample temperatures were controlled to 40 degrees Celsius.

Examination of the spectra found that different cream products required different calibrations. As such the scanned samples were divided into three groups based on product type. The resultant spectral groups were uploaded into NTAS (NIR Technology Australia Software) and Partial Least Squares Regression (PLS) was used to develop trial calibrations for fat content in the cream samples.

Results:

Figure 1, below, shows the NIR spectra, over the wavelength range of 720nm to 1100nm, for the combined samples of cream.

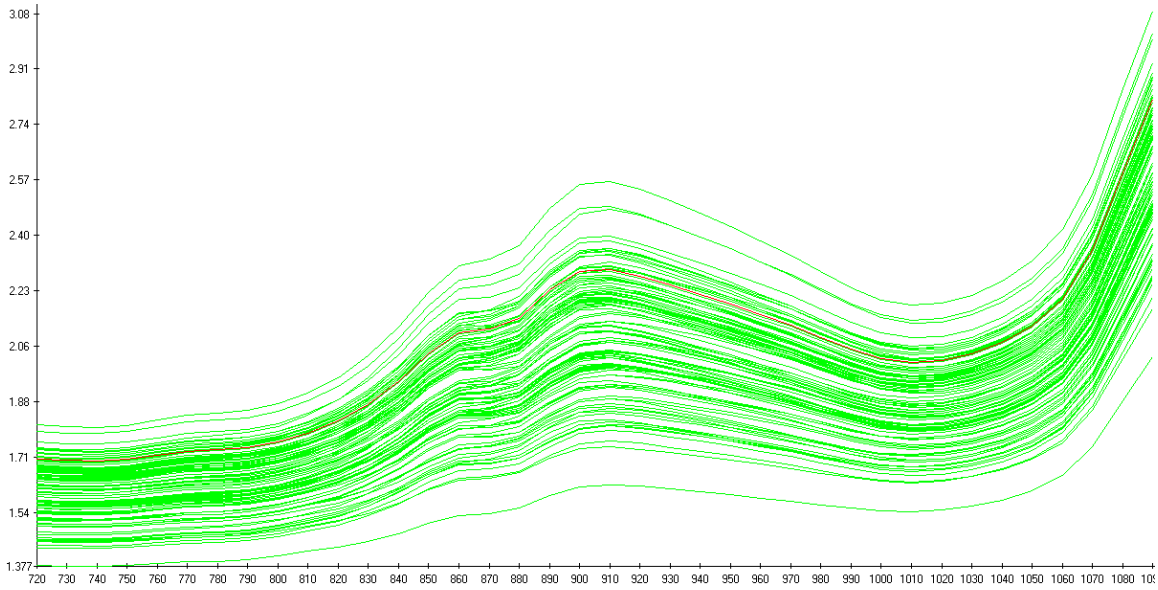

Figure 1: Plot of NIR Spectra for cream samples.

Figure 2 shows the calibration statistics for the UF cream, NIR fat values versus the reference fat values. The Standard Error of Calibration is 0.56% with a correlation (R^2) of 0.81.

