

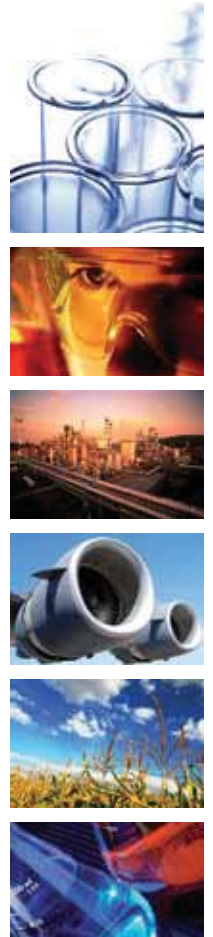


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## FIJI FAME in Jet Instrument



DEF STAN 91-91 & ASTM D1655 Jet Fuels

IP 583; ASTM D7797 - Determination of the FAME content of aviation turbine fuel (AVTUR) with FTIR, Rapid screening method

## Key Features

- Analysis time 20 minutes
- Certified range 20–150 mg/kg
- Laboratory and field instrument
- Fully automatic
- Suitable for untrained operators
- No cleaning solvents required
- No pre-sample preparation required
- 50 ml sample volume
- Patent Approved



## What are the concerns over contamination?

- In many cases Diesel and JET use shared multi-product pipelines which can lead to fuel contamination
- FAME is surface active and attracted to the inner wall of pipelines which causes fuel contamination
- JET can release FAME from tankers and pipelines which creates cross contamination
- Whenever fuel is moved or stored there is the potential for fuel contamination

Industry concern over fuel contamination has prompted the need for improved testing, and reliable operating procedures are necessary to prevent airports suffering any disruption from handling contaminated fuel.

## New technology and test method developed to identify risks

The patented Fame In Jet Instrument (FIJI) has been developed to offer the industry a rapid and easy check on Parts Per Million (ppm or mg/kg) levels of FAME in Aviation fuel using test method IP 583 and ASTM D7767.

FIJI uniquely utilises state of the art FTIR (Fourier Transform Infra-Red Spectroscopy) technology and a patented sample preparation system which allows FAME detection accuracy down to the 20mg/kg level.

FIJI can be used as a field or lab based screening tool to give a quick indication of possible FAME contamination that may then necessitate further investigations. The instrument can be used to prevent expensive testing and avoid costly delays of fuel release.

## What types of FAME can FIJI detect?

A key advantage over current analytical FAME in Jet methods is FIJI's ability to detect all types of FAME in the range C8 to C22 including;

- Coconut
- Mustard
- Palm
- Rapeseed
- Sunflower oil
- Soya
- Jatropha



# Principles of FIJI operation



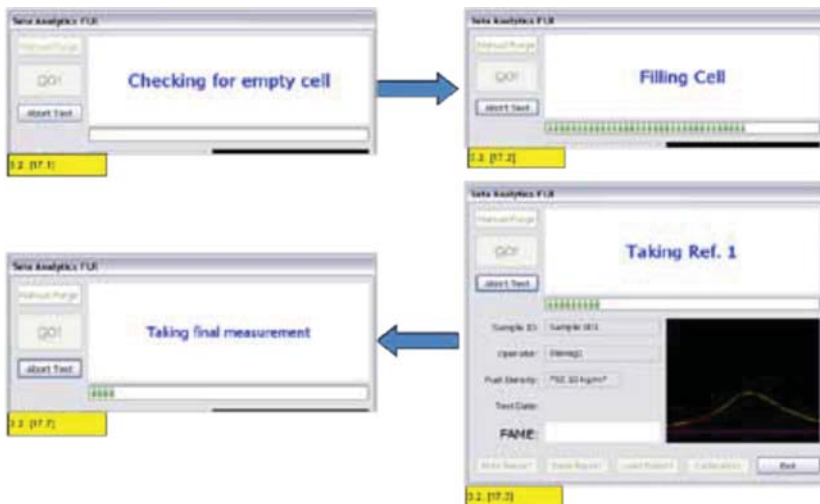
FIJI Cartridge

The FIJI instrument is robust, extremely simple to use and is fully automatic so no specialist operator training is involved. Tests require less than 50ml of sample and typically take under 20 minutes. Results are presented in mg/kg units together with an optional traffic light system for flagging FAME contamination levels of the fuel. By comparison current analytical tests can take many hours, require complex equipment and demand high skill levels.

