

# OPTIFUEL: A GAME-CHANGER IN RAPID FUEL ANALYSIS USING CUTTING-EDGE FT-IR TECHNOLOGY

Fuel products can get mixed and contaminated while being transported for distribution, so they need to be tested and certified continuously to guarantee its quality. The process of analyzing the refined fuels needs to be done quickly and effectively.

Refined fuel products and blends change ownership several times after being produced: from refineries to receiving terminals, to pipelines, to delivery terminals, to tanks before making it to the end user. In many countries, the ownership transfer happens more frequently than others.

During this process of transportation and distribution, fuel can get mixed with other fuel forms and may get contaminated. While fuel is tested and certified during this process several times, there are times and places, when it is not. When fuel isn't certified, it is usually tested for quality and audit purposes in order to ensure that it remains within the allowable limits.

As part of this quality control process, several physical and chemical properties are measured depending on the type of the fuel. The process involves tapping small amounts of fuel samples from the tanks, pipelines or containers and measuring them on single or multiple analyzers. Due to the nature of fuel transportation where there is a constant flow of incoming and outgoing fuel, it is essential to have all these measurements done quickly, economically and with the least amount of personnel training.

Below are some of the common physical and chemical properties measured on different types of fuels:

Gasoline	Diesel	Jet Fuel
RON, MON	Cetane Number, Cetane Index	Freezing Point
Evaporation, Distillation	Evaporation, Distillation	Smoke Point, Flash Point
Benzene, Xylene, Toluene	FAME	FAME
Oxygenates, Aromatics	Aromatics	Viscosity
Methanol, Ethanol, MMT	Cetane Improver	Napthalene

Analyzing these properties using individual direct measurements involves formidable amount of time, labor and expenses. Since molecular composition of these samples ultimately gets reflected in the physical and chemical properties of them, molecular vibrational spectroscopy in the infra-red (IR) region is becoming an appropriate advanced tool to solve this issue. But not all IR analyzers are the same. The IR technology used to measure these properties has evolved over time from a one-parameter dispersive to a multi-parameter dispersive to FT-IR (Fourier Transform Infrared Technology), which is the most advanced version used today.

FT-IR technology provides a significant advantage over dispersive spectroscopy because of its ability to capture molecular information spanning the entire IR range. One scan gathers information from practically all parameters in less than 30 seconds. FT-IR is capable of building universal models for these parameters, which can easily be enhanced by the addition of IR spectra from local samples, on the instrument. The same technology can be used to quantitatively monitor degradation of lubricants, as well.

For almost 20 years, PAC has been at the forefront of fuel analysis with its robust PetroSpec products. By using powerful and more versatile FT-IR technology, we are now combining the best of our GS PPA, TD PPA and QuickSpec capabilities into one analyzer, and adding many more features. OptiFuel is not a mere replacement of our legacy products, it is the best FT-IR dedicated fuel analyzer in the market.



Fig 1: OptiFuel

The new OptiFuel has the ability to measure physical & chemical properties of Gasoline, Diesel or Jet Fuel in seconds, all in one system, with a one push of a button. It is so easy, that the user doesn't require any kind of training to operate the analyzer.

By virtue of OptiFuel's proprietary ATR (attenuated total reflectance T) flow cell design, it's measurement cell has no moving parts, and the user can measure gasoline, diesel or jet fuel samples without any hardware change. Optifuel comes with an industry leading 10-year warranty on its modern Michelson interferometer and a 5-year warranty on its IR light source, so users can rest assured that they will have near zero downtime on the analyzer.

With its vibration-resistant advanced cube corner design and humidity-resistant ZnSe optics, OptiFuel provides high and reliable performance crucial for quality control checks. The spectral shift is virtually non-existent, due to its extreme temperature controlled laser reference design. OptiFuel can predict fuel properties with high accuracy that you can base your decisions on.

The graphs below show examples of OptiFuel's reliable performance.

