

Near Infrared Spectroscopy

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Analysis of Dairy Powders Using the DA 7250 NIR

Introduction

Analysis of dairy powders is of great importance to production plants producing them and to those using them as ingredients. By accurately controlling many constituents, the producer can experience significant savings by optimizing production to meet specifications. The dairy powder user can avoid mistaken deliveries as well as formulate products to meet functional and compositional requirements

The Near Infrared Reflectance (NIR) technique is particularly suited for measurement of dairy powders, but past instrument limitations have not allowed users to reap the full benefits of NIR. Which made analyses slow, laborious, time consuming and error-prone.



DA 7250 NIR Analyzer

The PerkinElmer DA 7250™ is a proven NIR instrument designed for use in the food industry. Using novel diode array technology it performs a multi-component analysis in less than ten seconds with no sample preparation required. 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 rated and available in a sanitary design version, making it suitable for use in the lab as well as in production environments.

Method

More than 2500 samples of various dairy powders from multiple processing plants were analyzed on DA 7250 instruments. Samples included large product variability and consisted of both skim and whole milk powders.

Multivariate calibration models were developed to model the relationships between the instruments NIR spectra and reference chemistry results for moisture, protein, fat, ash, lactose and alkalinity for the dairy samples. Calibrations were developed using scatter correcting pre-treatments and Perten Hongis Regression, HR, algorithm. HR is a proprietary calibration algorithm designed for NIR calibrations to include large product variability, while maintaining high accuracy.

Results and Discussion

The DA 7250 results were very accurate when compared to the results from the reference methods, comparable to the reproducibility of the reference methods. Statistics for the respective parameters are presented in the table below and calibration graphs for moisture, protein and fat calibrations are displayed in Figures 1, 2, and 3.

Table 1. Statistics for various constituents and respective parameters.

Parameter	N	Range	R
Moisture %	2500+	1.3 – 5.3	0.95
Protein % asis	2500+	3.8-38.7	0.99
Fat % asis	2700+	0.01-37.6	0.99
Ash % asis	1500+	4.8-10.2	0.98
Lactose % asis	100+	36.8-79	0.98
Alkalinity mg/l CaCO ₃	200+	1-320	0.83

In summary it is concluded that the Diode Array 7250 NIR analyzer can analyze dairy powders with high accuracy for the constituents.

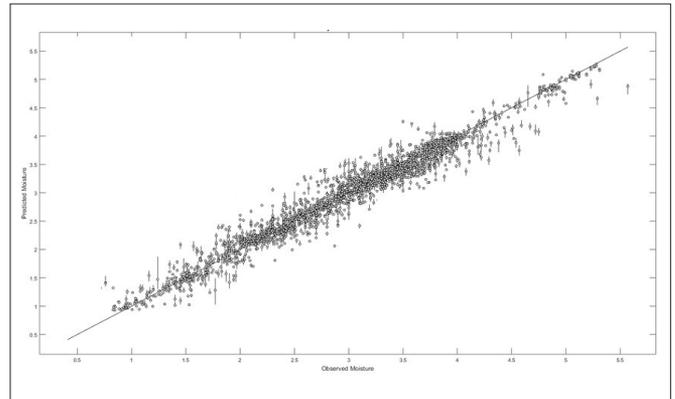


Figure 1. **Moisture:** Proper moisture levels affect the profitability of the plant as well as the quality of the product. Incorrect moisture levels can cause clumping.

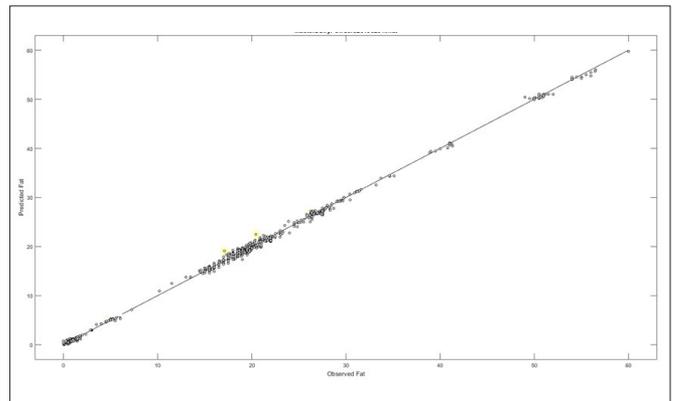


Figure 2. **Fat:** Fat is accurately and readily measured across a wide range of values. Fat effects product taste and functionality.

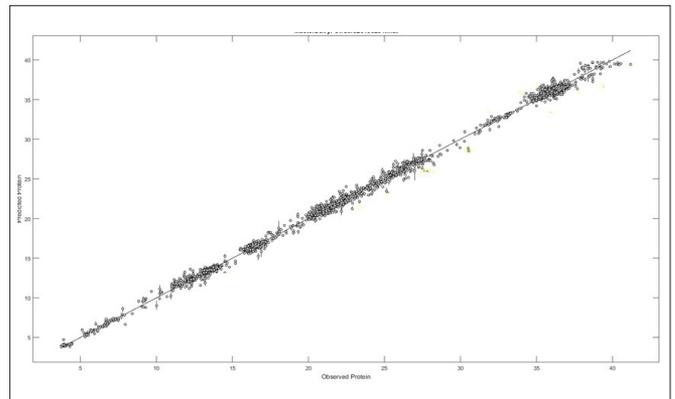


Figure 3. **Protein:** Different protein level dairy powders are required to provide specific functionality in formulated products. The DA 7250 can verify shipments quickly.