Analysis of Batters & Coatings for Total Solids Using a DA 7200 NIR Diode Array Based Analysis System

Introduction

Analysis of Total Solids of batter and coatings is an important process control measurement for potato processors. By accurately controlling solids, the producer can experience significant savings. Realizing these savings is dependent both upon the accuracy of the analyses and the availability of real-time results. Using the DA 7200, production staff can perform their own analysis 24/7 and have instant access to the results. The results can be used to ensure the proper solids are available to the potatoes, to reduce waste, and to avoid costly mistakes and potential penalties.

The Near Infrared Reflectance (NIR) technique is particularly suited for measurement of batters and coatings, but past instrument limitations have not allowed users to reap the full benefits of NIR. Sample presentation requirements such as glass sample cells that had to be filled properly and were difficult to clean made analyses laborious, time consuming and error-prone.

Diode Array 7200

The DA 7200 is a new full-spectrum, NIR instrument designed for use in food processing industries. Using innovative 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. Since the sample is analyzed in an open dish, the problems associated with cells are avoided and operator influence on results is minimal.

Experimental

Over 100 batter and coating samples from several processing plants served as the calibration set. The samples encompassed starch and flour based batters and coatings. Each sample was collected directly at the production line application point. A portion of the collected sample was placed into a disposable cup and spectral data was collected on the DA 7200.

A separate portion of the sample was analyzed using a CEM microwave moisture oven with results reported in Total Solids. The accuracy of the CEM was measured to be +/- 0.6%. The CEM measurements were then used as the reference chemistry results in the calibration process.

Calibrations were developed using Partial Least Squares (PLS) regression. Standard Normal Variant Transform was used as a data pre-treatment to improve the calibration models.

Results and discussion

The DA 7200 results are very accurate when compared to the results from the reference methods. Statistics for the Total Solids are presented in the table below and a graph is displayed on page 2.

Parameter	Range	Samples	R
Total Solids	28.39 – 42.57	100+	0.939

The differences between the DA 7200 and the CEM are of the same magnitude as typical differences between two different reference labs. The DA 7200 is more precise than the reference methods meaning that replicate analyses are generally more repeatable and representative. It should also be noted that it might be possible to analyze additional parameters of a batter or coating simultaneously. Total analysis time per sample – including sampling – was 35 seconds for the DA 7200 and 4-7 minutes for the CEM.

Total Solids

Total Solids is accurately and readily measured across a wide range of values. Several batters and coatings are included in this single calibration.

Solids in Batter