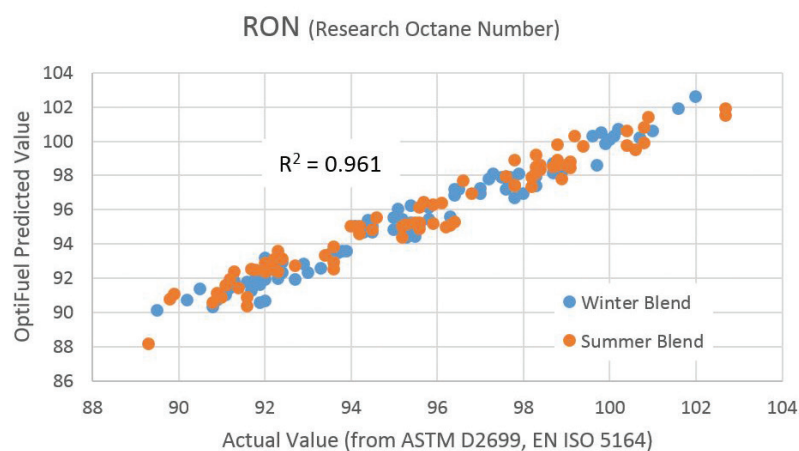


Fig 2: OptiFuel 'RON' prediction on 'global' summer and winter blend real samples

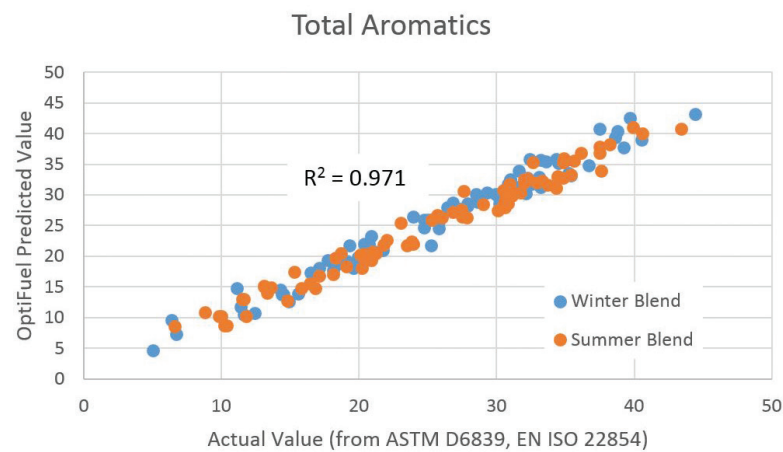


Fig 3: OptiFuel 'Total Aromatics' prediction on 'global' summer and winter blend real sample

Due to the meticulously design efforts and consistency in manufacturing, the calibration of a new system is quickly done through a one-step transfer/cloning procedure and it lasts for years. Preventive maintenance can be easily done on-site.

OptiFuel is delivered from the factory with high quality chemometric models, built using hundreds of real samples acquired from top oil & gas producers across the globe. This allows the use of the system from day one and the realization of return on the investment. Thanks to its advanced FT-IR technology and user-friendly GUI (graphical user interface), the opportunities for future expansion of these models are endless.

Compliance	Correlation
<ul style="list-style-type: none"> <li>• Benzene: ASTM D6277, EN 238</li> <li>• FAME: ASTM D7371, D7806, EN 14078</li> <li>• Oxygenates (MTBE, ETBE, TAME, DIPE, Methanol, Ethanol, tert-Butanol): ASTM D5845</li> <li>• Density: ASTM D777</li> </ul>	ASTM D2699, D2700, D5191, D86, D4814, D6839, D6839, D6839, D613, D4737A, D86, EN ISO 3405, EN 14078, EN ISO 5164, EN ISO 5163, 13016/1, 3405, 22854, 22854, 22854, 22854, 5165, 4264, SGS M2533 & others

OptiFuel is in compliance or correlation with most of the standard methods:

With its industry leading warranty, proprietary design with no moving parts in the measurement cell and extreme ease-of-use, OptiFuel offers a quick and easy solution to measure fuel properties with minimal training, from day one.

## Author Contact Details

Prashant Chandarana & Supriyo Ghosh • PAC • 8824 Fallbrook Drive, Houston, TX, 77064, USA • Tel: 832-701-5092 • Email: prashant.chandarana@pacpl.com • Web: www.pacpl.com

Read, Print, Share or Comment on this Article at: [Petro-Online.com/Articles](http://Petro-Online.com/Articles)

