Application Note: 113. Irish Flour Analyses. Cropscan 2000F

Introduction:

Near Infrared Reflectance (NIR) spectroscopy has been used in the flour milling industry for 30 or more years, however Near Infrared Transmittance (NIT)spectroscopy, which used for whole wheat grain analysis, is a new procedure for flour analysis.

This study is to demonstrate that NIT provides flour millers an analyser that measures protein, moisture, water absorption and starch damage in flour as well as protein and moisture in whole wheat grains.

Description:

Odlums Milling, Cork, Ireland, invited us to setup a Cropscan 2000F in their laboratory to evaluate the performance against the Leco combustion analyser for protein and the Perten 8600 NIR analyser for moisture, starch damage and water absorption.

38 bags of flour which had been analyses by the Leco and Perten systems were used to develop a calibration for 4 parameters. A second set of 13 samples were used as a check set . All samples were scanned on the Cropscan 2000B NIT Analyser using a 5mm pathlength Powder Cell and 5 scans were collected for each sample and then repacked and repeated.

Results:

Figure 1 shows the NIT spectra of flour collected on the Cropscan 2000B.

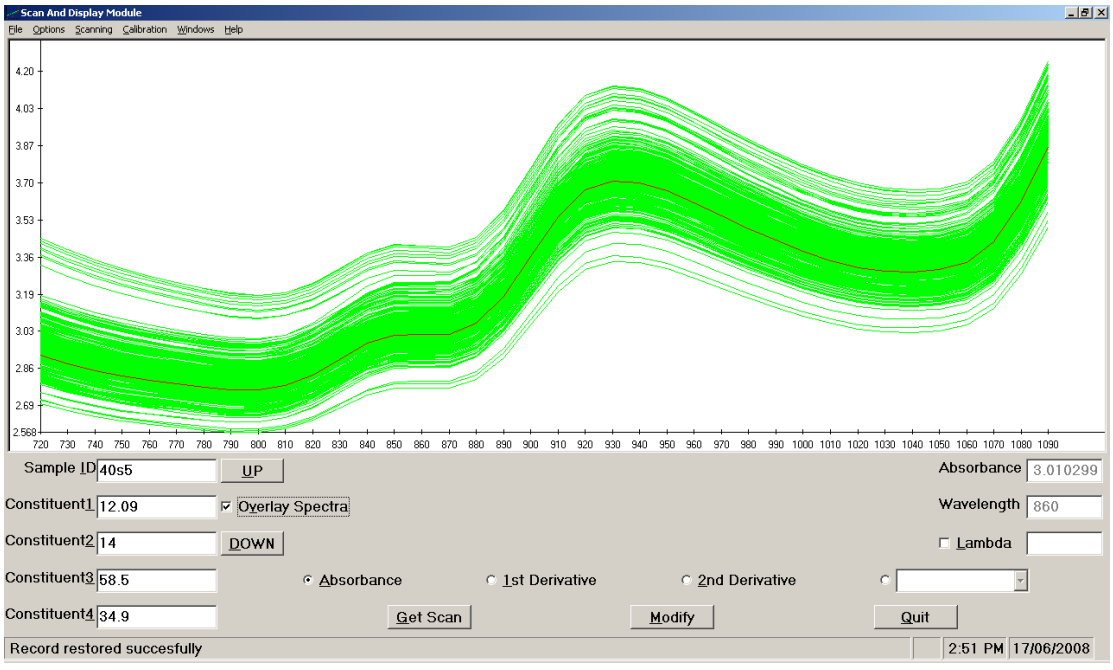


Figure 2 shows the calibration plot for Protein.

