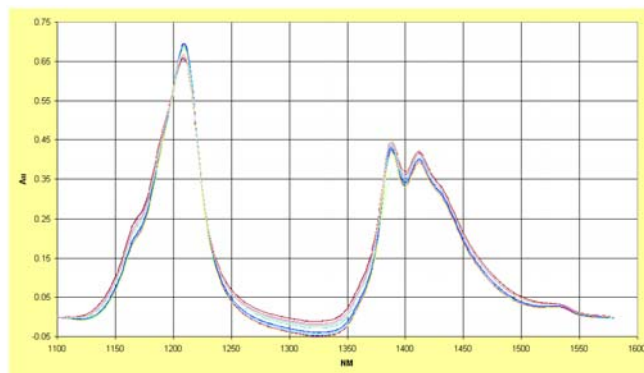


## Application Note – Iodine Value of Oils

An important characteristic of a fatty oil product is its iodine value (IV). This is a measure of the unsaturated fatty acid content and indicates the ease of oxidation or the drying capacity of the product. Empirically, the IV is expressed in terms of the number of centigrams of iodine per gram of sample. The laboratory analysis for IV determination is both time consuming and involves the use of hazardous materials. This note will discuss the use of Guided Wave hardware and software tools for the measurement of the iodine value of fatty oils using fiber optic-based, Near-Infrared (NIR) spectroscopy. NIR can be applied in real time directly in process monitoring or as a laboratory procedure. In either case NIR is a time and money saving alternative to traditional methods. NIR also offers the benefit of increased safety over traditional methods.

Figure 1 NIR Spectra of Fatty Oil Samples



### Measurement Background

The NIR region of the electromagnetic spectrum allows the use of the overtone and combination bands of the C-H, O-H, and N-H fundamentals. By measuring the NIR spectra of a series of fatty oil samples of known iodine value, a quantitative model can be developed which will allow the measurement of iodine value in future samples based only on their NIR spectrum. Guided Wave analyzer systems use fiber optics to allow the sample probe to be located in remote locations away from the spectrophotometer itself.

### Experimental

The NIR spectra of a group of different fatty oil samples were measured between 1100 and 1600 nm using a Guided Wave Model 310 NIR Spectrophotometer. Figure 1 shows the absorbance spectra of some representative samples using an on-line process probe with a 1 cm pathlength measure over 100 meters of fiber. The iodine value for these samples ranges from 34 to 74. For this application, data preprocessing consisted of a simple 2-point baseline correction to remove any offset. The spectra and concentration data were submitted to the Unscrambler<sup>tm</sup> software and a calibration model was developed

using PLS regression methodology. For a discussion of PLS and other multivariate calibration techniques please see Martens & Naes<sup>1</sup> and ASTM E1655<sup>2</sup>.

### Results

The model was used to predict iodine values in a laboratory setting. The results for this are shown in Figure 2 as a scatter plot. The model produced a prediction RMSEP (root mean square error of prediction) of 0.93. This is in good agreement with the accuracy of the standard laboratory method.

## Conclusion

The measurement of the iodine value of fatty oils using NIR spectroscopy is both fast and reliable utilizing the Guided Wave hardware and software tools as described here. This method minimizes the need for performing the previous laboratory

method and hence the results are available in real-time (seconds). This method can be applied in either a laboratory or a process environment. For more detailed information regarding system specifications please contact a Guided Wave sales or technical specialist.

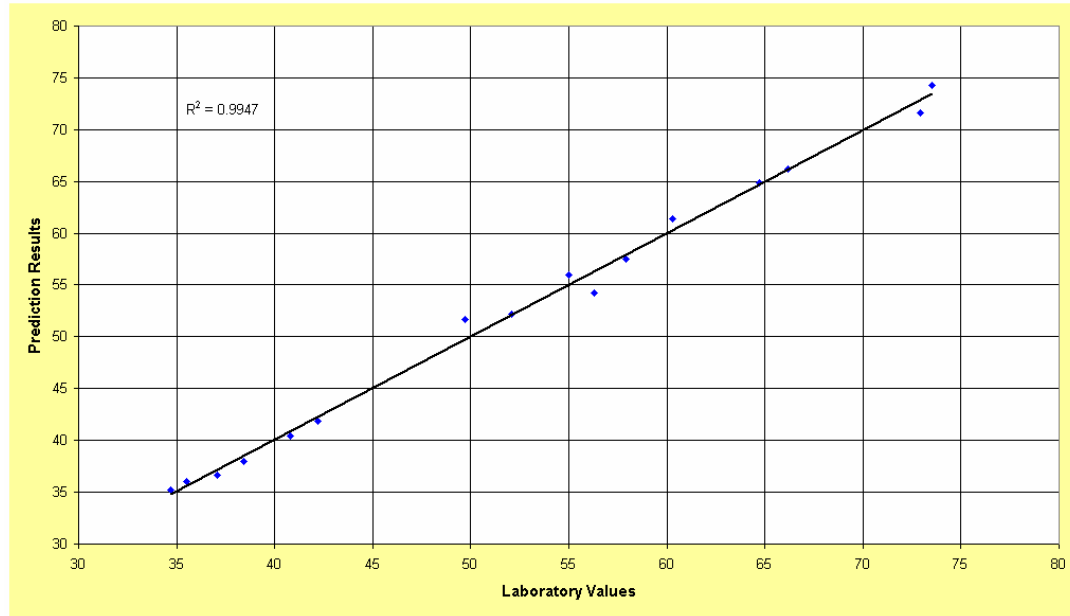


Figure 2 Iodine Value Laboratory vs NIR

## References

1. H. Martens, T. Naes, Multivariate Calibration, John Wiley & Sons, 1989.
2. ASTM E1655 Standard Practices for Infrared, Multivariate, Quantitative Analysis.

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