

Analysis of Wheat Flour Using the DA 7250 NIR Analyzer

Introduction

Flour millers need to adhere to strict quality specifications and deliver a consistent product even when incoming wheat varies. At the same time mill profitability depends on maximizing the extraction. Being able to quickly determine key characteristics in the flour is thus of great importance.

The Near Infrared Reflectance (NIR) technique is highly suitable for this purpose, but limitations in older instrument have not permitted users to reap the full benefits of NIR. Requirements such as special cups and laborious cleaning between samples made analyses laborious and time consuming, and as instruments were sensitive to dust they needed to be kept in clean labs.

DA 7250 NIR Analyzer

The DA 7250 is a proven, full-spectrum NIR instrument designed for use in the flour milling industry. Using novel diode array technology it performs a multi-component analysis in only 6 seconds.



During this time a large number of full spectra are collected and averaged. As the sample is analyzed in an open dish, the problems associated with sample cups are avoided and operator influence on results is minimal. The DA 7250 is IP65 certified and can be placed even in very dusty environments.

Experimental

More than 500 wheat flour samples from mills around the world were collected. The samples were analyzed in the DA 7250 and by wet chemistry methods.

Calibrations were developed by Perten Instruments using Partial Least Squares (PLS) regression, a method which develops accurate and robust calibrations. Savitsky-Golay 1st derivative, Detrend and SNV data pretreatments were used to improve the calibration models.

Results and discussion

The DA 7250 NIR Analyzer measured the samples with an accuracy similar to the reference methods. Statistics for the respective parameters are presented in the table below and graphs are displayed on page 2.

Parameter	Samples	Range	R
Moisture	400+	9.3 – 15.6	0.99
Protein	400+	8.3 – 21.3	0.99
Ash	500+	0.38 – 2.11	0.98
Wet gluten	400+	12.3 – 51.8	0.99
Zeleny sedimentation (ml)	300+	10 – 61	0.87
Color L*	500+	80.6 – 94.1	0.94
Color a*	500+	-0.2 – 3.0	0.9
Color b*	500+	6.3 – 12.7	0.83
Water absorption	300+	55.5 – 73.1	0.91
Starch damage	200+	3.9 – 7.5	0.95
W (Alveograph)	<100	111 – 417	0.91
Dry gluten	400+	3.9 – 18.9	0.99
Alveolength (mm)	300+	37 – 185	0.84
Alveo swelling index (ml)	100+	13.5 – 30.3	0.86

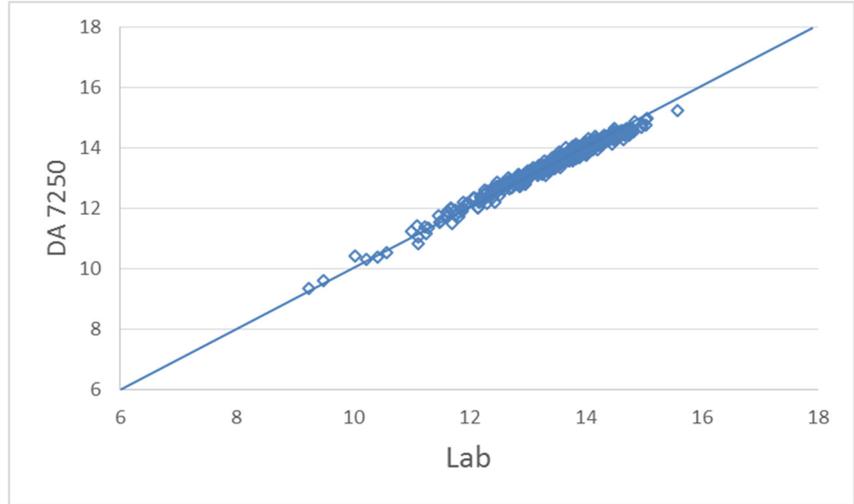
The differences between the DA 7250 and the reference methods are of the same magnitude as the typical differences between two reference labs.

Considerable product variation is built into these calibrations. The statistics reported above therefore represent true future performance.

In summary it is concluded that the DA 7250 NIR Analyzer can analyze the aforementioned parameters in wheat flour accurately in 6 seconds.

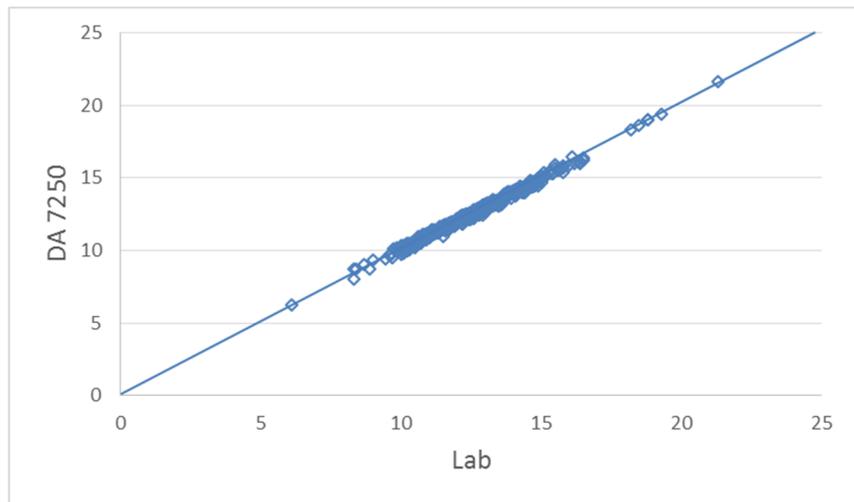
Moisture

The DA 7250 determines moisture very accurately.



Protein

The calibration covers a very wide range, and accurately measures high protein samples. This means that all types of flours can be analyzed with the same calibration.



Ash

The calibration handles samples from below 0.4% to over 2% ash, all with a very good accuracy, making the DA 7250 suitable for monitoring and optimization of ash.

