

Infrared Spectroscopy

Key Benefits

- State-of-the-art FT-IR and sampling with built-in diagnostics and calibration functions to ensure the most accurate and reliable data
- Dedicated software functions for singleclick FAME prediction from a measured spectrum using either ASTM D7371-07 or EN 14078:2003 calibrations
- ASTM D7371-07 calibrations and prediction protocol supplied so instrument is up and running in the shortest possible time
- Automated, single-click calculation protocol for easy, reproducible results
- On-demand output diagnostics give additional insights into the errors associated with the results to provide highest confidence in analysis
- Built-in automated system suitability feature for biodiesel enables system to be qualified prior to analysis using relevant test samples
- Flexible reporting for easy output to other reporting packages and control charting

Biodiesel IR Fatty Acid Methyl Ester (FAME) Analyzer

Introduction

The potential of biofuels to provide an economical,

cleanburning, and sustainable source of fuel, now and for the future, has led to a growing global commitment to their use.

The production and distribution of alternative fuels is strictly regulated by both national and international regulatory bodies. PerkinElmer®, via its EcoAnalytix™ initiative, provides a series of solutions comprised of analytical instrumentation, standard operating procedures, training and support to help meet such regulatory requirements.

Biodiesel IR FAME Analyzer

Biodiesel, derived from vegetable feedstocks such as soybean and rapeseed or from animal fats, is a fuel commodity primarily used as a value-added blending component with diesel fuel. The term biodiesel describes a fuel of pure mono alkyl esters such as fatty acid methyl ester (FAME), and is designated B100. The term Bxx (e.g. B20, B30 etc.) is used to describe a blend of biodiesel with petroleum-based diesel fuel.

The international standard ASTM D7371-07 and the European EN 14078:2003 standard each specifies a quality control method for the production and distribution of diesel and blended fuels containing FAME. The ASTM test method applies the use of a Fourier Transform Infrared (FT-IR) instrument with an Attenuated Total Reflectance (ATR) sampling accessory; the EN standard requires liquid transmission sampling with Beer's Law calibration. The absorption spectra of samples where the percentage of FAME concentration is known are used to develop calibrations against which FAME concentrations of unknown samples can be confirmed.

The PerkinElmer Biodiesel IR FAME Analyzer comprises a Frontier FT-IR spectrometer with the appropriate ATR or transmission accessory, and Spectrum 10 software that gives the user the choice of being configured specifically for either the ASTM D7371-07 or the EN 14078:2003 methodology.

Detailed SOPs are provided for both the ASTM and the EN

standard. For the ASTM D7371-07 test method, the Analyzer includes three starter calibrations for FAME derived from soy oils covering the ranges 0-10%, 10-30% and 30-100% FAME. Spectrum Quant+™ software is provided so calibrations can be validated independently and updated as necessary with customer samples. Validation is recommended so any differences between feedstocks (rapeseed, palm, sunflower seed, etc.) are modeled by the chemometric calibrations.

Spectrum 10 software simplifies sample analysis by the use of Process Chains. With a single click, the percentage FAME concentrations are calculated and the results printed and individually saved to file as a report.

The Biodiesel IR FAME Analyzer is based on a high performance benchtop PerkinElmer Frontier Fourier Transform Infrared spectrometer (FT-IR). This instrument combines highest performance FT-IR with instrument control, biodiesel analysis and reporting software.

The sampling interface for the ASTM standard is an extremely rugged diamond surface with highest resilience to damage due to sample abrasion and cleaning. Just a few drops of sample are required to cover the sampling crystal, and the data is collected and report generated in less than 1 minute.

