

APPLICATION NOTE

Real-time Determination of Ethanol in Gasoline Using a NIR-O™ Spectrometer or ClearView® db Photometer

Ethanol is now a common biofuel additive for gasoline. The additional oxygen in ethanol provides for a cleaner burning fuel. The data presented demonstrates measurement of the ethanol content of fuel using near-infrared (NIR) spectroscopy. Our GUIDED WAVE™ near-infrared dual beam photometer and near-infrared full scanning dual beam spectrometer make use of fiber optic technology to allow remote process monitoring for a large variety of applications. The determination of ethanol in fuels can be accurately and repeatably verified using both analyzers.

Experimental

A series of samples were prepared by adding known amounts of ethanol to a fuel sample covering the range of 0.1% to 22% added ethanol. Data for these standard samples was collected using a 10 mm cuvette cell with both our GUIDED WAVE analyzers. The dual beam photometer was equipped with filters at 1140 nm, 1300 nm, 1410 nm and 1445 nm. The full near-infrared spectra of the standards are shown in Figure 1, along with an indication of filter locations (wavelengths selected) used in the dual beam photometer is shown in Figure 2.

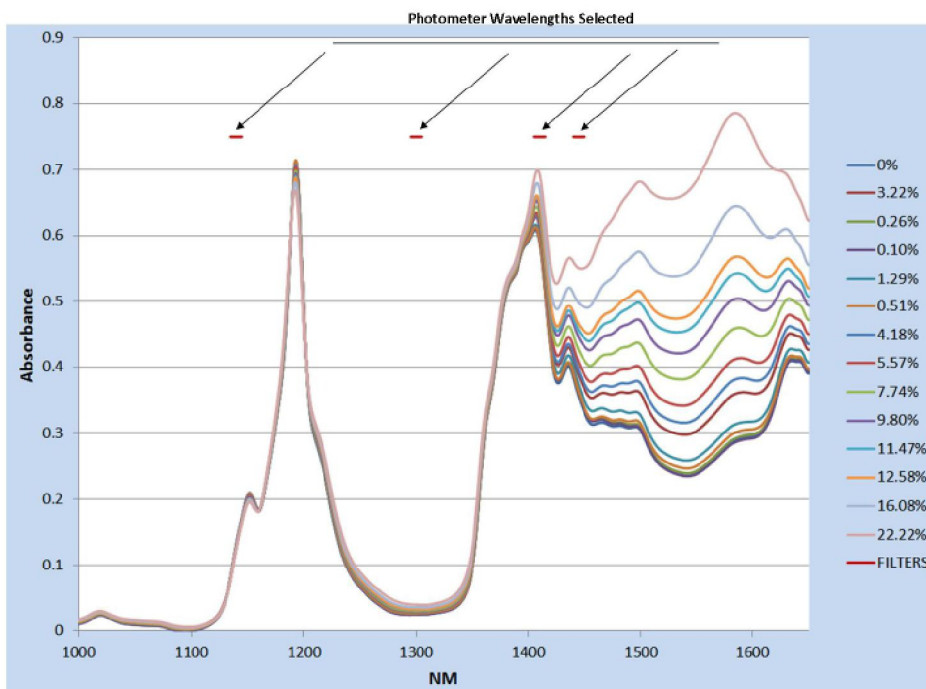


