

Solutions from Upstream to Downstream

Petroleum Industry



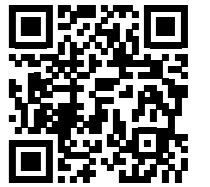
Your Tomorrow Is Our Mission

Anton Paar, the market leader in the development and manufacturing of reliable and accurate measuring instrumentation, is your trusted partner for optimizing production processes at key points. We specialize in increasing the productivity of routines in many areas of refining, processing, distributing, and trading of petrochemical products.

To meet our customers' various needs, we offer a full-range portfolio. From the analysis of crude oil to the testing of fuels and biofuels, lubricants, liquefied petroleum gas, asphalt, and much more, you can be certain you will find the right solution for your laboratory or process environment.

- ✓ Safeguard your processes and people with high-quality instruments and integrated safety features
- ✓ Enhance your productivity with automated solutions and minimal operator interaction
- ✓ Maximize your production output and eliminate product loss due to quick measurements and fast reaction times
- ✓ Certify your products according to relevant standards and specifications
- ✓ Reduce waste and environmental impact by using smaller samples and fewer solvents
- ✓ Save time thanks to fast measurements and minimum sample preparation

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Anton Paar:

Setting standards for more than 100 years

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We support you in your challenges: complying with national and international regulations, reaching maximum efficiency in the development of new products, meeting the highest safety standards, and fulfilling current requirements for sustainable procedures and technologies.

Our instruments are at hand for the analysis of crude oil, fuels, lubricants, and asphalts at the refinery, before transport and distribution, and for consumers as well as testing laboratories. Instruments by Anton Paar are known for their reliability, accuracy, and robust construction.

UPSTREAM

Analysis for exploration and oil recovery

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DOWNSTREAM

Fuel analysis at refineries

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DOWNSTREAM

Lubricant analysis at refineries

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DOWNSTREAM

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MIDSTREAM

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TESTING LABORATORIES

Analysis of raw materials, petroleum products, and oil-condition monitoring

18-19



Broadest Standards Compliance on the Market

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Crude Oil



Density	D5002
Viscosity	D7042
Cold flow properties	D5853

Fuel Oil



Density	D4052, ISO 12185
Viscosity	D7042
Cold flow properties	ISO 3016
Pensky-Martens flash point	D93, EN ISO 2719
Distillation	D86, ISO 3405

ASTM: D396, D2880
EN: EN 14214
ISO: ISO 4261, ISO 8217

AvGas



Density	D4052, ISO 12185
Distillation	D86, ISO 3405
Gum content	D381, ISO 6246
Freeze point	D2386

ASTM: D910, D6227, D7547, D7960

Diesel & Biodiesel



Viscosity	D7042, EN 16896, ISO 23581
Oxidation stability	D7545, EN 16091
Cold flow properties	D6371, D2500, ISO 3015, EN 23015, D97
Pensky-Martens flash point	D93, EN ISO 2719
Distillation	D86, ISO 3405

ASTM: D975, D6751, D7467
EN: EN 590, EN 14214, EN 15940, EN 16709, EN 16734

Aviation Turbine Fuels



Density	D4052, ISO 12185
Viscosity	D7042
Pensky-Martens flash point	D93, EN ISO 2719
Abel/Tag flash point	D56, EN ISO 13736
Distillation	D86, ISO 3405
Gum content	D381, ISO 6246
Freeze point	D2386

ASTM: D1655, D6615, D7223, D7566
DEF STAN 91-091
JIG AFQRJOS

Asphalt



Density	D8188
Penetration	D5, EN 1426
Softening point	D36, EN 1427
Fraass Breaking Point	EN 12 593
Cleveland flash & fire point	D92, ISO 2592

Rheology
AASHTO T315, T316, T350, TP101 UL, TP123, TP126, ASTM D7175, D4402, D7405, D7552, DIN EN 13302, EN 13702, EN 16659, EN 14770, GOST R58400.10, R33137, R58400.6 R58400.7 R58400.9, AGPT T125, T192, T194, FGSV AL720, AL721, AL722, AL723