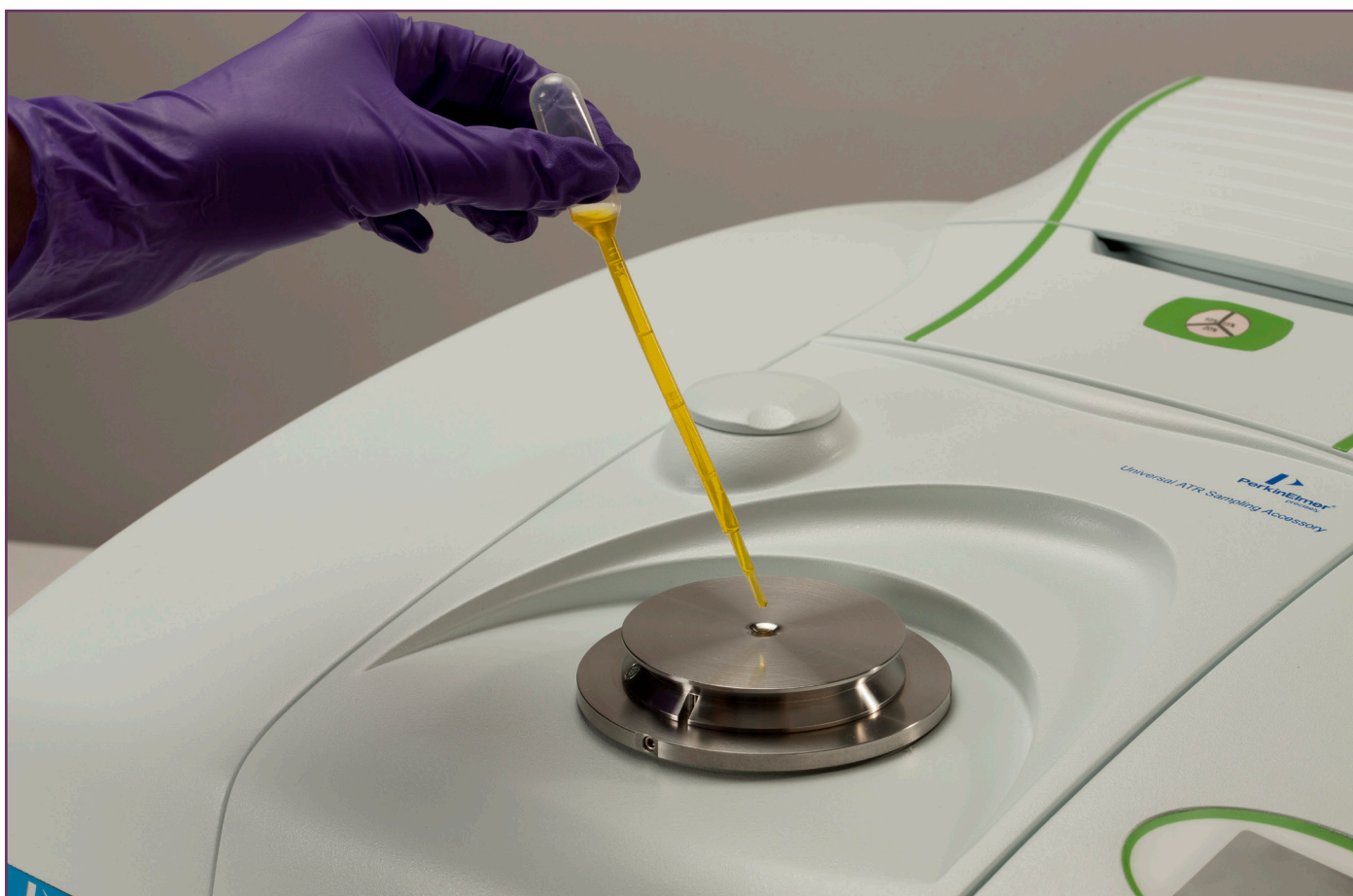


Figure 1. The quality control method according to the international ASTM D7371-07 standard requires an Attenuated Total Reflectance (ATR) accessory as shown here on the PerkinElmer instrument.

The software provides an unprecedented degree of user flexibility with the ability to configure the system to provide single push-button control over all the steps of the analytical procedure including specific system performance checks for biodiesel analysis, data collection, data analysis according to the ASTM D7371-07 or EN 14078:2003 protocol, and report generation.

Calculated concentrations can be processed further using the unique Process Chains facility in the software to provide customized results and multiple predictions output to charts for results trending and statistical analysis. To further simplify operation and assist with good measurement practice, the user interface is highly configurable to allow just those essential functions to be available to the analyst, and a number of in-built intelligence features and diagnostics such as Quality Checks provide the operator with visual warnings of potential data problems which could influence results.

Conclusion

With proven leadership in product innovation, including the introduction of the first commercial instruments in Infrared Spectroscopy (IR), Gas Chromatography (GC), and Graphite Furnace Atomic Absorption (GFAA) Spectroscopy, PerkinElmer continues to make advances in analytical solutions, including EcoAnalytix complete testing systems for the environment, food safety and renewable energy industries. Combining instruments, standard operating procedures, training and support, EcoAnalytix analyzers are designed to help these industries meet regulatory requirements.

