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AFIDA SA6000-0

Advanced Fuel Ignition Delay Analyser

ASTM D8183; IP 617; EN 17155

Correlates with ASTM D613; EN ISO 5165 & DIN 51773

Specifications ASTM D975; ASTM D1655; ASTM D6751; ASTM D7467; EN 590; EN 15940; ISO 8217

- Indicated Cetane Number by CVCC
- Range 35 - 85 ICN
- Built in autosampler
- Highly automated - load and go
- Reference Fuel Calibration
- No bias correction to engine values
- Excellent precision to minimise giveaway
- Easy to use, suitable for 24/7 operation
- Load and go
- Small sample size (40 mL)
- Correlates with Lean Blow Out (LBO)

Now included in ASTM D975; ASTM D1655; ASTM D6751; ASTM D7467; EN 590; EN 15940 ISO 8217

Middle Distillates • Biodiesel • FAME • Jet A-1 • HVO • XTL • Synthetic Jet

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AFIDA (Advanced Fuel Ignition Delay Analyser)

AFIDA is a revolutionary development providing fully automated determination of the Indicated Cetane Number (ICN) of diesel and diesel related fuels.

The analyser incorporates a unique and patented high pressure injection system that generates fine fuel droplets similar to modern common rail injectors in most diesel engines.

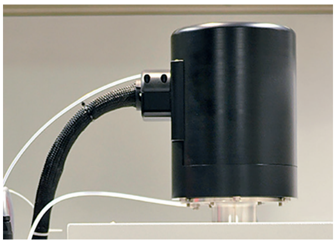
A temperature controlled piezo electric injector provides rapid switching and highly repeatable fuel metering, offering improved performance and consistency when compared with solenoid controlled injectors and pintle type nozzles.

The analyser provides very fast, efficient and calibrated ICN determinations, tests are fully automated via an integral 36 position carousel and auto sampler.

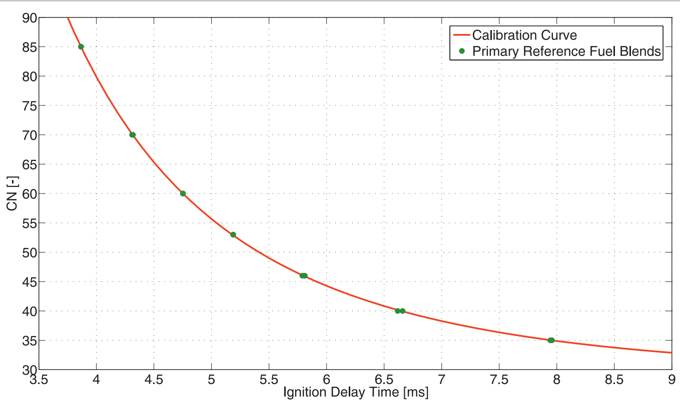
Features

- SQC analysis in accordance to ASTM D6299
- Excellent correlation to ASTM D613, EN ISO 5165 & DIN 51773
- Integral 36 place carousel and auto sampler
- Calibrated with industry approved reference fuels
- Fully automated measurement
- Small sample volumes (approx 40 ml/analysis including flushing)
- Short analysis time of approximately 25 minutes per sample
- Precise and reproducible software controlled determination of ICN
- Advanced electronically controlled high pressure fuel injection system with piezo electric injector
- Safe operation - integral safety monitoring functions
- Results saved to PC or for download
- Proven calibration stability - minimising downtime (see figure 3)
- Uninterruptable power supply to maintain cooling in the event of power failure
- LIMS compatible

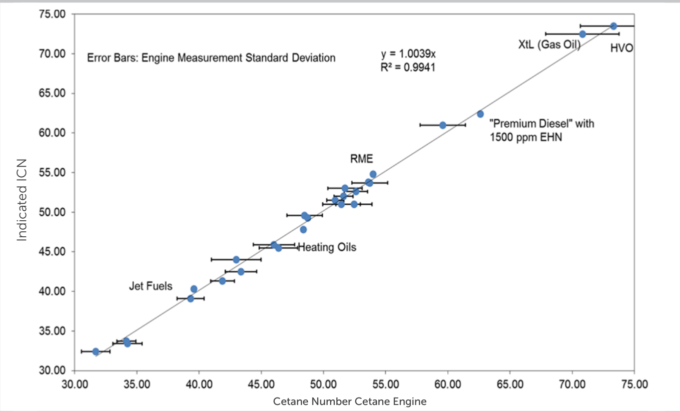
› Sample Carousel



› Piezo Electric Injector



› Figure 1: Calibration with 7 PRF blends covering measurement range CN 85 to CN 35



