

HUMAN HEALTH

ENVIRONMENTAL HEALTH



REFINERY  
AND NATURAL GAS  
ANALYSIS.  
COMPLETE SOLUTIONS  
FOR YOUR LAB.

Refinery and Natural Gas Analysis

  
**PerkinElmer**<sup>®</sup>  
*For the Better*



ENSURE MORE  
ACCURATE  
AND EFFICIENT  
ANALYSIS



# TAKE CONTROL OF YOUR OPERATIONS

Oil refineries and natural gas producers around the world require their lab operations to perform large numbers of analyses before their products are used in industries and by consumers. Detection of even the slightest impurities, accurate process control and hydrocarbon distribution analysis is critical to the success of these operations. That's how PerkinElmer can help.

**“We used the knowledge provided by PerkinElmer as a guideline in our lab.”**

- IRPC (Integrate Refinery Petrochemical Complex), Thailand

As a global scientific leader and solutions provider to refining and natural gas labs, PerkinElmer's proven technology and experience meets the ever-changing needs of the oil and gas industry. PerkinElmer is committed to the success of your oil and gas sample analysis by providing the instrumentation, consumables, software and services you need for fast, easy and precise testing. The result: better control of your operations and improved product quality.

PerkinElmer understands that keeping a refinery or natural gas testing laboratory running smoothly can be a difficult process. In addition to supplying leading-edge instrumentation, we provide our OneSource® Laboratory Services, the largest team in the industry with over 1600+ engineers globally to assist you. OneSource offers the most comprehensive portfolio of laboratory services, including maintenance and compliance, asset management, instrument disposition, relocation assistance, training and much more.

**“For years we have depended on our PerkinElmer refinery gas analyzers for continuous and reliable sample analysis. We have not found another instrument company that can provide a complete solution package combined with fast reliable service support.”**

- Large Crude Oil Refiner, United States



# THE RIGHT SOLUTIONS FOR ANY APPLICATION

## Gas Chromatography

Our family of Clarus® GC systems includes innovative features for unmatched flexibility and ease-of-use. Each instrument has been designed to meet the analytical needs, experience level and productivity demands of the user.

To enhance the flexibility and performance of our Clarus Gas Chromatographs, we offer a broad range of sample handling systems, multiple detectors, intuitive interfaces, data management software, and a full complement of accessories and consumables.

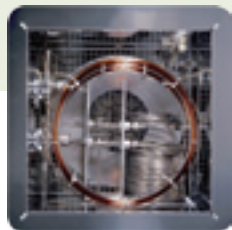


We work with consensus groups, such as ASTM, to promote method development with new technology and to ensure all methods are designed to meet your testing requirements. Over 100 different turnkey systems are available. Our PerkinElmer experts will ensure you choose the system that meets your specific analytical needs, from hydrogen to asphalt.



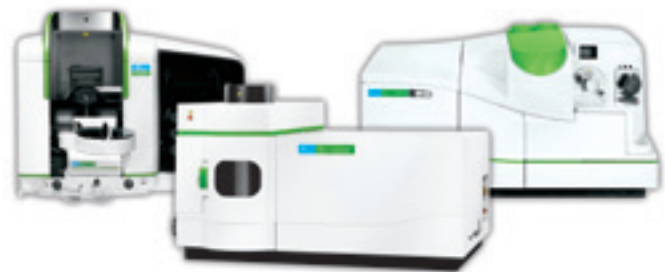
**“Our PerkinElmer GC Refinery Gas Analyzer (RGA) is a fantastic analyzer, stable, reliable, robust, with traceability. We used the first unit for more than ten years and just bought a new RGA early this year. We never worry about RGA analyzer results, which gives our staff more time to focus on other areas.”**

– Bangchak Refinery,  
Thailand



## Metals Analysis

Testing for metals is an important part of the sample analysis picture. Meeting product specifications is critical to efficient and profitable plant operation as well as assuring safe and reliable use of the products by the end user. The presence of the wrong element or too high a concentration can poison a catalyst or cause unintentional releases into the atmosphere. PerkinElmer offers a wide range of inorganic measurement solutions covering the full range of elements, concentrations and matrices that may need to be analyzed. The new Optima ICP-OES series is built around the market leading design of the Optima platform, it delivers breakthrough performance through a series of cutting-edge technologies that optimize sample introduction, enhance plasma stability, simplify method development and dramatically reduce operating costs.