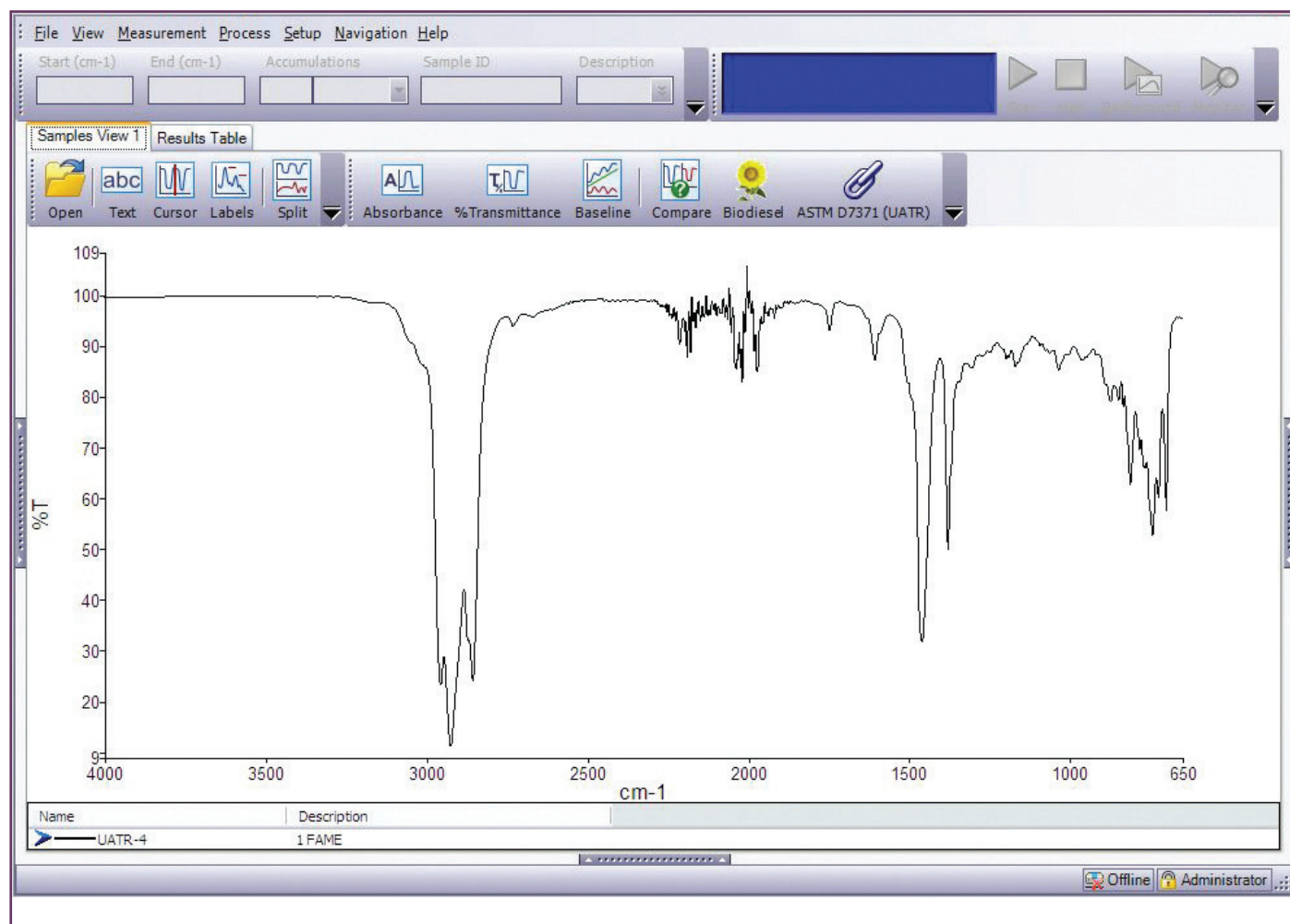


Figure 2. Spectrum 10 biodiesel software.

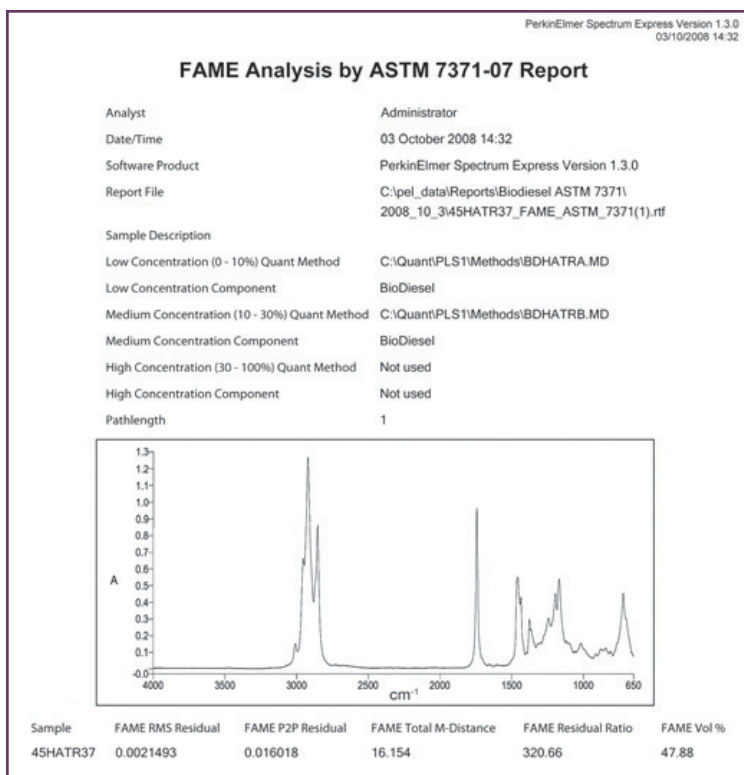


Figure 3. ASTM D7371-07 report.

The biodiesel IR FAME Analyzer is a total solution for FAME analysis. A number of pre-configurations is available. For routine FAME determination for ASTM method, we recommend the system equipped with universal ATR sampling or, for EN method, that equipped with CaF₂ 0.5 mm accessory. For further information on these and other configurations, contact your local PerkinElmer representative.