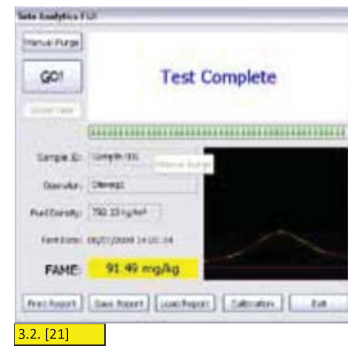
Using a unique sample preparation module the sample is pumped at a controlled flow rate through a proprietary disposable cartridge. The sample components are spectrally analysed by the FTIR and a result is displayed in mg/kg and a graphical spectrum is also shown.

The system is self-cleaning so no solvents are required. After each test the cartridge is simply and easily replaced and the instrument is immediately ready for the next sample.

## Running a test



## The result



## Specification

Measurement range:	Certified range 20-150 mg/kg FAME in AVTUR
Principle of measurement:	Flow Analysis by FTIR Spectroscopy
Operating Temperature Range:	5 – 35°C maximum (80% RH)
Test duration:	20 minutes
Sample size:	50ml
Voltage:	100 to 250V 50/60Hz
Power:	50W max
Size (HxWxD):	55 x 38 x 42 cm
Weight:	Approx 20kg



## What is the advantage of this technology?

The FTIR technology used in FIJI has been subject to extensive development with more than 1000 tests on jet fuel samples from refineries, storage and distribution facilities globally. Many of the major international aviation oil companies participated in the sample supply and round robin studies.

The Chemometrics model has additionally been validated against ASTM E1655 and independent studies have confirmed that it is in full compliance with this standard practice.

## Energy Institute IP 583 World Wide Test Programme confirms precision

The test programme was requested in order to demonstrate the applicability of IP 583 across a wide sample set.



FAME free fuels were sourced from all over the world so they could be tested neat and a proportion dosed at 100 mg/kg to ascertain whether the fuels would give high positive or negative biases.

- 68 fuels (Hydrotreated, Severe Hydrotreated, Merox, Straight Run, Synthetic, Wing)
- 36 countries
- 42 locations (terminals, refineries and aircraft)

The Worldwide Fuel Test Program concluded that IP 583 does not exhibit any significant bias due to the type or source of fuel.

The current limit of 5 mg/kg showed the GC-MS and HPLC-ELSD methods to be suitable for measurement at very low levels, such as 5 mg/kg. Currently at 100 mg/kg IP 583 has the best precision - please see the table below:

Nominal	IP 583 (FTIR)		IP 585 (GCMS)		IP 590 (HPLC)	
	r	R	r	R	r	R
5			1.3	2.1	1.1	1.8
20	3.3	3.7	3.8	5.9	3.0	4.9
30	3.5	3.9	5.4	8.5	4.3	6.9
50	3.8	4.4	8.7	13.7	6.8	10.9
<b>100</b>	<b>4.8</b>	<b>5.5</b>	<b>16.8</b>	<b>26.6</b>	<b>13.0</b>	<b>21.0</b>

Data courtesy of the Energy Institute, London

## The Future

FIJI has an excellent track record in playing its part in the JIP programme and is recognised as the industry measurement tool to rapidly screen for contamination of FAME in Jet fuel throughout the Jet Fuel distribution system at all stages of critical Jet fuel transfer – pipelines, shipping and for recertification.

The next step is for the EI JIP programme to report the results of its finding to establish whether the proposed 100 mg/kg levels of FAME will be accepted.



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