› Figure 2: ICN correlation to Cetane Engine - **R^2 = 0.9941**

New Generation AFIDA Technology

Direct correlation to ASTM D613 (ISO 5165) engine tests

The traditional Cetane Engine methods establish an ignition delay period for the test fuel which is referenced to a primary reference fuel scale.

Existing Constant Volume Combustion Chamber (CVCC) technology provides a Derived Cetane Number (DCN) result based on a historical averaged correlation equation applied to the ignition delay of the fuel sample.

The new generation AFIDA technology is a significant step forward as it uses the original Primary Reference Fuels as specified in the Cetane Engine method to provide a calibrated Cetane Number measurement (see figure 1). This approach eliminates the need for temperature tuning and uses fixed test conditions.

Standardisation by CEN, ASTM and the Energy Institute

ASTM D8183, IP 617 and EN 17155, all three methods are aligned in scope and precision.

An EI inter-laboratory study was successfully completed with excellent precision and concluded no bias correction to ASTM D613 (cetane engine).

ASTM D8183, IP 617 and EN 17155 have now been included in EN 590; ASTM D975; ASTM D6751; ASTM D7467; EN 15940

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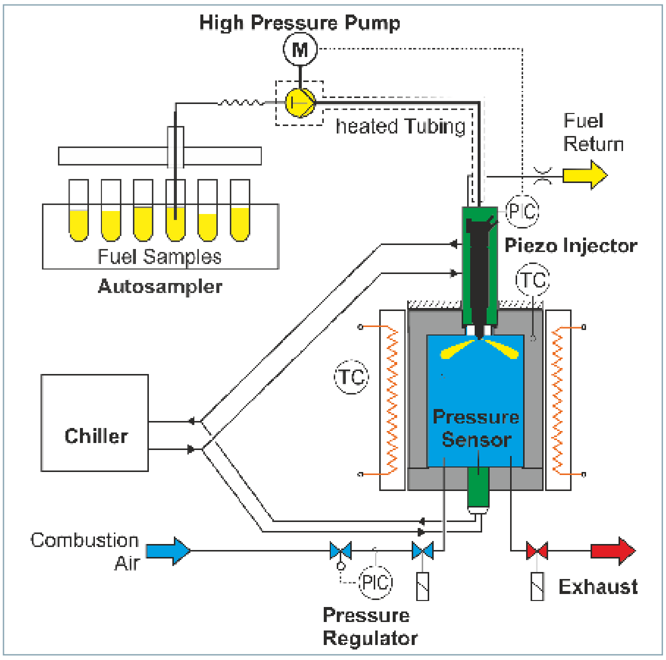
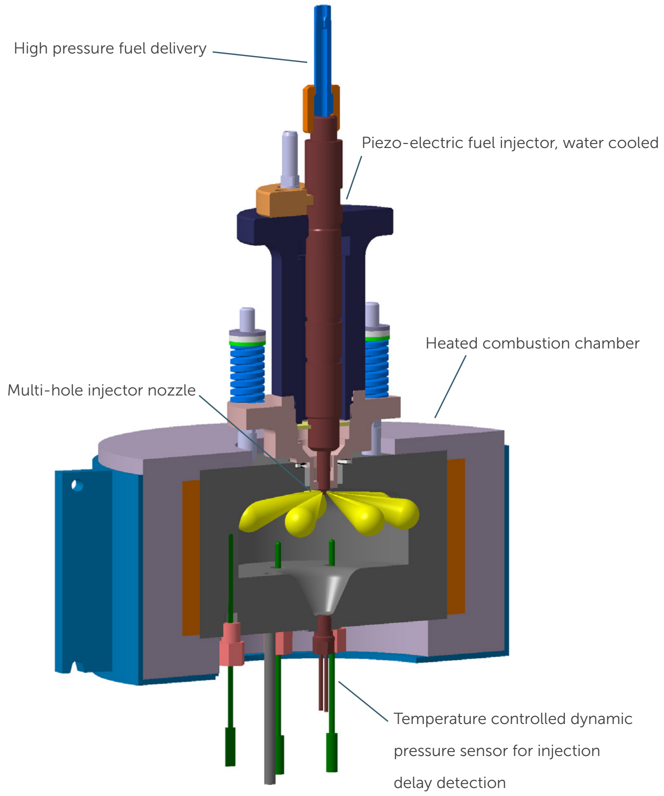
Operating Sequence