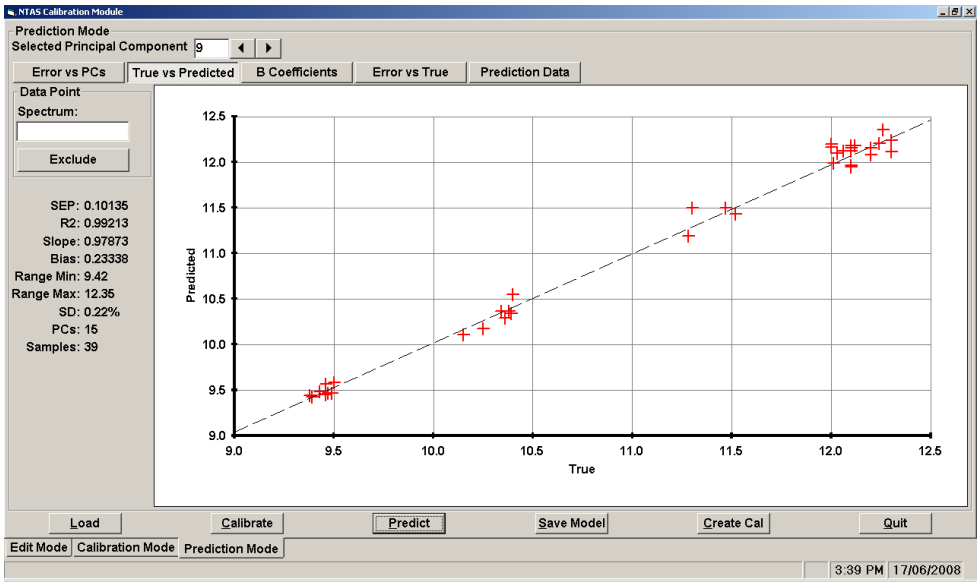


Figure 3. shows the calibration plot for Moisture.

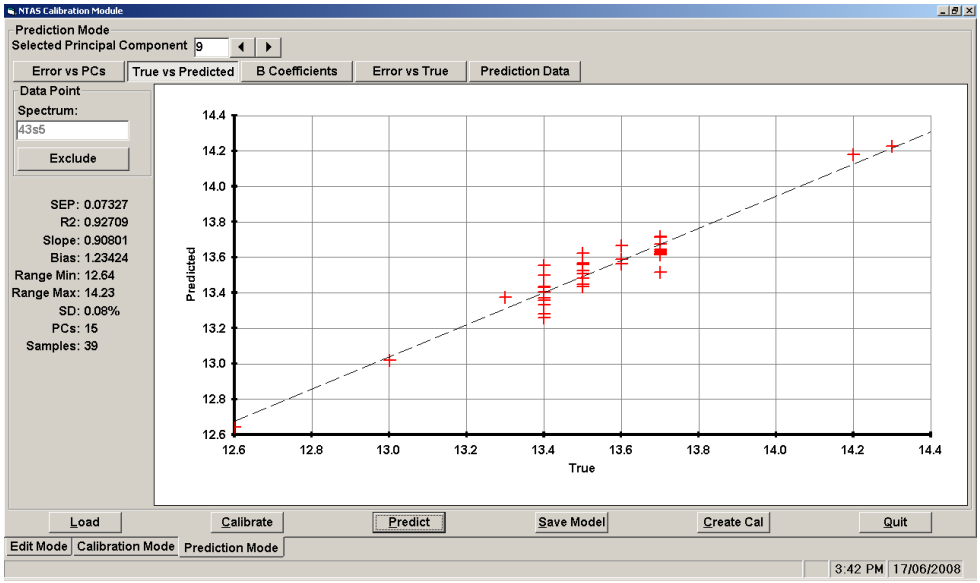


Figure 4. shows the calibration plot for Water Absorption.

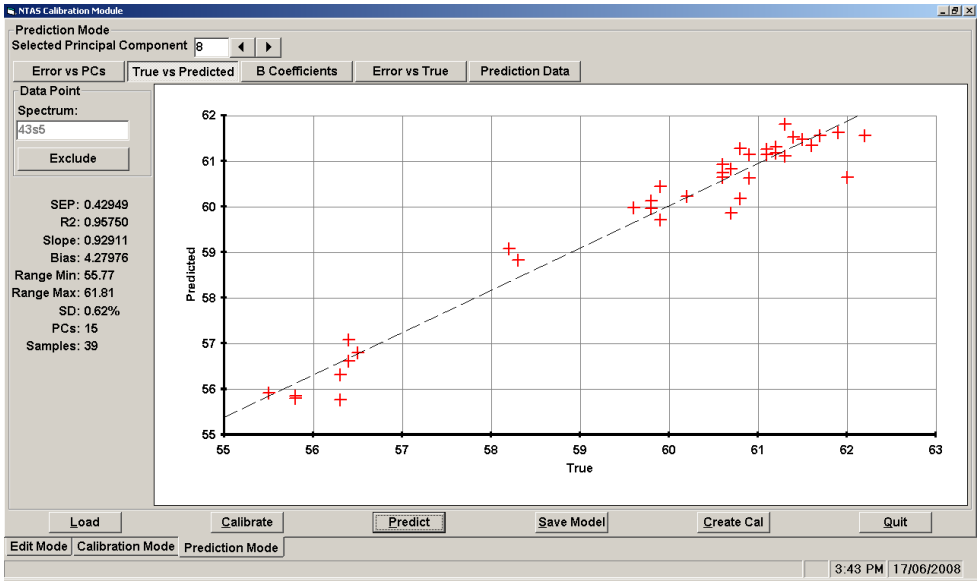
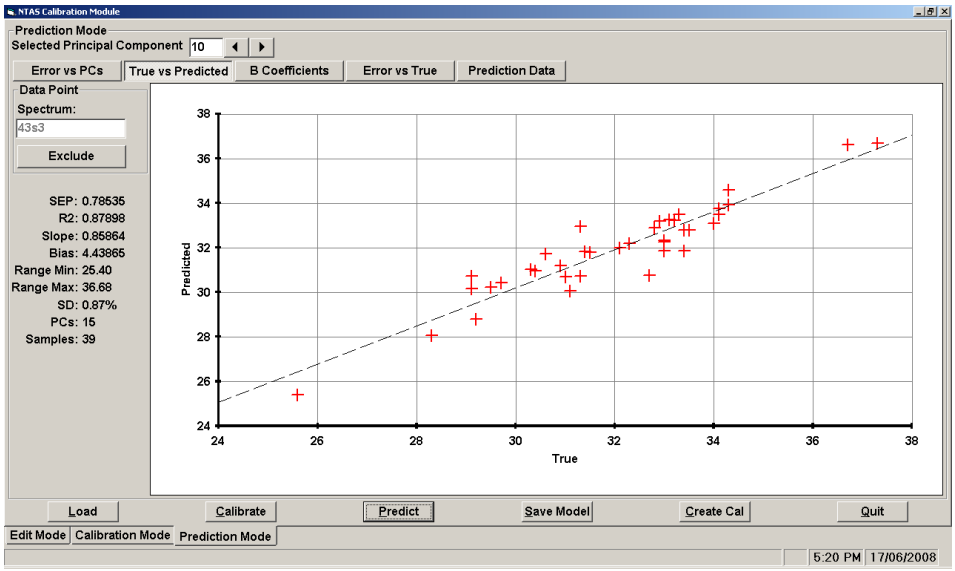