AASHTO M320, M332
ASTM: D449, D2521, D3381, D5078, D6114, D6373, D8239
EN: EN 12591, EN 13108, EN 14023
AGPT T190 / GOST R58400.1 / IS 15462, IS 73

Ethanol



Density	D4052, ISO 12185
Distillation	D86, ISO 3405
Gum content	D381, ISO 6246

ASTM: D4806

Gasoline



Density	D4052, ISO 12185
Oxidation stability	D525, D7525, ISO 7536
Distillation	D86, ISO 3405
Gum content	D381, ISO 6246

ASTM: D4814, D5797, D5798, D8011
EN: EN 228, EN 15293

Further Test Methods



Density	D7777, D7961, IP 365, IP559
Viscosity	D2161, D2270, D2501, D2502, IP 626
Oxidation stability	D8206
Penetration	D5, D217, D1321, D1403
Distillation	D850, D1078
Refractive index	D1218
Elemental analysis	D7876



Analysis for Exploration and Production



Evaluate crude oil properties by using Anton Paar's measuring instruments. Receive hard facts to make decisions about the drilling process, yield improvement, crude oil treatment, and transportation.

Using measuring instruments to evaluate and simulate conditions at the well will help you to optimize the drilling process and take the right steps to improve reservoir yield. To support your crude oil exploration, Anton Paar offers a wide range of solutions for crude oil analysis, including measurement of density, viscosity, and rheological behavior.

Knowledge of these parameters gives you the information you need to optimize your crude oil treatment and ensure hassle-free transportation to the refinery. As the refining process is highly sensitive to changes in the crude oil composition, constant monitoring with reliable instrumentation enables you to react immediately to any deviations in output quality and process safety.

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Use Cases	Benefits
Choosing the right extraction strategy based on actual reservoir conditions	Characterize the composition of artificially changed crude oil in pressure-volume-temperature studies by measuring density to increase the exploitable reservoir capacity by up to 80 %
Determining the bubble point to increase the extraction potential of the well	Expand the extraction potential of a well by up to 40 % by measuring the technology-based determination of the bubble point
Improving drill fluid management	This will reduce the costs for crude oil recovery and ensure well bore stability by optimizing the drilling fluid performance without on-site presence or sample drawing
Checking the purity of crude oil after treatment	Determine automatically the °API for crude oil classification and checking the crude oil purity within 30 seconds in just 1 measurement
Evaluating the flow behavior to obtain good pumpability	Ensure the most economic pipeline transport conditions by simulating and fine-tuning the crude oil's flow behavior
Rheological characterization of drilling fluids / drilling mud under high pressure and high temperatures	Characterize the rheological properties of drilling fluids and compare newly developed drilling fluid recipes under various conditions
Determine the rheological properties of crude oil under different environmental conditions (pressure, temperature)	Improve and facilitate oil recovery by understanding the rheological properties at different temperatures and increased pressures, and in the presence of different gases

Density	Viscosity	Rheological Properties
x		
x		
x	x	
	x	x
		x
		x

Fuel Analysis at Refineries

From fuel research to fuel quality testing, using analytical instruments at key points in your work will help you increase productivity and maximize returns.



In the refinery, our measuring technology ensures incoming crude oil flows correctly and additives have the right composition. Our instruments provide process and lab measurements for raw materials, production monitoring, and quality testing of products like jet fuel and bunker oils. Anton Paar devices determine parameters in compliance with ASTM, EN, or ISO standards, reducing errors and increasing efficiency. They assist in making distillation cuts and meeting specifications while speeding up sample preparation for elemental analysis. Our portfolio supports research, carbon emission reduction, and environmental impact reduction.