## Material Characterization

A leader in FT-IR and UV/Vis analysis, PerkinElmer has over 65 years of experience to dramatically simplify fuel analysis. Our new FT-IR Spectrometers, Spectrum Two™ and Frontier, take ease-of-use to a new level. With Spectrum Two, you can assure the quality and composition of fuel samples faster and more easily than ever before. Now, operators in the lab or in the field can obtain industry-standard IR results in minutes. Frontier systems can exceed your expectations for your current FT-IR analysis and can also be expanded as your research or analytical goals evolve. The system offers flexible configurations in the near, mid-far and far infrared regions.



## PerkinElmer Laboratory Solution Enhancements

To further foster your analysis and enhance your instrument performance, PerkinElmer offers the broadest range of high-end consumables, accessories and technical support for all major companies in the analytical industry. From sample preparation through sample disposition, we offer everything you need to help streamline your laboratory process.

**Sample preparation** is one of the most critical steps in your analytical procedure. Often accounting for 60% of your timetable, it has a fundamental impact on a wide range of operational parameters. PerkinElmer offers a full line of superior sample preparation tools from Solid Phase Extraction (SPE) columns to sample preparation blocks, which simplify your process and limit errors. Let us help you identify the best solution from the beginning.



**Elite columns** are ideal for the analysis of non-polar petrochemical samples, such as detailed hydrocarbon analysis, hydrocarbon gases, petroleum oxygenates, petroleum aromatics, fuels, waxes, oils, sulfur compounds, mercaptans and carbon disulfide.

We also offer many different phases for solvents, chemicals, flavors, fragrances, essential oils, air toxins, chlorofluorocarbons, arson analysis, pesticides, hydrocarbons and high-temperature applications.

### PerkinElmer's analytical gas supply solutions

go beyond basic gas generators. Our high purity hydrogen generators offer the optimum combination of safe operation, reliability and performance. Utilizing field-proven PEM cell technology, hydrogen is produced on demand from de-ionized water and electricity, at low pressure and with minimal stored volume. Innovative control software allows unrivaled operational safety and reliability. Whether you require ultra-high purity hydrogen for your GC or GC/MS or multiple gases to operate your sophisticated LC/MS instrumentation, we have the right generator you need to best fit your laboratory.



**Consumables, accessories and supplies** are needed on a daily basis to keep your instruments running smoothly. Whether your laboratory is equipped with SimDis, RGA, NGA, or traditional GC systems, ICP/AA, IR or any other technologies, we can provide you

with the consumables to meet all of your analytical needs. From custom-packed GC-specific column sets, gas standards, routine vials, liners, caps and septa to a full array of sample introduction systems, we have you covered from start to finish.

Application support and technical training seminars are just more ways we can help keep you up-to-date on industry trends and knowledge. Whether you need help choosing the right columns for your instrument, setting up new methods or installing your accessories, PerkinElmer has a team of trained customer service representatives and experienced field service engineers ready to assist you.

OPTIMIZES  
OPERATIONS

ENSURES  
COMPLIANCE

CONTROLS  
COSTS

**OneSource**  
Laboratory Services

## OneSource Laboratory Services

With OneSource Laboratory Services, you have the world's largest and most respected global service and support network at your disposal. We go beyond maintenance and repair of instrumentation. We incorporate laboratory asset management as part of our customers' business equation—a partner with proven results in improving efficiencies, optimizing operations and providing cost certainty across the globe. No matter what you need, our team of certified, factory-trained Customer Support Engineers is just a phone call away, 24 hours a day, seven days a week.

Operating in more than 150 countries with more than 400,000 assets currently under care, OneSource offers the most comprehensive portfolio of professional laboratory services in the industry, including complete care programs for virtually every technology and manufacturer. By allowing you to consolidate all your service contracts under a single supplier, and by providing responsive, expert technical advice and support at a moment's notice, we ensure your instrumentation—and your lab—is running at optimum levels at all times.

