

MEASURING THE BIOFUEL BLEND RATIO IN GASOLINE AND DIESEL

INTRODUCTION

As more mandates for a minimum of ethanol in gasoline and biodiesel in diesel come into effect, a large number of major oil companies are blending higher percentages of biofuels at their terminals. Although manufacturers of in-line blending systems claim indisputable accuracy, a quick analytical measurement method to assess the blend ratio gives real data to a claimed assumption. This can be a valuable asset for fuel distributors, engine manufacturers, fleet operators, and regulatory agencies. The InfraCal Blend Analyzers and the InfraSpec VFA-IR Spectrometers are rugged, compact, portable and easy to use for non-technical personnel. In less than a minute, the user gets a direct readout in percent biodiesel or ethanol on-site at a manufacturing facility, distribution center or laboratory.

PRINCIPLE OF OPERATION

The InfraCal Analyzer and InfraSpec VFA-IR Spectrometer are compact, fixed-filter mid-infrared analyzers with no moving parts and an insignificant optical air path. They weigh less than 5 pounds and can be operated from a battery pack or a cigarette lighter adapter cable. This makes them portable, sturdy and operable in a range of ambient conditions typically found in field environments.

INFRACAL BIODIESEL BLEND ANALYZER

INFRACAL ETHANOL BLEND ANALYZER

Both are lower-cost, single wavelength analyzers preset with a specified filter suited for a particular measurement such as percent ethanol in gasoline or biodiesel in diesel. The InfraCal Analyzer is self contained with an internal calibration program and a direct readout display. An RS 232 interface is available for data transmission to a PC. The InfraCal Blend Analyzers are ideal where a single, repetitive analysis is needed.



INFRA SPEC VFA-IR SPECTROMETER

This spectral range analyzer contains a linear variable filter and a 128 pixel detector array covering a wavelength range of 5.4-10.8 μm ($1850-925\text{ cm}^{-1}$). The capability to measure more than one wavelength allows for multiple analyses with one instrument, i.e., biodiesel in diesel, ethanol in gasoline, or water in ethanol. The InfraSpec VFA-IR Spectrometer is compact, portable and has a simplified PC interface for non-technically trained personnel giving the user the capability to measure on-site at a manufacturing facility as well as in the laboratory.

ANALYSIS

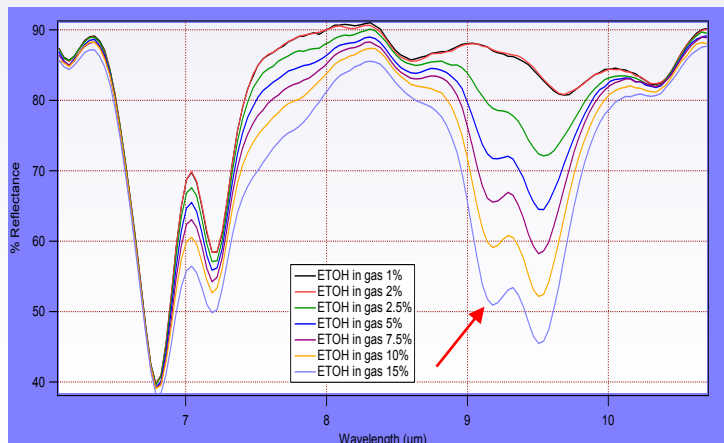
Ethanol and biodiesel have characteristic absorbances in the mid-infrared range as demonstrated in these ethanol spectra. The increase and decrease of infrared absorbance correlates directly to the amount of biofuel present in the sample. Ethanol can be measured independently from gasoline at $9.6\mu\text{m}$ (1042 cm^{-1}) and biodiesel can be measured independently from diesel at $5.73\mu\text{m}$ (1745 cm^{-1}). The fuel sample is placed directly on the exposed ATR sample window of the analyzer. In under a minute the percent biodiesel or ethanol is displayed. The fuel is easily cleaned off the window using a solvent such as isopropyl alcohol and a wipe.

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MEASUREMENT SPECIFICATIONS

	Range	InfraCal Blend Analyzer	InfraSpec VFA-IR Spectrometer
Ethanol in Gasoline	0.5-20%	+/-0.20	+/-0.20
Ethanol in Gasoline	65-98%	+/-0.93	+/-0.93
Biodiesel in Diesel	0-100%	+/-0.20	+/-0.20
Water in Ethanol	0-10%	N/A	+/-0.20

INFRACAL FILTOMETER SPECIFICATIONS

INFRACAL ETHANOL BLEND ANALYZER	Model HATR-T2E, part number 405-2019
INFRACAL BIODIESEL BLEND ANALYZER	Model HATR-T2B, part number 405-2013
Dimensions	6.5 x 6.5 x 5 in. (165 x 165 x 225 mm)
Weight	4.5 lbs (2.0 kg)
Power Requirements	12V DC, 7.5 watts max
Power Supply	Universal AC/DC converter type, optional 12 volt battery
Operating Temperature Range	4°C - 45°C
Humidity	0 – 98% relative humidity (non-condensing)
Communications Port	RS 232
Analytical Wavelength	5.73µm (1745cm ⁻¹) or 9.6µm (1045cm ⁻¹)
ATR Crystal Material	Zinc Selenide

INFRASPEC VFA-IR SPECTROMETER SPECIFICATIONS

INFRASPEC VFA-IR SPECTROMETER	Model E, part number 405-1021-1013
Dimensions	6.0" x 6.5" x 2.75", 15.2 x 16.5 x 7 cm
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)
ATR Crystal Material	Zinc Selenide
ATR Surface Size	50 x 16 mm
# of Reflections	12
Resolution	25 cm ⁻¹