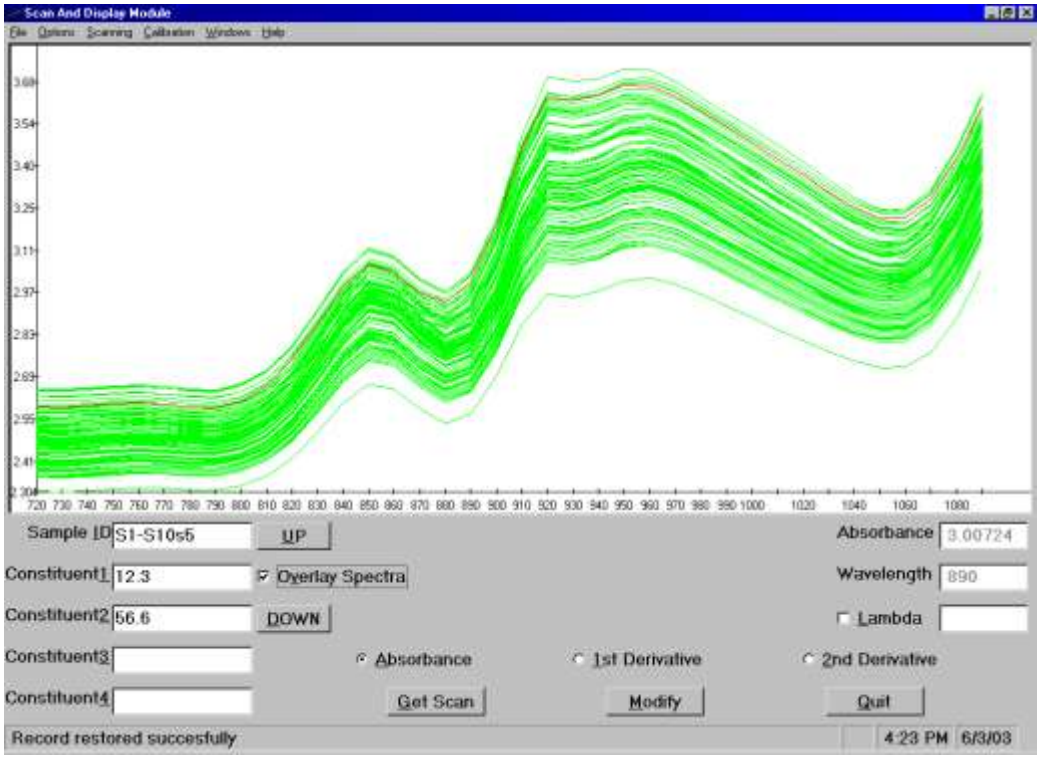
Application Note 21: Analysis of Milk Powder Blends using the NIT-38 Dairy Analyser

Introduction

A set of 10 blended milk powder samples were provided for analysis using the NIT-38 Dairy Analyser. The samples were provided with fat and sugar concentrations. The objective of this study was to access the ability to develop a NIR calibration for these samples and to assess the accuracy and reproducibility of the analysis.

Procedure:

The powder was transferred into a Powder Cell using a spoon and leveled using the shank of the spoon. The two halves of the cell were closed to form a 4 mm thick layer of milk blend between two glass windows. Excess sample was left in the cell so that the powder would compact easily on tapping. Sample loading took 15-30 seconds. The Powder Cell was loaded into the NIT-38 Dairy Analyser and 5 scans were collected for each sample. Scan time was approximately 30 seconds. The spectra were saved in the analysers internal memory. Figure 1. shows the NIR spectra of these samples.



Each sample was loaded into the sample cell, scanned, removed and then repacked, then scanned again. 10 spectra were collected for each sample.

Since the range of fat and sugar values was very small, mixtures of sample 1(8.2% fat, 59.7% sugar) and samples 9(22.8% fat, 49.8% sugar) and 10(22.7% fat, 49.7% sugar), were prepared to fill in the gap between 8.2 and 22.9 for fat and 49.7 and 59.7% for

sugar. These mixtures were scanned and added to the spectra for the rest of the samples.

Calibration:

The 110 spectra were loaded into NTAS (NIR Technology Australia Software). A Partial Least Squares (PLS) calibration was developed for both fat and sugar. The results of the calibration were as follows;

Fat	SEC = 0.24	Correlation = 0.99	7 PC's
Sugar	SEC = 0.22	Correlation = 0.99	7 PC's

Figure 2. shows the plot of the NIR Fat values versus the Reference Fat values.
Figure 3. Shows the plot of the NIR Sugar values versus the Reference Sugar values.
Table 1. shows the duplicate results for Fat.