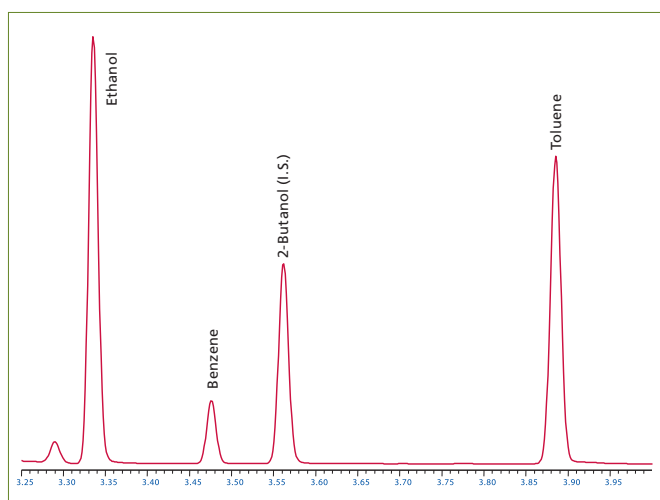
Whether it's care and repair, validation and compliance, asset management and laboratory relocation, software and hardware upgrades or education and training, OneSource is... the ONE you can count on.

## KEY TO ANALYZING REFINERY AND NATURAL GAS SAMPLES

The following is a list of some significant refinery and natural gas tests required to ensure that your most critical sample analyses are performed. Instrumentation and compliance methods required for these key applications are also provided, allowing you to quickly and easily determine what you will need to deliver expert analysis for your particular product sample.

Product	Application	Compliance Methods	Instrument	
Crude Oil	Methanol in Crude	D7059	Clarus GC with Swafer™ Technology	
	Simulated Distillation	D7169, D6352	Clarus 580/680 GC with Arnel Solution	
	Light Hydrocarbons (DHA for Improved SimDis Analysis)	IP PM-DL	Clarus GC(s) with Swafer Technology and Arnel Solution	
	Total Mercury	D7623	SMS 100 Automated Mercury Analyzer	
	Metals Analysis	D5708, D5863	Optima™ ICP, NexION™ ICP-MS, PinAAcle AA	
Gasoline	Benzene and Toluene	D3606, D5580	Clarus GC with Swafer Technology with Arnel Solution	
	Simulated Distillation	D2887, D3710, IP 406	Clarus 580/680 GC with Arnel Solution	
	Detailed Hydrogen Analysis (DHA)	D6729, D6730, D6733	Clarus 580/680 GC with Arnel Solution	
	Oxygenates	D4815	Clarus 580/680 GC with Arnel Solution	
	Aromatics	D5580	Clarus 580/680 GC with Arnel Solution	
	Sulfur Selective Detection	D5623	Clarus 580/680 GC with Arnel Solution	
	Benzene Content	D6277	Spectrum Two FT-IR	
	Benzene, Toluene, and Total Aromatics	D5769	Clarus 680 GC/MS	
	Total Sulfur in Light Hydrocarbons	D5453	LAMBDA UV-Vis	
	Phosphorus Analysis	D3231	LAMBDA UV-Vis	
	Biodiesel Testing	D7371, EN 14078	Spectrum Two FT-IR or Frontier FT-IR	
	Natural Gas	Saturated Light Hydrocarbons - "Natural Gas Analyzer"	D1945, D1946, D5504, DIN 51872-5, GPA 2261, 2177, 2286, 2186, 2165, ISO 6568, 6974-5, 6975, 6976	Clarus 580/680 GC with Arnel Solution. More than 30 options available.
		Sulfur	D5504	Clarus 580/680 GC with Arnel Solution
Refinery Gas	Concentrations of the Fixed Gases and Light Hydrocarbons "Refinery Gas Analyzer"	D1945, D1946, D2597, DIN 51872-4, UOP 539, 709	Clarus 580/680 GC with Arnel Solution	
Jet Fuel	FAME Analysis (Biodiesel)	IP 585	Clarus GC/MS or Spectrum Two FT-IR	
	Simulated Distillation	D2887, IP 406	Clarus 580/680 GC with Arnel Solution	
	Naphthalene Testing	D1840	LAMBDA UV-Vis	
Naphthas	DHA	D5134, D6730	Clarus 580/680 GC with Arnel Solution	
	Metals Analysis	D5185	Optima ICP, NexION ICP-MS	
	Silicon Testing		Optima 8300 ICP-OES, NexION ICP-MS	
	Mercury Testing		SMS 100 Automated Mercury Analyzer	
LPG	Determination of Hydrocarbons	D2163	Clarus 580/680 GC with Arnel Solution	
Kerosene	Simulated Distillation	D2887	Clarus 580/680 GC with Arnel Solution	
Biodiesel	Free and Total Glycerin	D6584, D7371, EN 14078	Clarus GC, Spectrum Two FT-IR or Frontier FT-IR	
	Phosphorus Testing	D4951	Optima ICP-OES	
	Simulated Distillation	D7398	Clarus 580/680 GC with Arnel Solution	
	FAME Analysis	D7371, EN 14078, EN 14103	Clarus 580 GC, Spectrum Two FT-IR with UATR	
	Trace Metals	D4951	Optima ICP	
Other	Hydrogen Sulfide Analysis in the Vapor Phase	D6021	Clarus 580/680 GC with Arnel Solution	
	Metal Analysis in Lubricants	D5185, D5708, D4551, D4628	Optima ICP, PinAAcle AA	
	Trace Elements in Coal, Coke, and Combustion Residues from Coal Utilization	D6357	Optima ICP, NexION ICP-MS, or PinAAcle AA	
	Trace Metals in Gas Turbine Fuels	D3605	PinAAcle AA	
	2,6-di-tert-Butyl-p-Cresol and 2,6-di-tert-Butyl Phenol in Electrical Insulating Oil	D2668	Spectrum Two FT-IR	
	Aromatics in Diesel fuels	D6591, IP 391, EN 12916	Flexar™ HPLC	
	Diesel Engine Oils in T-8 Diesel Engines (Soot Build Up Test)	D5967	Pyris 1 TGA	
	Carbon, Hydrogen, and Nitrogen in Petroleum Products, Coal, and Lubricants	D5373, D5291	2400 Series II CHNS/O System	
	Evaporation Loss of Lubricating Oils by the Noack Method	D5800	Pyris 1 TGA	
	Greenhouse Gas Emissions Reporting for EPA Compliance - Total Carbon Content	Regulatory Requirement: 40 CFR part 98	2400 CHN Series II	

