

# Application Note 79: Analysis of Moisture in Skim Milk Powder using the NIT-38 Dairy Analyser



## Introduction:

Skim milk powder is a major raw material produced by the milk industry. The quality parameters are fat and moisture as well as protein. This study demonstrate the ability of the NIT-38 Dairy Analyser to analyse moisture in skim milk powder.

## Procedure:

20 sample of skim milk powder were used to a calibration for fat, moisture and protein. The samples were scanned using a 5mm powder cell in the NIR Technology Systems NIT-38 Dairy Analyser. 10 scans for each sample were collected and imported into NTAS(NIR Technology Analysis Software) where a partial least squares regression analysis was performed for each component. To test the calibrations, 2 sets of 10 samples were analysed using the original calibration.

## Results:

Figure 1. shows the calibration plot of the NIT-38 Moisture vs Ref Moisture for the skim milk samples. The SEC = 0.1% and R2 = .869.

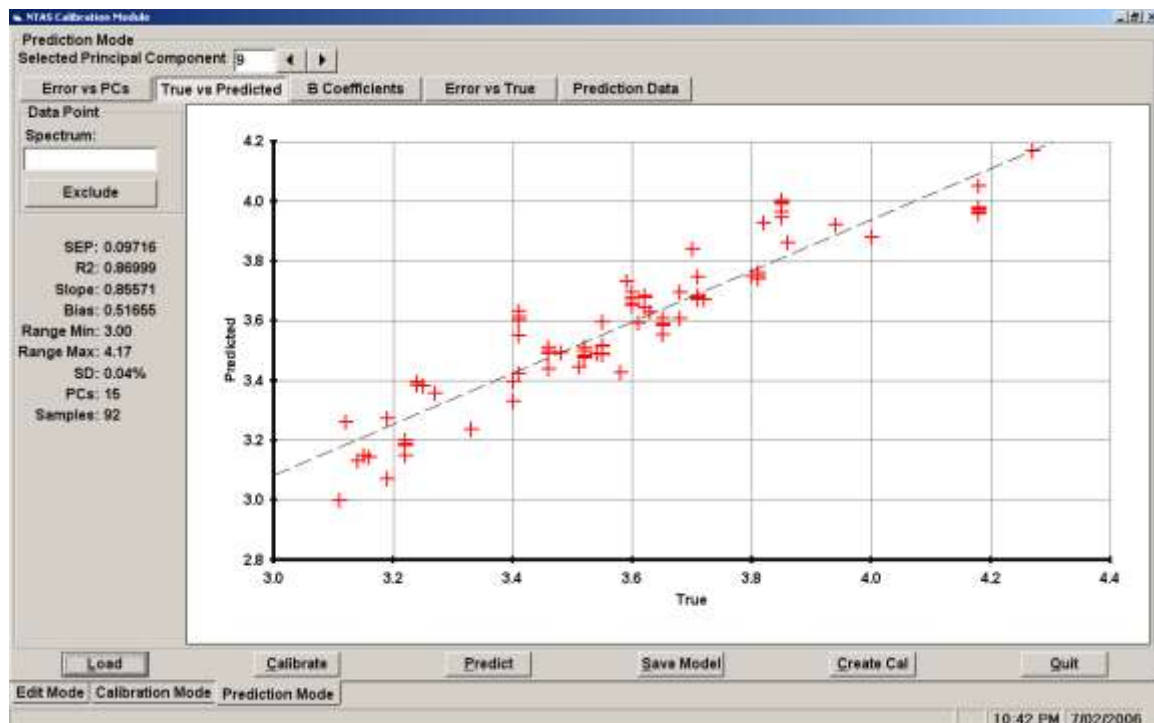


Figure 1. Calibration data

Table 2. and Figure 2. shows the results of predicting these sets

Table 2. Moisture Prediction Data

Sample ID	NIT-38	Ref	Diff
201s1	3.36	3.4	0.04
202s1	3.20	3.41	0.21
203s1	3.20	3.15	-0.05
204s1	3.21	3.33	0.12
205s1	3.30	3.54	0.24
206s1	3.29	3.27	-0.02
207s1	3.26	3.12	-0.14
208s1	3.25	3.4	0.15
209s1	3.18	3.14	-0.04
210s1	3.27	3.19	-0.08
211s1	3.03	3.19	0.16
212s1	3.13	3.11	-0.02
3201s1	2.93	2.97	0.04
3202s1	3.50	3.48	-0.02
3203s1	3.15	3.16	0.01
3204s1	3.87	3.94	0.07
3205s1	3.79	3.68	-0.11
3206s1	3.42	3.46	0.04
3207s1	3.68	3.72	0.04
3208s1	3.52	3.51	-0.01
3209s1	3.60	3.61	0.01
	SEP		0.10
	Bias		0.03