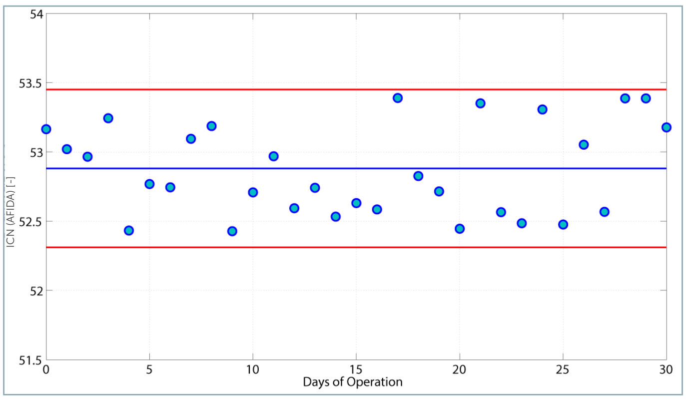
- Prior to the analysis each sample is filtered by the operator using a 0.45 µm filter
- Software controlled auto sampler selects the sample to be analysed
- System is flushed and primed automatically with the selected sample
- High pressure pump generates the injection pressure, while the heating tubes keep the fuel at a constant temperature
- Test sample is injected into the pressurised combustion chamber
- Nebulized fuel ignites spontaneously and leads to a pressure increase, see figure 4
- The pressure variation curve is recorded at high resolution by a dynamic pressure sensor
- ICN is read directly from the calibration curve, see figure 1



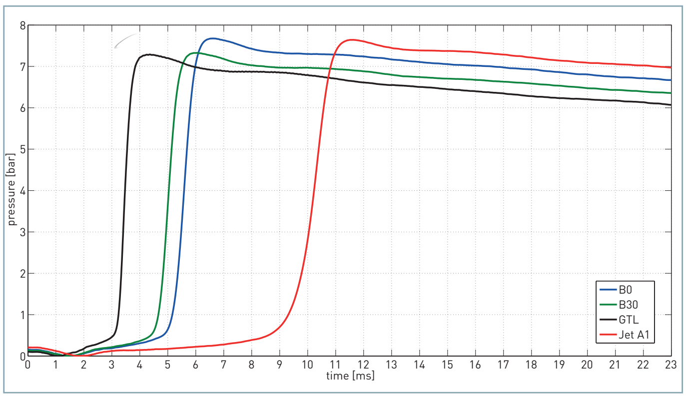


Features of the Chamber and Injector

- Fuel reservoir maintains high fuel pressure during injection
- Piezo-electric fuel injector as used in modern passenger cars' diesel engines
- Water-cooled injector jacket maintains constant fuel temperature during operation
- Effective nozzle tip cooling to avoid fuel degradation due to high temperatures
- Real internal chamber temperature measurement
- Pressure transmitter connection free of acoustic oscillation



› Figure 3: SQC graph showing ICN variation versus operation time



› Figure 4: Pressure variation curves vs ignition delay of four different fuels (B0, B30, GTL and Jet A1)

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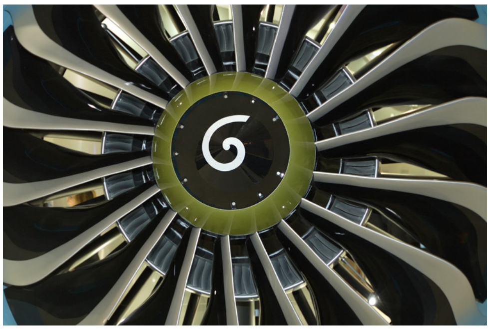
AFIDA (Advanced Fuel Ignition Delay Analyser)