## ENHANCED GASOLINE ANALYSIS BY GAS CHROMATOGRAPHY

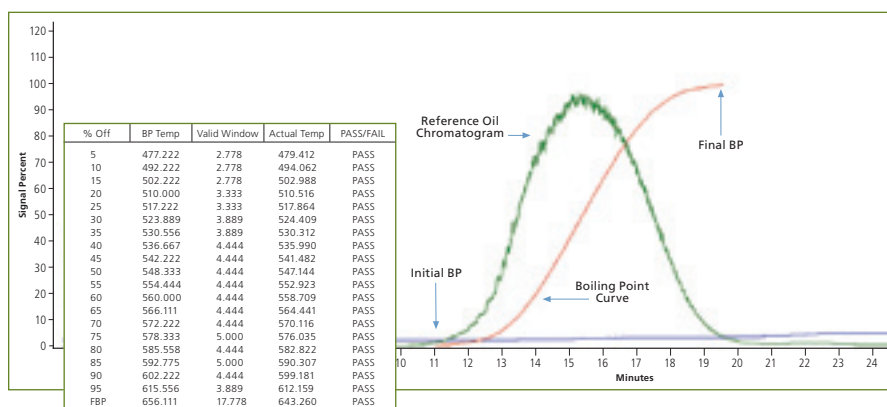


The combination of capillary columns with the Swafer technology has taken a mature method and improved the quality of data and reduced the run time.

ASTM® Test Method, D3606, is an established method used to determine the benzene and toluene content in gasoline—originally developed to analyze gasoline that did not contain ethanol. Ethanol is now added to modern gasolines to improve combustion efficiency. The presence of large amounts of ethanol in samples may cause co-elution problems with benzene.

Using a PerkinElmer Clarus 680 GC with Swafer microflow technology and capillary columns, data quality and run times have been significantly improved. This approach completely eliminated all chromatographic interference between ethanol and benzene, which improves the quality of the chromatography in general and reduces the analysis time significantly (by 50 – 75%). Swafer technology enables the separation on the precolumn to be directly monitored by a detector—allowed the backflush point to be easily and accurately established.