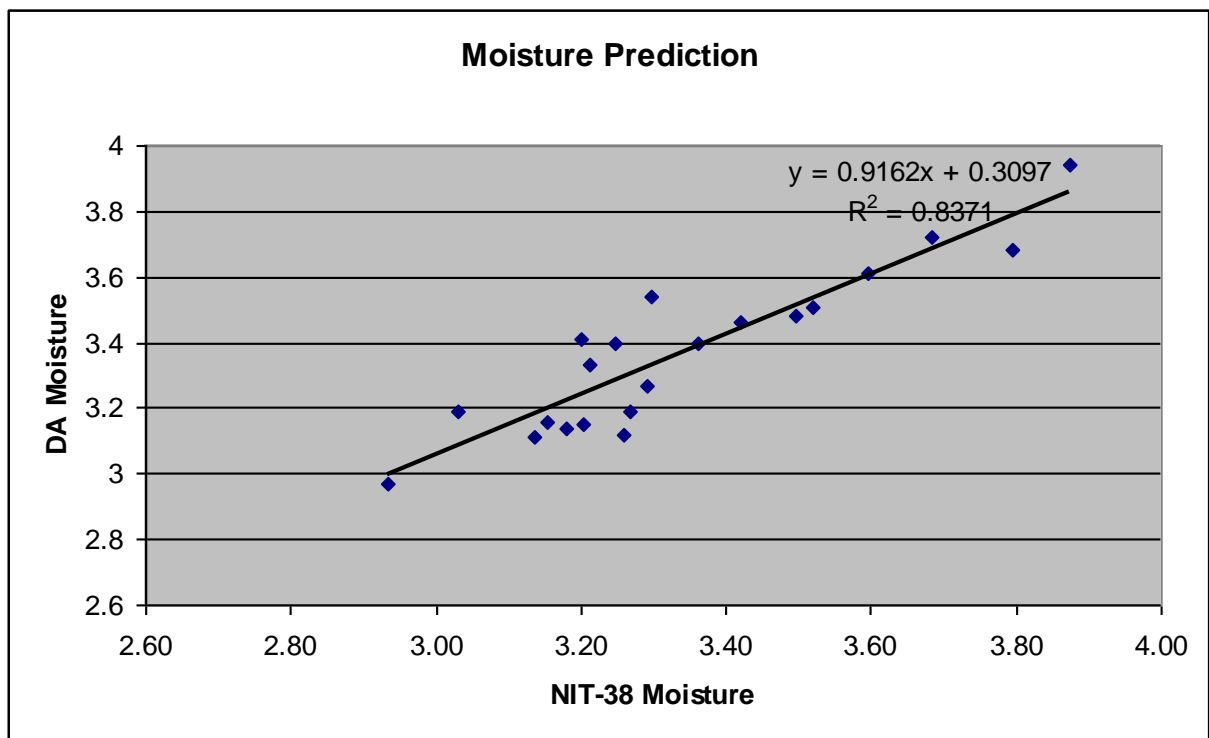


Figure 2. Plot of NIT-38 Moisture vs Ref Moisture

In the original calibration, 9 PC's were used, however the optimum number of PC's proved to be 6 based on the prediction set.

To see if the new calibration provides an improvement, the model was used to predict the 201-210 and 3201-3210 samples. Figure 4. shows the plot of the prediction data using the new calibration. The SEP is reduced to 0.08%.

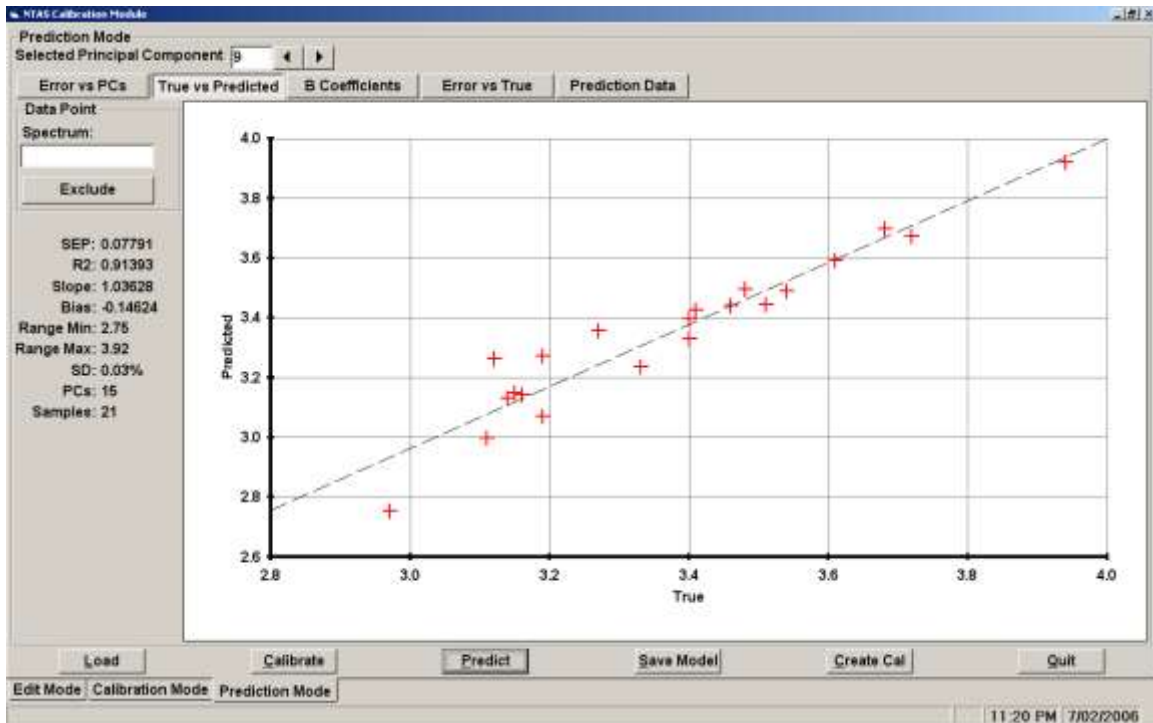


Figure 4. Moisture Prediction Data

## Conclusion:

The new calibration appears to be more robust and more accurate. This is often the case because the selection of the number of PC's used in the new calibration is based on prediction data rather than just calibration data.

The development of robust and accurate NIR calibrations is a gradual process. The objective is to develop a cause and effect relation between the NIR spectral data and the reference data. Initial calibrations can only be considered as starting calibrations so that further data can be collected which represents the true variation in samples, environment and instrument conditions. This is what we can see from the above data.