AFIDA for Sustainable Aviation Fuel (SAF)

Indicated Cetane (ICN) values can be used to predict the potential occurrence of a condition called Lean Blowout (LBO) in a gas turbine. LBO is a very undesirable effect and occurs in a jet engine when the fuel to air ratio reduces to such an extent that the flame extinguishes. Fuels and synthetic blend components (SBC's) tested by the National Jet Fuel Combustion Program (NJFCP) on a variety of engines, and data gathered by the National Renewable Energy Laboratory (NREL) enabled a correlation to be formed between LBO and ICN*. The ASTM D4054 Fast Track Annex indicates that a value between 35 and 60 for the finished fuel maintains safety by keeping the fuel in the range of conventional Jet A-1 experience.

The AFIDA is particularly attractive for trial blends of SBC's and conventional jet fuel, as well as early stage research, due to its fast test time, low sample volume (less than 40 ml) and autosampler, noting that during development some synthetic components can cost thousands of dollars per milliliter when very limited volumes might be available.

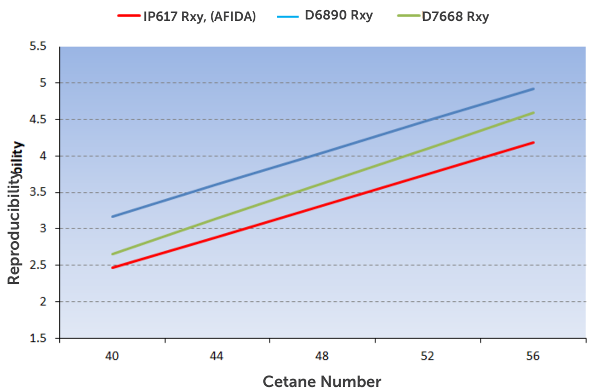
*Research report available



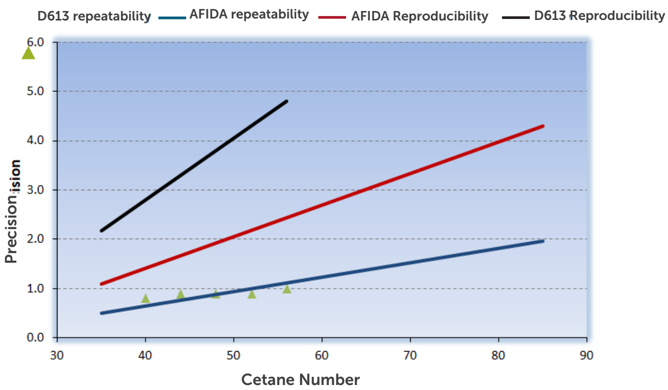
Technical Specification AFIDA SA6000-0

Operation	
Measurement Conditions	Chamber temperature: 580 °C Chamber pressure: 17.5 bar Injection pressure: 1000 bar Compressed air (20.9 ± 0.5 % O_2)
Sample volume	approx. 40 ml for analysis and cleaning
Warm-up time	approx. 45 min
Analysis time	approx. 25 min per sample
Range for ICN	35 - 85 in standard mode
Carousel capacity	36 samples
Reporting	
Test parameters	All measurement values are stored in the data file
Reports	Detailed report of test results, date and time, operator name and calibration date
Safety	
External cooling	Backup power supply and liquid level sensor
Waste	Liquid level sensor
Various	Programmable Logic Controller (PLC) based
Requirements	
Operating requirements	Ambient temperature: 10 °C to 35 °C (recommended 15 °C to 25 °C) Humidity: up to 80% non-condensing
Size (WxHxD)	130 x 80 x 60 cm
Weight	Approx 100 kg (excluding platform)
Voltages	See AFIDA manual

Best cross method Reproducibility to ASTM D613



Minimise giveaway - precision comparison



*Manufactured under licence from ASG Analytik-Service Gesellschaft mbH