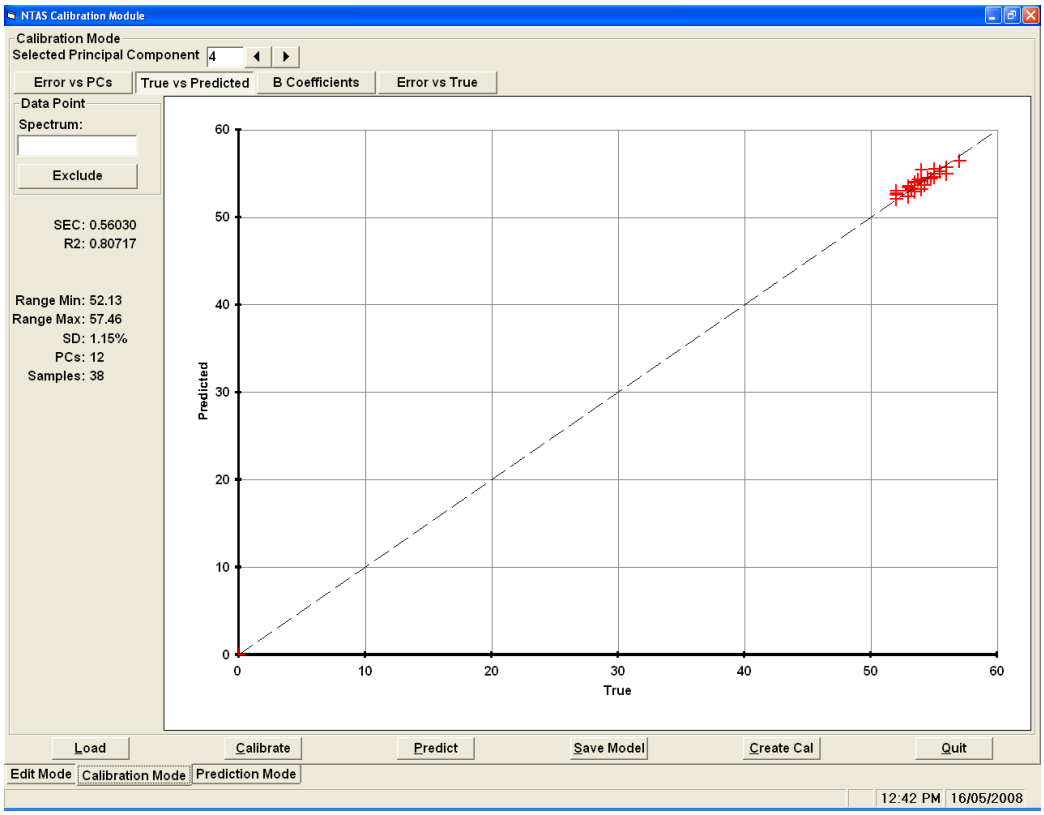

Figure 2: Plot NIR Predicted fat value vs. Reference fat value for UF cream samples.

Figure 3, below, displays the calibration plot for NIR fat versus the reference fat for the HH cream samples. The Standard Error of Calibration is 0.56% with a correlation (R^2) of 0.81.

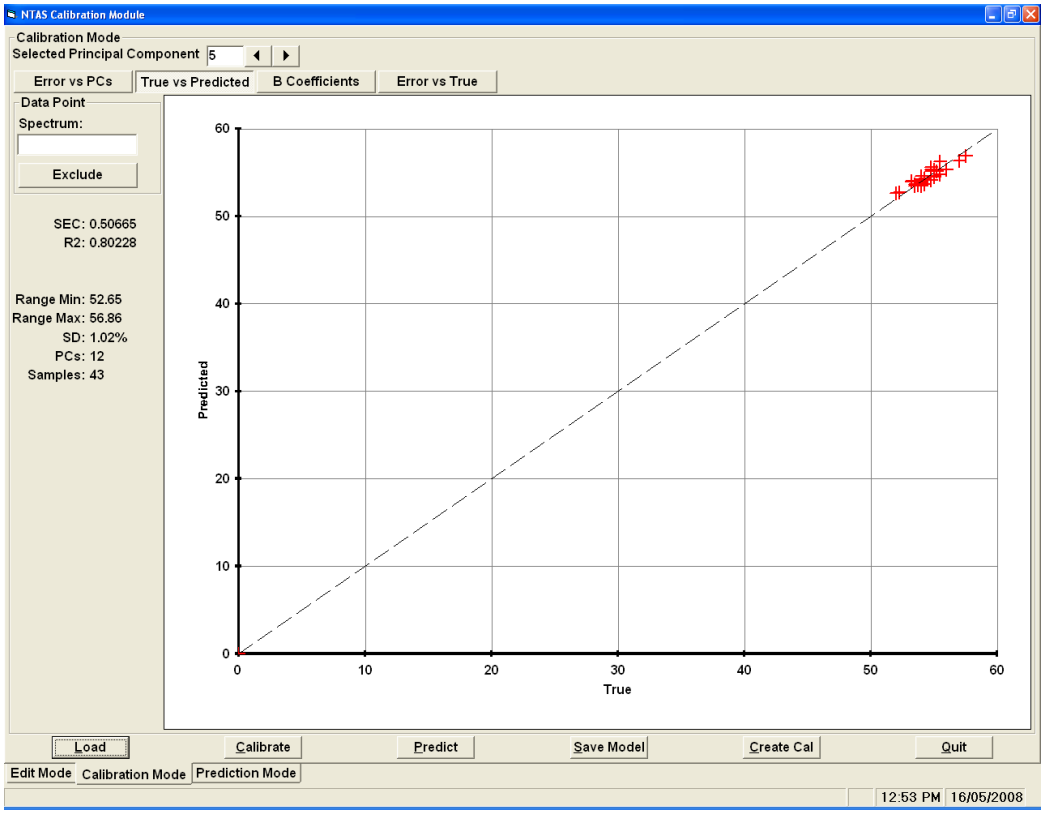

Figure 3: Plot of NIR Predicted fat value vs. Reference fat value for HH cream Samples.