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Use Cases	Benefits
Determining the cloud and pour point of incoming crude oil	Ensure the right concentration of additives to keep the crude oil moving (along the pipeline)
Automating data management to increase productivity	Reduce the work load of lab personnel, eliminate the risk of human error, and ensure data integrity
Precisely measuring the mass of final products to ensure profitable trading and a reliable basis for account settlement	Save time and money when trading goods by using mass-to-volume conversion
Optimizing sample preparation (digestion) for elemental analysis (ICP)	You will save time and increase safety during routine sample preparation
Characterizing new fuels, blends, and solvents during research and development	Benefit from economically efficient measurements and get several physical parameters with easy-to-use instruments to save time
Measuring fully and automatically the density and viscosity of highly viscous samples	Minimize the operator's contact with hot substances, increase your lab's safety and productivity, and eliminate potential human errors
Atmospheric distillation measurement according to ASTM D86	Safely and accurately simulate the distillation in the lab to maximize process output and meet environmental regulations
Checking the composition of incoming additives used for cracking and other manufacturing steps to ensure safe operation	Quickly and correctly identify and prevent hazardous reactions due to mixups and eliminate risk for personnel and process plants

Density	Viscosity	Rheological Properties	Refractive Index	Distillation	Flash Point	Gum Content	Oxidation Stability	Cold Flow Properties	Sample Preparation / Elemental Analysis	Molecular Spectroscopy
	x	x								
x	x	x	x	x	x			x		
x										
									x	
x	x		x	x	x	x	x	x	x	x
x	x									
				x						
x	x									x

Lubricant Analysis at Refineries



At all steps in a refinery – from vacuum distillation to solvent extraction, hydro treatment to blending – Anton Paar’s measuring solutions help you optimize your processes.

Automated measurements with Anton Paar’s benchtop devices relieve your personnel of repetitive work, increase efficiency, and minimize handling errors, e.g. when conducting product certification in the lab to ensure compliance with the required specifications. Our instruments for sample preparation provide digested samples in a fraction of the time required by conventional methods, allowing you to get on with elemental analysis with ICP, e.g. for lubricant contamination analysis. During distillation, for instance, our instrumentation can help you to assess the best time to make distillation cuts.

Our portfolio offers the viscometers, rheometers, penetrometers, density meters, and flash point testers you need: for research into new and improved products as well as for the reduction of carbon emissions and overall environmental impact.

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www.anton-paar.com/apb-lubricant-testing

Use Cases	Benefits
Characterizing and specifying base oils and formulated lubricants	Improve efficiency, reduce operator time and operational costs, and increase flexibility and uptime with fast, error-free and accurate measurements to obtain crucial physical parameters for product characterization
Classifying dangerous goods to ensure safe transportation and storage	Increase throughput and benefit from low cost of operation and no instrument downtime
Simulating the storage behavior	Use the results to adjust the product so the quality and functional properties remain stable in the specified range during storage, leading to fewer problems due to oxidation and corrosion
Minimizing product loss in multiproduct pipelines	Reduce product waste and financial loss
Digesting oil samples for trace metal analysis	Ensure fast, safe, and complete digestion of difficult-to-digest samples
Analyzing flow behavior to evaluate the performance and longevity of the product	Enhance the long-term stability and performance of your lubricant products to minimize maintenance cycles and unnecessary downtimes of your customers' machinery
Performing automated measurements of density, viscosity, and cold flow properties of highly viscous lubricants, greases, and additives	Relieve operators to perform other tasks, reduce the potential for human error, and maximize your lab productivity

Density	Viscosity	Rheological Properties	Refractive Index	Distillation	Flash Point	Consistency & Rheological Properties	Oxidation Stability	Cold Flow Properties	Sample Preparation / Elemental Analysis
x	x	x	x	x	x	x	x	x	x
					x				
							x		
x	x								
									x
	x					x		x	
x	x							x	

Asphalt and Bitumen Analysis at Refineries



Using analytical instruments at key points in asphalt and bitumen quality testing will help you increase productivity and maximize returns.

