

EDYE, LESLIE, A., and MARGARET A. CLARKE, Sugar Processing Research Institute, Inc., 1100 Robert E. Lee Blvd., New Orleans, LA 70124. - Near infrared (NIR) analysis of sugarbeet juices and factory products.

ABSTRACT

The application of scanning near infrared spectroscopy to the analysis of sugarbeet factory process streams is described. Data on diffusion (raw) juice and thin juice were collected at 8 factories, in different geographical regions. The NIR spectra of these juices were obtained on an NIRSystems Model 6500 spectrophotometer, in transmittance mode, from 1100 to 2500 nm, in a 1mm quartz cuvette. For NIR spectral analysis, no sample clarification or filtration is necessary, even for juices from deteriorated beet. Analysis time is less than 2 minutes.

Statistical analysis to correlate NIR spectra with conventional analytical data results in calibrations for simultaneous measurement of several juice parameters; pol and Brix (RDS) are shown here, and development of calibrations for true sucrose (by HPLC), invert (by IC), raffinose (by IC), and amino nitrogen and nitrate are discussed. Spectra of diffusion and thin juices can be combined to form robust calibrations for pol and Brix from over 500 samples, that can be applied at any of the factories included in this study. The selection of wavelength for calibration is discussed; the calibration of pol in juice is shown as an example.

Propagation of Errors

For many calculations done in the sugar factory, water and syrup streams are considered to have three components: sugar, non-sugar (NS), and water. The two analytical techniques that are used most often to measure these are polarimetry for sucrose (W) and refractometry for dry substance W/W (dissolved solids or DS). The major advantage of these systems is speed (100-150 samples/hr). The major disadvantage is that they are not very precise, but neither method is highly specific and thus they are slightly inaccurate. When values determined by these methods are used in calculations, their errors propagate through the

Propagation of measured errors through calculations has been extensively studied and the mathematics is well known. In general, any value, Q , that is calculated from n measured quantities