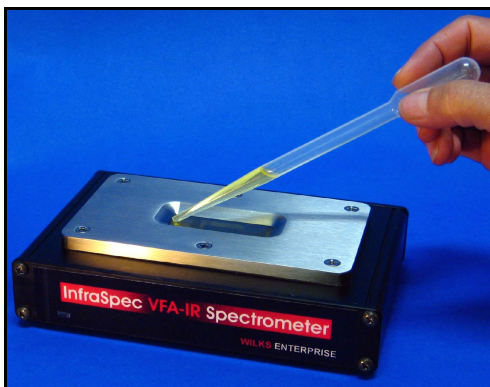


Biofuels Blend Ratio and Total Glyceride Measurements



Introduction:

The InfraSpec VFA-IR Spectrometer is a portable mid infrared spectrometer that gives spectral, quantitative or qualitative information on a wide variety of materials wherever they occur – at the production line, in the field or in the laboratory. The trend toward alternate fuels is resulting in an increase of biodiesel and ethanol production. The InfraSpec can measure percent biodiesel in diesel fuel, ethanol in gasoline, water in ethanol as well as total glycerides during the biodiesel reaction process. Using the InfraSpec Spectrometer for making pass/fail determinations for total glycerides can significantly reduce

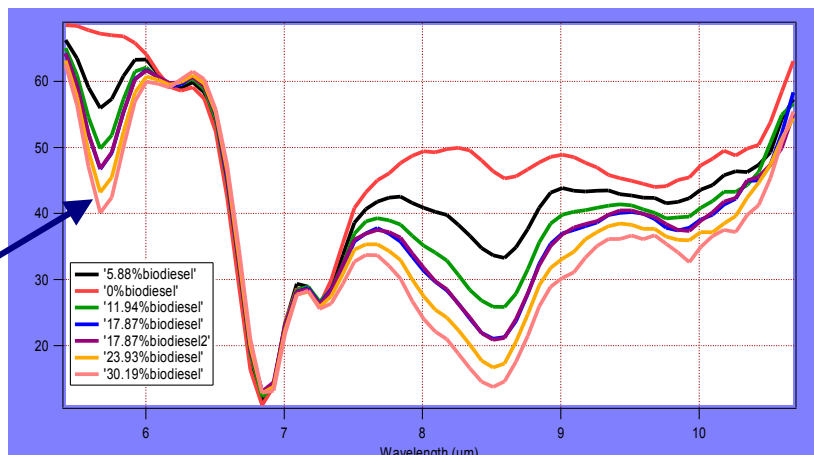
analysis time and increase reactor throughput by as much as 20 percent. The InfraSpec VFA-IR Spectrometer is compact and portable and has a simplified software interface for non-technically trained personnel giving the user the capability to measure the blend ratio of biofuels or total glycerides on site or at a manufacturing facility.

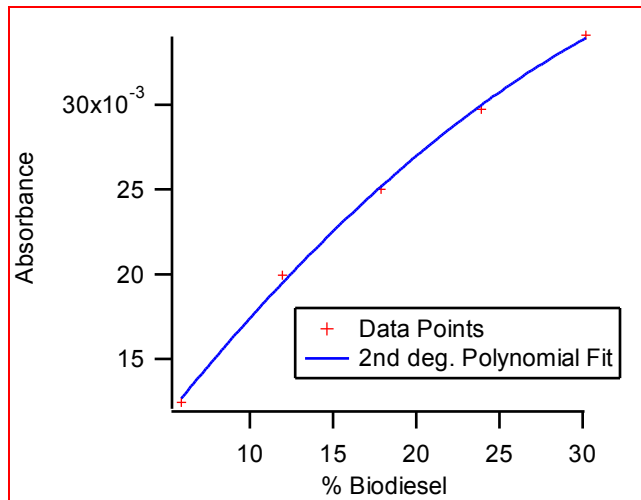
Operating Principal:

The InfraSpec VFA-IR Spectrometer is a new concept in infrared instrumentation. It utilizes a patented design consisting of an Attenuated Total Reflection (ATR) sample plate with an electronically modulated source on one end and a linear variable filter (LVF) and combined with a 128 pixel detector array on the other. The result is an infrared analyzer that, unlike an FTIR spectrometer, has no moving parts and an insignificant optical air path. This makes for a portable, rugged analyzer suitable for use in a field environment. For biofuels blend ratio and total glyceride analysis a 5.4-10.8 μm (1850 – 925 cm^{-1}) LVF range is suitable.