Figure 4, shows the calibration plot for NIR fat versus the reference fat for the 69-type cream samples. The Standard Error of Calibration is 0.46% with a correlation (R^2) of 0.97.

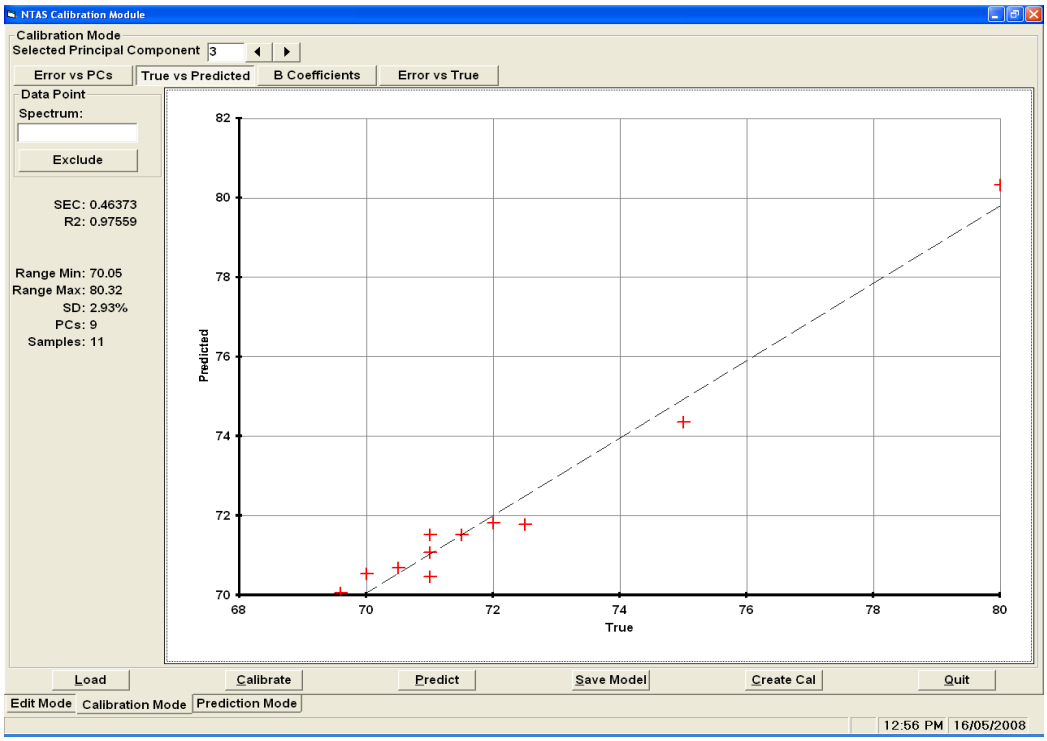

Figure 4: Plot of NIR Predicted fat value vs. Reference fat value for 69-type cream Samples.

Conclusion:

It can be seen from all of the figures above it can be seen that the Series 3000 Food Analyser can be calibrated to measure the fat values in cream.

Whilst the Standard Errors of Calibration for all sample types are approaching acceptable levels, the correlations for cream types HH and UF are not yet adequate. This is a result of a large number of samples within only a small range. If the ranges are increased the correlations will be greatly enhanced and the final calibration will be significantly more robust. It may be necessary to artificially create multiple samples to widen the current ranges of available samples.

The type-69 cream calibration whilst having an acceptable standard error of calibration and correlation it does not have sufficient samples. The range of samples appears to be acceptable for this product, however, for a truly robust calibration a significant number of samples would need to be added.

It is also important to control the temperature of the samples as much as possible. Care also needs to be taken to avoid large air bubbles in the samples as these would have an adverse effect or the readings of the analyser.

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