## MORE ACCURATE, EFFICIENT CRUDE ANALYSIS BY GAS CHROMATOGRAPHY



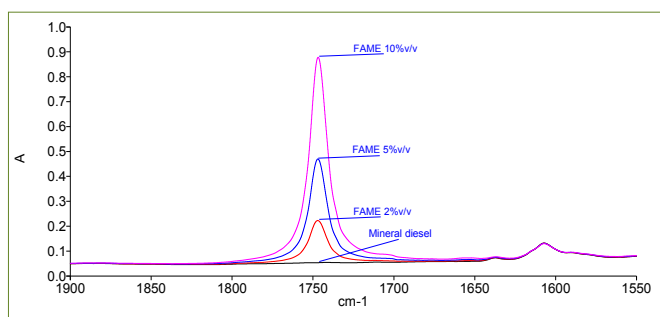
This is an example of a reference oil chromatogram with the calculated boiling point curve. Slices of the chromatogram are taken to determine the boiling point fractions.

With the PerkinElmer 680 GC, SimDis Analysis by Modified ASTM D2887, D6352 and D7169, run times have been reduced by approximately half the time of other manufacturers.

SimDis is considered to be the most important technique in a refinery laboratory. Understanding the boiling range of crude oil, or its fractions, is critical for determining quality assurance, regulatory compliance, refinery process control and physical property predictions. ASTM methods used for SimDis applications have been widely used to obtain reliable and repeatable analysis given the specific parameters of each method.

With the Clarus 680 GC oven, users will have an extremely accurate boiling point curve and see a fast cool down time, which in turn provides higher throughput. The POC injector has no discrimination problems against difficult samples and is extremely easy to maintain and use.

## FUEL ANALYSIS BY INFRARED



The Spectrum Two FT-IR provides fast and easy analysis of varying FAME concentrations in diesel fuel.

IR is a common technique for analyzing fuels. Standard IR tests may include testing for biodiesel, or benzene quantity in the fuel. PerkinElmer has harnessed over 65 years of IR experience to dramatically simplify fuel analysis. With Spectrum Two, you can assure the quality and composition of fuel samples faster and more easily than ever before. With the enhanced technology built into the Spectrum Two platform, you can achieve accurate, dependable answers in even non-laboratory environments. Compact in size and robust, the instrument can be transported to any location, or kept in the lab. Performance is never compromised.

You get the result you need—when you need it.



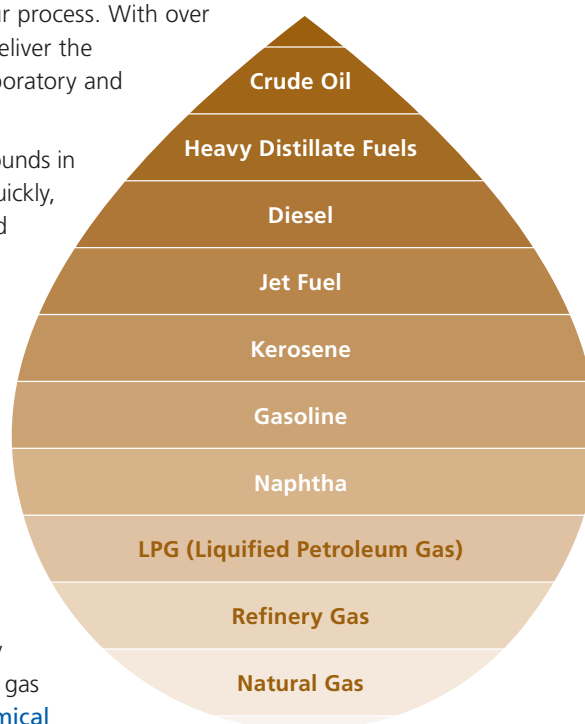
# COMPLETE SOLUTIONS FOR REFINERY AND NATURAL GAS ANALYSIS

Whether you're analyzing crude oil, natural gas, or any other associated products in the industry, PerkinElmer offers a full range of instrumentation and proven applications to streamline and simplify every stage of your process. With over 60 years in the analytical-measurements business, we deliver the knowledge and experience necessary to ensure your laboratory and business requirements are met.

Analyzing and measuring semivolatile and volatile compounds in finished products and raw materials can be performed quickly, easily and accurately with our turnkey solutions. Designed specifically for today's most common industry methods, our systems help you optimize operations and ensure complete quality control across a broad range of analyses, including:

- Hydrocarbon Analysis
- DHA
- Sulfur
- Aromatics
- Light Gases
- Elemental
- FAMES
- Simulated Distillation
- Oxygenates
- Methanol
- Metals
- Mercury
- Naphthalenes
- Glycerin

For more information on how we can help you efficiently determine the crucial components in your oil and natural gas samples, [visit us at www.perkinelmer.com/petrochemical](http://www.perkinelmer.com/petrochemical)



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