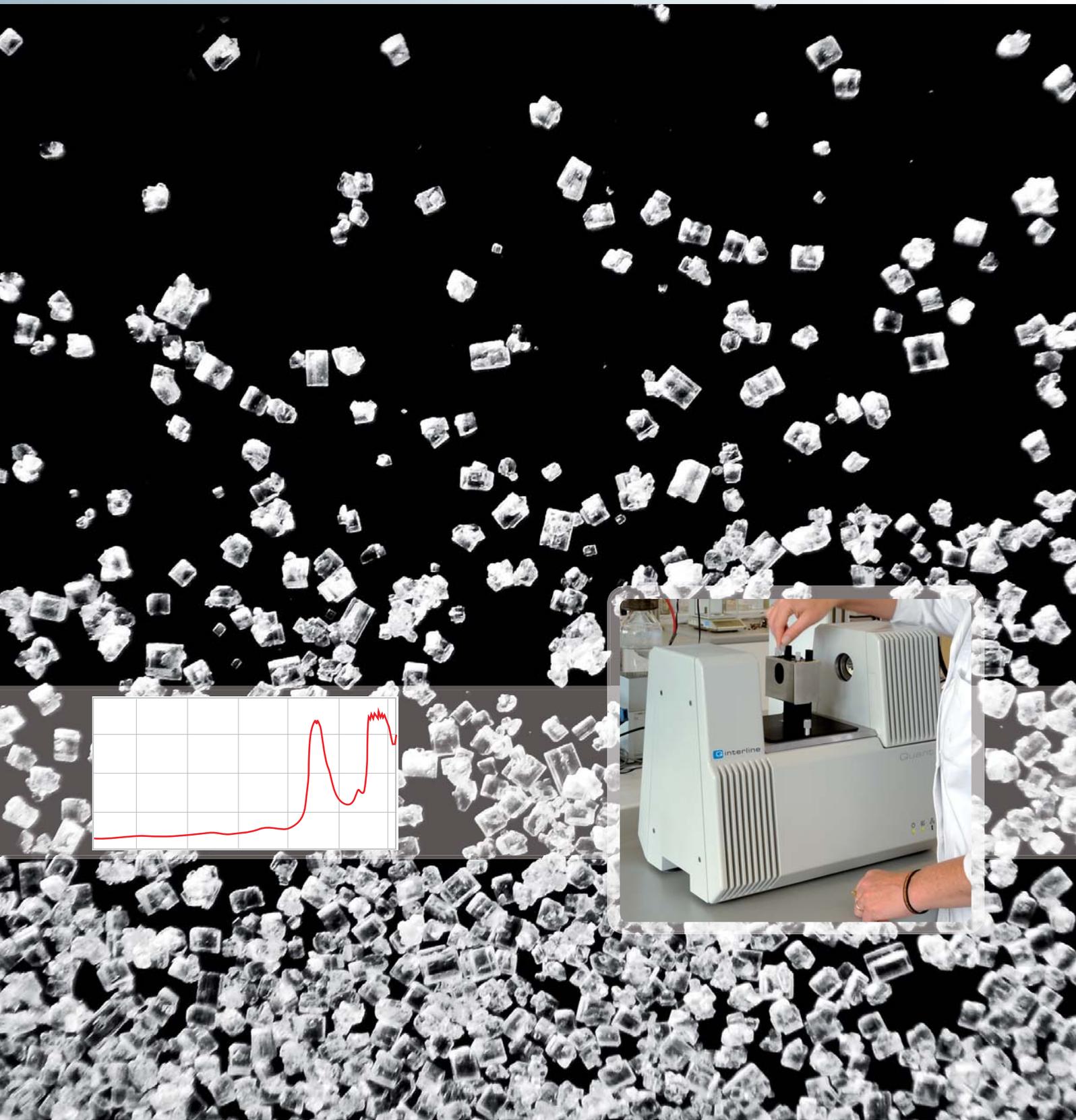


Application Note

Sugar



Introduction

NIR analysis can quickly and cost-efficiently measure components such as Pol, Brix and Pol/Brix Ratio in sugar solutions coming from either sugar beets or cane sugar. The chemical analysis is time consuming, especially the Pol/Brix Ratio, where both Pol and Brix have to be analysed before making the calculation. The analysis time with this NIR analyser is only one minute after the sample has reached constant measurement temperature to get all three figures. The analyser can be placed in the production area and can be operated by plant personnel.

Analyser: The FT-NIR LipidQuant

The LipidQuant FT-NIR analyser is used for non-destructive analysis of liquid samples. The sample is poured into 8 mm lidded glass vials to avoid changing during the process and placed in the heating vial holder. The sample can be kept due to the sealed vial.

The LipidQuant is powered by the latest ABB Bomem FT-NIR technology and measures the entire spectrum of the sample, i.e. in the range $14000\text{-}3800\text{ cm}^{-1}$ (700-2600 nm). It generates a large amount of high-quality spectral data, which makes it possible to accurately determine multiple components.

With no scheduled maintenance for five years, the LipidQuant is practically maintenance-free. It is equipped with parts with a long lifetime. For instance, the laser and NIR source have an average lifetime of ten years.

LipidQuant is operated with the InfraQuant software, which makes it easy for everybody to work with analyses. Two clicks with the mouse is enough to make the analysis. Among the features is a wizard that guides you through the program, spectra are displayed right away, and sample information and trends can be reviewed easily.

Calibration

The LipidQuant can be used with either customised calibrations or starter calibrations for sugar beet solutions delivered with the instrument. A typical FT-NIR spectrum of sugar beet solution can be seen on the cover of this application note. The NIR region contains both combination and overtone information. All spectra are pre-processed with mean centring and 2nd derivative Savitsky-Golay with 9 smoothing points. Partial Least Squares (PLS) models were developed based on the analytical and spectral data.

Calibration Performances

The models for Pol, Brix and Pol/Brix Ratio are developed on a small set of samples. The results can be seen in table 1 and the predicted value versus the actual value for Brix can be seen in figure 1.

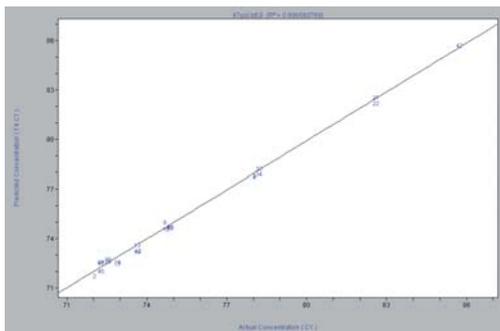


Figure 1: The FT-NIR predicted value vs the measured laboratory value

| Property | Range | SECV |
|----------------|-------------|-------|
| Pol | 71-87 | 0.35 |
| Brix | 72-91 | 0.33 |
| Pol/Brix Ratio | 0.885-0.955 | 0.004 |

Table 1: Performance of the calibrations for Pol, Brix and Pol/Brix Ratio.

Conclusion

The LipidQuant FT-NIR analyser is designed for liquid measurements. Pol, Brix and Pol/Brix Ratio can be measured in sugar solutions in less than one minute, and the method is very robust for rapid quality control.

The analyser can be operated with models from Q-Interline or with customised models for specific customer products. The latter is easy to optimise and maintain, since the models become a property of the customer.