Figure 1: Ethanol in Gasoline - Full Scanning Dual Beam Spectrometer

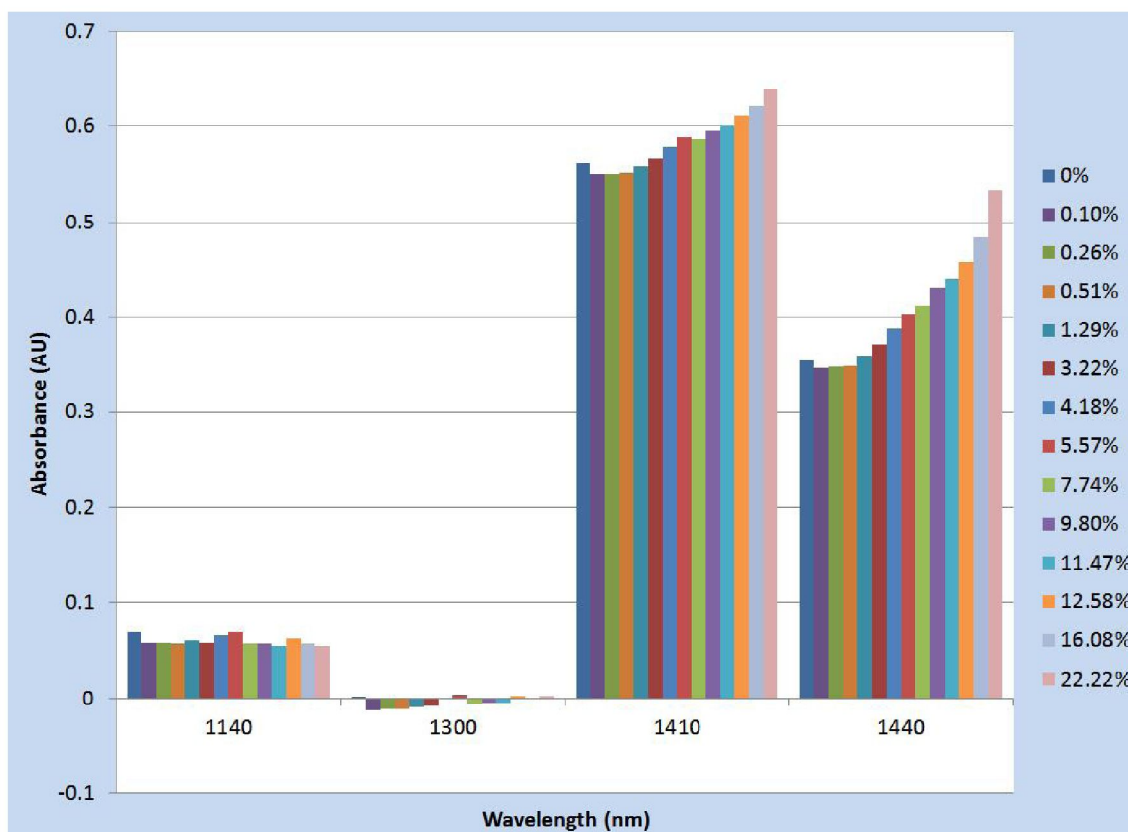


Figure 2: Regression Results - Dual Beam Photometer

Analyzer Selection

Simple pre-processing methods were applied to each data set (derivative for spectrometer, baseline correction for photometer). Regression analysis (PLS for spectrometer, MLR for photometer) produced results for ethanol determination as shown in Figure 3 (spectrometer) and figure 4 (photometer). Both methods demonstrate accurate repeatable measurement capability over the entire range of added ethanol.

Discussion - Choosing the Analyzer

Both analyzer technologies demonstrate successful measurement of ethanol. The differentiating factor for choosing one unit over the other is typically the measurement environment and other measurement parameters that are of interest. For example, if a measurement of the Octane rating or some other physical property of the fuel were also desired then the full spectrum dual beam spectrometer can provide that functionality. The dual beam photometer is better suited for single component or single property applications. For more detailed information regarding system specifications and the NIR-O™ NIR spectrometer or the ClearView® db photometer please contact a Process Insights sales or technical specialist.

