



Application Note AN N282

FT-NIR Spectroscopy for the Sugar Industry

Producing sugar from sugar cane or beet is a process with multiple steps. Along the complete production chain a tight quality control is important to ensure optimized yield and quality. FT-NIR offers a fast and effective tool for controlling the critical QC parameters of raw materials, products and by-products in all production steps: disintegrated cane, different types of juices, molasses, massecuites, raw sugar and syrups up to side products like bagasse and bioethanol.

Near infrared spectroscopy provides accurate analysis results of multiple components within seconds. It is a non-destructive method without any sample preparation and does not require the use of any solvents or reagents. Operators can easily perform the real time measurements resulting in huge time and cost savings. FT-NIR can be implemented in the lab of a sugar mill, at-line in the production area or even on-line in order to control products and by-products.

Cane Reception and Milling

The samples of incoming cane taken by a core sampler from the trucks are shredded for further analysis. Instead of pressing out the cane juice for payment analysis the cane can be directly analyzed with the CPS (Cane Processing System) which allows an analysis of 3 to 15 kg in one run. The cane is automatically settled on a small conveyor belt and passes the NIR sensor head which can be installed for an on-line cane analysis directly in the mill as well. On cane the parameters Brix in Juice, POL, Fiber and Moisture can be analyzed simultaneously and within a minute.

Sugar Factory Operations

During the different steps of processing the cleared juice to raw sugar a lot of intermediate products are of interest to be analyzed quickly for process monitoring and control. With a lab or at-line FT-NIR bench top analyzer all kind of samples of different juices, molasses, magma, seed, pan feeds and massecuites can be analyzed on Brix, Pol, Ash, Sucrose, Glucose and Fructose directly by filling a sample vial. If the samples are diluted the analysis is performed in transmission flow cell with temperature control which ensures higher accuracy.

Sugar Refinery Process

In the refinery process first the raw sugar can be analyzed on many parameters: Pol, Moisture, Reducing Sugars, Ash and Color (ICUMSA). During processing again intermediate products like molasses and other can be checked for process optimization. Final products like crystal sugar and syrups can be analyzed for quality control.

Bioethanol Process

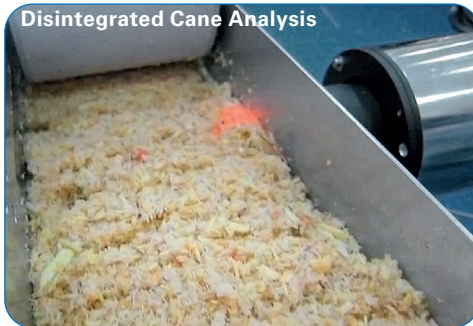
Fermentation of molasses and other sugar process by products is a straight forward and widely used production process for bioethanol. With FT-NIR each of the steps can be controlled starting from the raw materials over the fermentation and distillation/rectification to the final bioethanol. Especially for the fermentation and the distillation NIR in-line technology is an option which provides best opportunities for real time process control to optimize yield and processing time.

Cane Reception and Milling Operations

MATRIX-CPS System



Disintegrated Cane Analysis



Analysis of

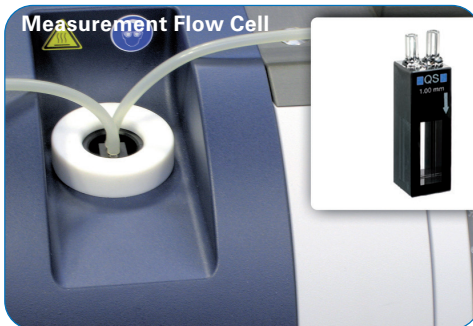
- disintegrated sugar cane on Brix, Fiber, Moisture, Pol
- Bagasse on Fiber and Moisture

Sugar Factory Operations

Samples of Factory Products



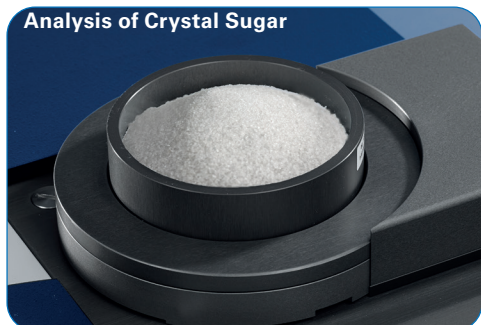
Measurement Flow Cell



Analysis of various factory products such as Juices, Molasses and Massecuites on Brix, Pol, Sucrose, Fructose, Glucose and Ash either directly or after dilution for higher accuracy.

Sugar Refinery Process

Analysis of Crystal Sugar



Measurement of Syrups



Analysis of raw sugar, and products like crystal sugar, syrups etc. on Pol, Moisture, Reducing Sugars, Ash and Color (ICUMSA).

FT-NIR Spectrometers: Bruker Optics offers various FT-NIR spectrometer models for lab, at-line and on-line applications:

TANGO



Touch-screen operated FT-NIR analyzer for routine use in the lab and atline.

MPA II



Multi Purpose Analyzer for maximum flexibility with ease-of-use.

MATRIX-F



Process monitoring with probes and contact-less sensor heads.

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