To ensure the durability of asphalt and bitumen in various conditions, we analyze their material properties using Anton Paar's measuring devices. These instruments fine-tune asphalt/bitumen elasticity by assessing additives. The results guide long-term stability evaluations for bitumen emulsions and asphalt deformation. We also offer solutions for assessing softening point, penetration, breaking point, and asphalt binder certification, as well as calculating bitumen mass from a known volume for accounting purposes.

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www.anton-paar.com/apb-asphalt-testing

Use Cases	Benefits
↓ Certifying asphalt binders according to relevant standards	↓ Benefit from increased speed and safety, and take advantage of more user-friendly certification of modified and unmodified asphalt binders and bitumen over a wide temperature range
Investigating asphalt and bitumen consistency, and rheological properties with automated solutions	Perform precise measurements with our comprehensive software, and in conjunction with active Peltier elements, quickly reach the desired temperature, reducing measurement and cleaning time
Developing bitumen emulsions to meet design specifications, performance, and stability criteria	Avoid the risk of unintentional product transformations during storage, transport, and processing
Determining the purity and composition of bitumen, and classifying mixtures by the gas pycnometry technique	When performing quality control and purity/composition determination of bitumen, reduce the time needed for measurements and virtually eliminate operator error by measuring with a gas pycnometer
Classifying bitumen based on accurate penetration testing	Apply automatic surface detection for fast penetration test results to determine the correct degree of bitumen hardness, and choose the right bitumen type for the asphalt mixture
Determining the viscosity of asphalt binders to assure pumpability, mixability, and processability	Take advantage of Anton Paar's rotational rheometer, equipped with an air counter-cooled temperature device, allowing for fast heating and cooling of the sample
Accurately measuring and matching the density of bituminous semi-solids, asphalt binders, and mixtures with paving requirements	Conduct fast and accurate measurements to determine the purity and composition of bitumen, and to classify mixtures
Streamlining the asphalt and bitumen trade with fast, accurate density measurements	Obtain standardized results with the market-standard density test method: minimal sample, cleaning agents, and operator skills required

Density	Viscosity	Rheological Properties	Flash Point	Consistency	True and Skeletal Density of Solids	Particle Size
↓	↓	↓	↓	↓	↓	↓
x	x	x	x	x	x	
		x		x		
		x				x
x						
				x		
	x	x				
					x	
x						

Transportation and Storage of Finished Products



Use measuring technology to ensure that the quality of the petroleum products you purchase is still the same after storage and transportation to your site.

For petroleum product consumers and sellers, verifying fuel quality and specifications is essential. Anton Paar provides devices for this purpose, including viscosity, density, gum content, and purity checks. We assist in meeting stricter emission and environmental regulations, leading to increased fuel testing and monitoring during transactions. Our measuring technology supports automotive sector advancements like biofuels, additives, and electric vehicles. We also offer testing equipment for facilities involved in liquefied gas use for household cooking and heating.

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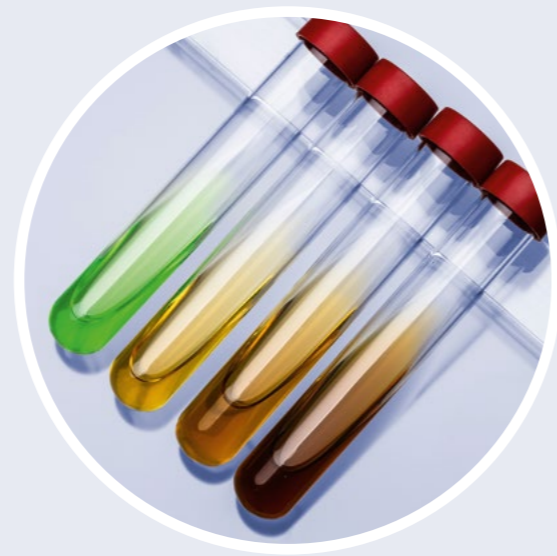