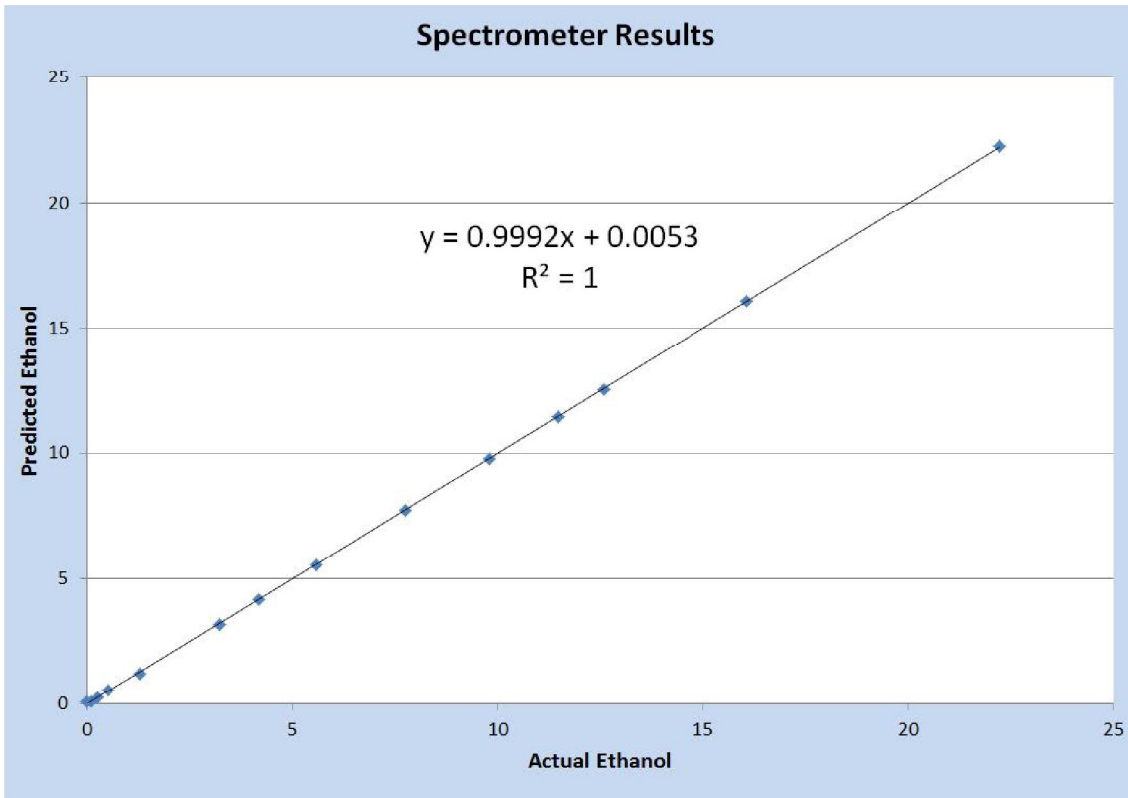


Figure 3: Regression Results - Full Scanning Dual Beam Spectrometer

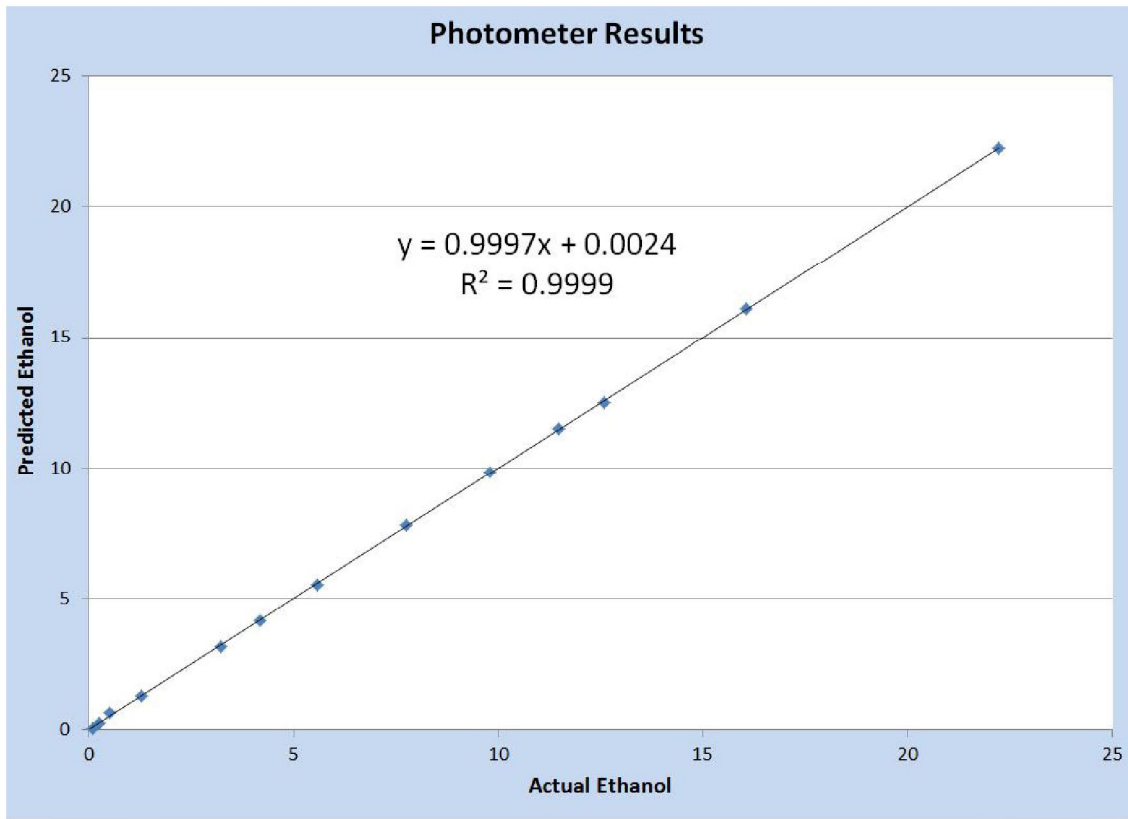


Figure 4: Regression Results - Dual Beam Photometer

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