Analysis:

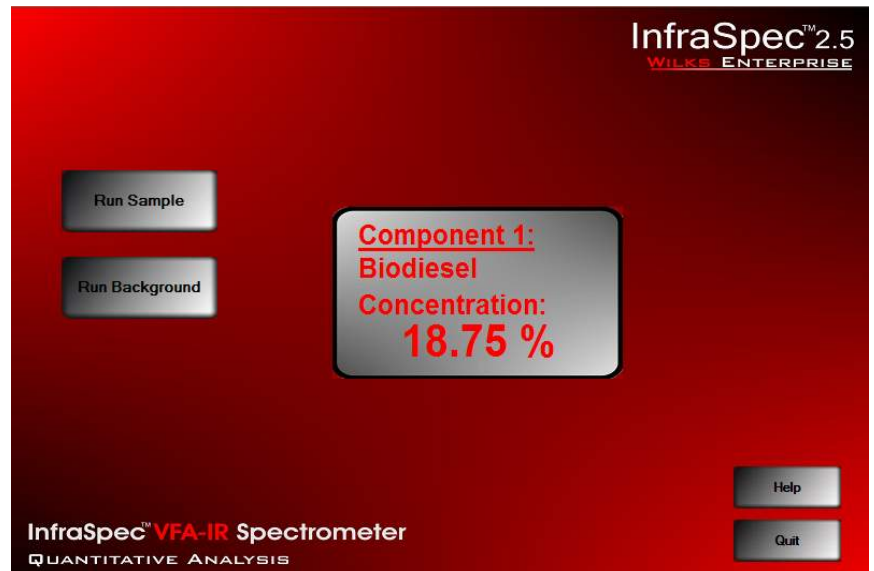
The methyl ester component, biodiesel, can be measured independently from diesel at the carbonyl band at 5.73 μm (1745 cm^{-1}) without interference from fuel additives, as specified in the European Standard EN 14078. Ethanol has a distinct absorbance from gasoline at 9.6 μm (1042 cm^{-1}). This allows for a quick and simple measurement of the biofuel blends. The measurement range for biodiesel is 0.2 to 100% with an accuracy of $\pm 0.1\%$. Water in ethanol can be measured at 6.06 μm (1650 cm^{-1}). The InfraSpec VFA-IR Spectrometer can make pass/fail determinations of the bound glycerin (mono-, di- and triglycerides) in samples of biodiesel while in the transesterification process. It can significantly reduce analysis time and thereby increase reactor throughput. While the InfraSpec will not replace a gas chromatograph, it can give a pass/fail determination in less than 5 minutes.





A calibration table as shown on the left can be created and stored in the InfraSpec VFA-IR software. A PLS calibration can also be created according to ASTM Method E 1655-05.

With an internal calibration table, the interface for the operator in the production area is greatly simplified. A direct readout is given in percent biodiesel, percent ethanol, percent water or total glycerides. If desired, a barcode scanner can identify the sample and the results can be accessed electronically from a remote laboratory. Spectra are also stored in the program for laboratory personnel to review.



Specifications:

Dimensions	6.5" x 4.25" x 1.6", 16.5 x 11 x 4 cm ³
Weight	3.5 lbs., 1.5 kg
P.C. Interface	RS 232, USB
Power Requirements	12V DC, 2.0 amps
Power Supply	Universal AC/DC converter type (supplied as standard)
Suggested Temperature Operating Range	15°C - 60°C
Humidity	0 – 98% relative humidity (non-condensing)
Detector Array	128 Pixel linear pyroelectric array
Array Responsivity	5.4-10 ⁵ V/W
Standard Spectral Range	5.4-10.8 μm (1850 – 925 cm ⁻¹)
For InfraSpec VFA-IR Spectrometer ATR Sample Plate	
ATR Crystal Material	Zinc Selenide
ATR Surface Size	50 x 16 mm
# of Reflections	12
Resolution	25 cm ⁻¹

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