www.anton-paar.com/apb-tank-terminal

Use Cases	Benefits
Performing on-board checks before refueling aircraft, watercraft, and land vehicles	Avoid damage to engines with correct product identification and checking of fuels for signs of aging and reduced quality
Meeting safety legislation for transportation, handling, and selling of final products	Evaluate flammability and volatility to meet regulations and assign hazard classifications according to internationally accepted referee methods
Checking for adulteration, biodegradation, and contamination during fuel storage and transportation	Avoid damage to tanks, filters or engines by continuously monitoring parameters indicating contamination during loading and storage operations
Unloading fuels and lubricants without losses or mixups	Monitor pumping and unloading processes continuously to avoid contamination and unintentional mixups, and minimize mass balance errors – a requirement for tight financial control of custody transfer points
Determining the storage stability of final products	Meet the performance criteria of fuels and lubricants and make sure that there are no issues with residues or oxidation stability before and after storage, to ensure correct specifications and prevent customer complaints and liability issues
Identifying products in hazardous areas on-site	Use a single intrinsically safe device to reliably identify all types of incoming and outgoing goods
Conducting viscosity analysis of asphalt and bitumen samples at different temperatures (primed by fast heating and cooling rates)	Experience rapid temperature control with Anton Paar's user-friendly rotational viscometer and its adaptable small sample adapter system

Density	Viscosity	Rheological Properties	Refractive Index	Distillation	Flash Point	Gum Content	Oxidation Stability	Cold Flow Properties	Molecular Spectroscopy
x							x		
				x	x				
x					x				x
x	x								
		x		x	x	x	x		
x									
	x								

High Throughput Analysis at Testing Labs



Anton Paar's analytical instruments enable you to obtain reliable and traceable results for product characterization, classification, and dispute settlement.

As a testing laboratory, you're tasked with various analyses, from fuel and diesel oil to quality testing, lube oil, and oil-condition monitoring (OCM). Anton Paar's devices enhance sample throughput and accuracy. We offer automated filling and cleaning for instruments, including fully automated platforms with integrated robotics for large-scale sample processing. Count on Anton Paar for reliable, traceable result protocols.

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www.anton-paar.com/apb-automation

Use Cases	Benefits
Characterizing and specifying products	Enhance efficiency, cut operator time and costs, and boost flexibility and uptime with swift, precise measurements for critical product characterization parameters
Conducting high-throughput rheology measurements for OCM	Benefit from unattended high-throughput measurements which run 24/7, and from results with fewer handling errors and less redundancy
Automating measurements and data transfer to increase your productivity	Eliminate the risk of human error, reduce the amount of waste, and greatly improve the repeatability and reproducibility of your analysis
Settling disputes in fuel trading	Save time and get the correct results quickly by using mass-to-volume conversion based on reliable and accurate results from the gold standard in digital density measurement
Conducting crude oil analysis to evaluate composition, and classify it according to API	Use cost-effective solutions to rapidly classify crude oil °API in under 30 seconds and assess the viscosity and rheological properties of various samples
Determining friction and wear as well as the right time for renewing a lubricant	Quick and easy quantification of a lubricant's long-term performance under given conditions to save your equipment from damage and unnecessary downtimes
Preparing samples for elemental analysis, asphalt / bitumen quality, and properties assurance	Optimize reaction control for thorough sample digestion, ensuring accurate elemental analysis at temperatures up to 300 °C and 199 bar
Digitization and harmonization of laboratory instrument data	Improve efficiency, quality and productivity: eliminate transcription errors, flexibly access data from any computer on the corporate network, streamline process steps, track all activities

Density	Viscosity	Rheological Properties	Refractive Index	Distillation	Flash Point	Consistency	Gum Content	Oxidation Stability	Cold Flow Properties	Sample Preparation / Elemental Analysis
x	x	x	x	x	x	x	x	x	x	
		x								
x	x									
x										
x	x	x								
	x	x								
										x
x	x	x	x	x	x				x	

