Analysis of Cut Tobacco for Oven moisture, Nicotine Sugar, Menthol and more

Introduction

For cigarette producers it is critical to be able to monitor and control key parameters such as oven moisture, sugar, nicotine, menthol and more.

The Near Infrared Reflectance (NIR) technique is particularly suited for measurement of these types of samples, but past instrument limitations have not permitted users to reap the full benefits of NIR. Filter technology instruments require frequent adjustments and recalibrations, and do not offer the accuracy required.

DA 7250 NIR Analyzer

The DA 7250 is a proven, full-spectrum NIR instrument designed for use in the tobacco 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. The analysis of full spectra makes it possible to determine complex parameters and to analyze without recalibration when switching blends.

Experimental

Close to 3000 cut tobacco samples were analyzed on DA 7250. Reference analyses were performed using drying at 110 deg C oven temperature for three hours for moisture, and Static Head Space Gas Chromatography for menthol. For nicotine Coresta method No. 35 was used, and for sugars Coresta method No. 37.

Calibrations were developed by Perten Instruments using The Unscrambler chemometrics software by Camo. The regression method used was Partial Least Squares (PLS). Multiplicative Scattering Correction (MSC) and Savitsky-Golay 1st derivatives were used as a data pre-treatment to enhance some of the calibration models.

Results and discussion

The DA 7250 results are very accurate when compared to the results from the reference methods. Statistics for the respective parameters are presented in the table below and graphs are displayed on page 2.
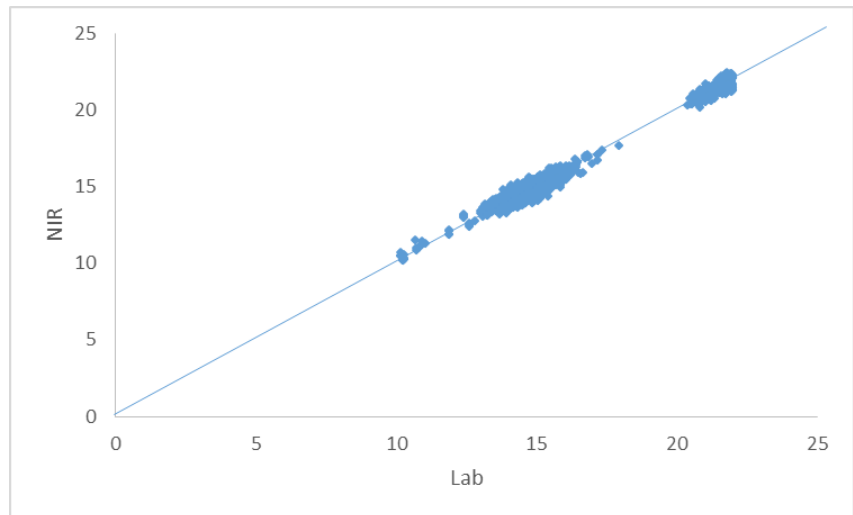
Parameter	Range	Samples	R
Oven Moisture	10.1 – 22.0	2500+	0.99
Nicotine	1.7 – 3.7	400+	0.97
Sugar	1.0 – 14.0	200+	0.98
Menthol	0.17 – 1.37	700+	0.99
Nitrate	0.4 – 1.3	200+	0.97
Ammonia	0.1 – 0.6	200+	0.96
Chloride	0.4 – 1.6	200+	0.95
Propylene glycol	0.2 – 2.7	<100	0.82
Glycerin	0.5 – 2.7	<100	0.84

The differences between the DA 7250 and the reference method are of the same magnitude as typical differences between two different reference labs. The DA 7250 is more precise than the reference methods meaning that replicate analyses are generally more repeatable and representative.

In summary it is concluded that the DA 7250 can analyze tobacco for the aforementioned constituents. The speed allows users to easily and accurately analyze many samples a day in nearly real time. The ease-of-use and accuracy make it ideal for use at cigarette plants worldwide.
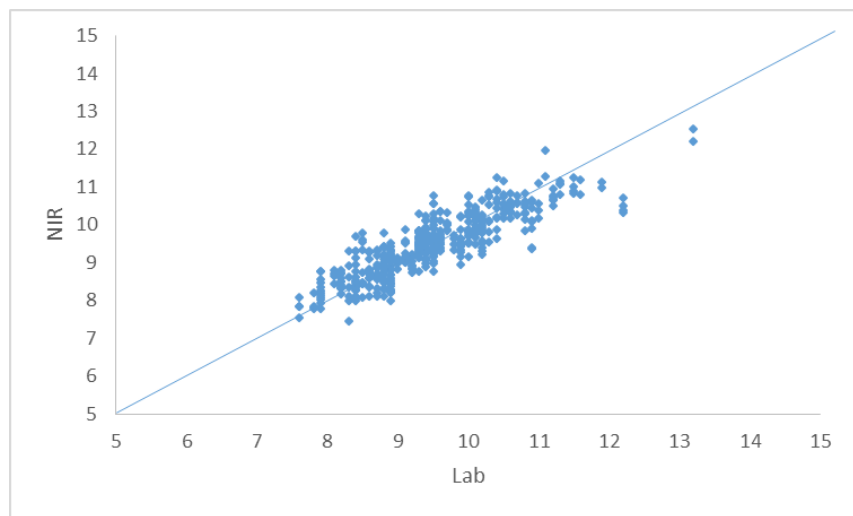
Oven moisture

Oven moisture is measured accurately, with no need for adjustments when switching blends. Tobacco with moisture from 10% to over 20% is measured with one calibration.

Sugars

The DA 7250 can accurately determine sugars, total as well as reducing, in only a few seconds.

Nicotine

Using the DA 7250 nicotine can be determined rapidly and accurately. While the number of samples is limited, the calibration has excellent correlation.