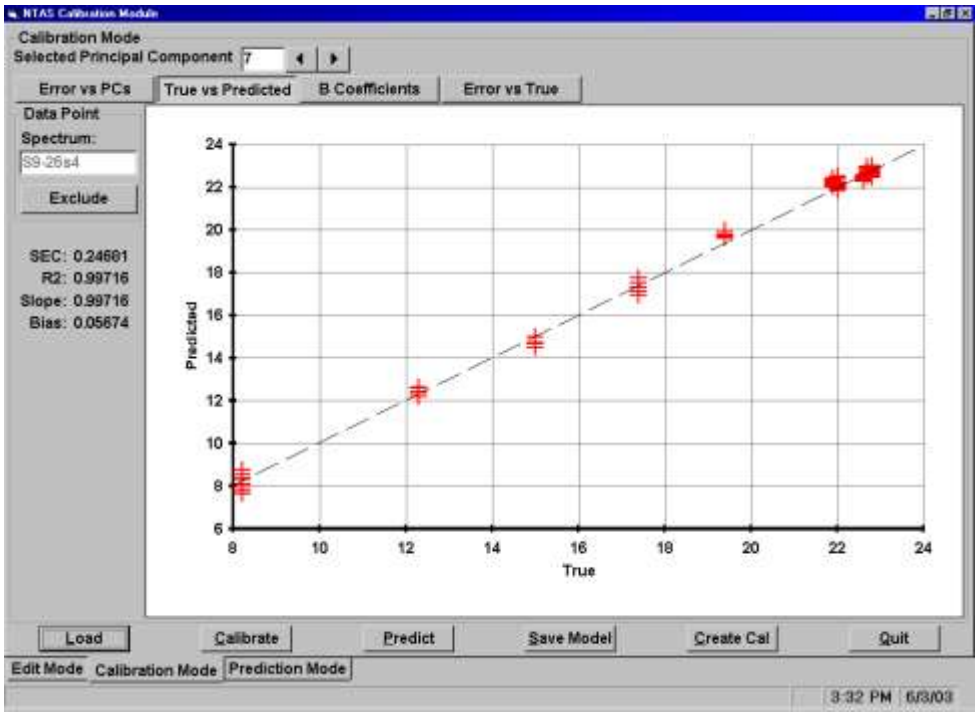
8.2	8.2	
8.2	8.2	0.0
22.8	22.7	
22.6	22.7	0.2
22.6	22.8	
22.6	22.8	0.0
22.9	22.8	
22.8	22.8	0.1
22.3	21.9	
22.1	21.9	0.2
21.9	22	
21.9	22	0.0
22.3	22	
22.1	22	0.3
22.4	22.6	
22.3	22.6	0.1

Std Deviation of Differences = 0.09%

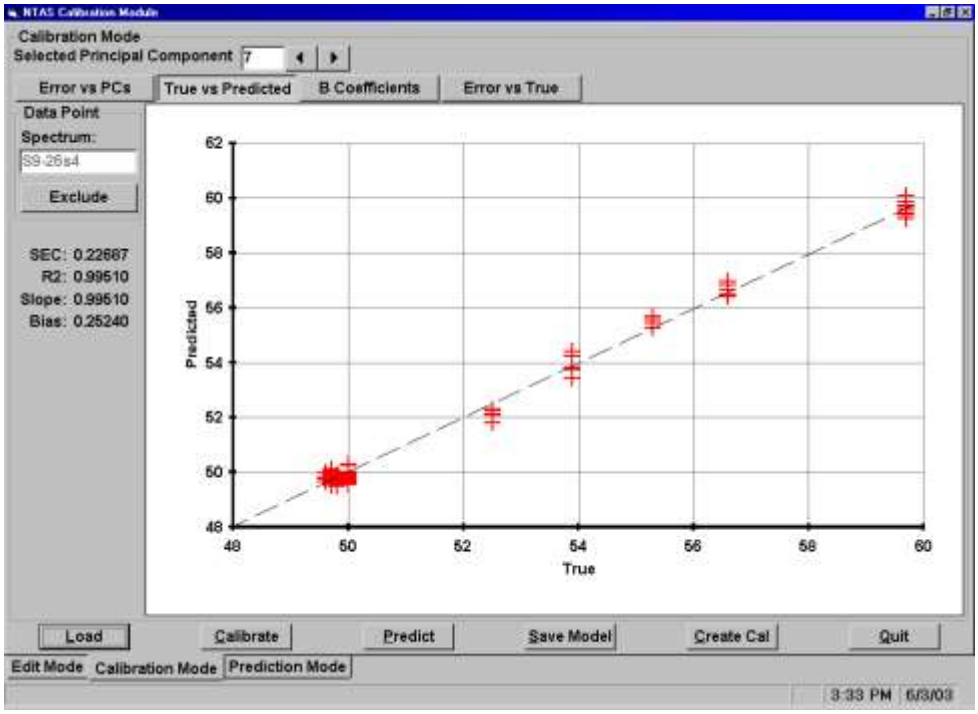
Table 2. shows the duplicate results for Sugar.

59.6	59.7	
59.7	59.7	-0.1
49.8	50	
49.9	50	-0.1
49.9	49.7	
49.8	49.7	0.1
49.7	49.8	
49.7	49.8	0.1
49.7	50	
50.0	50	-0.3
50.0	49.7	
49.8	49.7	0.1
49.8	49.6	
49.8	49.6	0.0
49.7	49.7	
49.7	49.7	0.0

Std Deviation of Difference = 0.15%



Milk Powder Blend, Fat Calibration



Milk Powder Blend, Sugar Calibration

Conclusion:

The above study is preliminary. There are insufficient samples over a wide enough range to develop a robust calibration. However the study does show that the NIR method is capable of measuring both fat and sugar to approximately 0.1%.

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