Figure 5. shows the calibration plot for Starch Damage.



The prediction set results are shown in the tables below.

Table 1. Prediction data for Protein and Moisture

Sample ID	NIT Prot	Ref Prot	Diff	NIT Mois	Ref Mois	Diff
3	12.14	12.3	0.16	13.6	13.7	0.13
11	10.38	10.34	-0.04	13.4	13.5	0.15
12	10.40	10.27	-0.13	13.4	13.3	-0.07
17	10.20	10.3	0.10	12.9	13.0	0.11
13	10.35	10.28	-0.07	13.4	13.4	0.02
24	9.52	9.49	-0.03	13.7	13.7	-0.04
28	9.53	9.39	-0.14	13.7	13.5	-0.18
5	12.02	12.05	0.03	13.7	13.7	0.00
Noon	12.23	12.41	0.18	13.7	13.6	-0.06
2	12.18	12.36	0.18	13.6	13.6	0.00
3	12.22	12.24	0.02	13.7	13.6	-0.09
4	12.11	12.23	0.12	13.6	13.6	-0.05
		SEP	0.12			0.10
		Bias	0.03			-0.01

Table 7. Prediction data for Water Absorption and Starch Damage

Sample ID	NIT Wabs	Ref Wabs	Diff	NIT SD	Ref SD	Diff
3	61.7	61.4	-0.34	29.6	32.5	2.93
11	59.7	60.1	0.36	32.5	34.2	1.68
12	60.2	59.8	-0.36	32.6	32.8	0.18
17	60.7	59.2	-1.46	27.8	28.8	0.98
13	60.2	60.2	0.05	33.4	33.6	0.24
24	56.2	56.3	0.10	33.5	34.0	0.50
28	56.3	55.8	-0.54	33.7	31.3	-2.36
5	61.2	61.2	-0.01	31.7	32.3	0.63
Noon	61.0	61.4	0.43	31.5	31.2	-0.34
2	61.1	61	-0.08	31.4	30.4	-0.99
3	60.9	60.5	-0.43	32.3	32.1	-0.18
4	61.2	61	-0.19	32.6	31.6	-1.00
		SEP	0.50			1.36
		Bias	-0.21			0.19

Duplicate analysis were performed for each sample. The repeatability of analyses after repacking are show in table 3.

Table 3. Repeatability data

	SDD
Protein	0.07%
Moisture	0.04%
Water Absorption	0.26
Starch Damage	0.35

Discussion:

The tables above show that the Cropscan 2000B working in transmittance rather than reflectance provides accurate and repeatable prediction of flour for protein, moisture and water absorption. The prediction data for starch damage has blown out as compared with the calibration data, ie, SEP = 1.36 vs SEC = .78. This may be due to some over fitting of the calibration data to produce a lower error as possible.

NIR Technology Systems
366 Edgar Street, Condell Park, NSW, 2200, Australia
Tel: 612 9771 5444, Fax: 612 9771 5255
Email: nirtech@nirtech.net, Web: www.nirtech.net