

Bulletin No. 20

October 2008

POTENTIAL CONTAMINATION OF JET FUEL WITH BIODIESEL – industry update

Previous JIG Bulletins (numbers 15 and 16) have described the potential for contamination of jet fuel from the introduction of biodiesel in multiproduct supply systems. Bulletin 15 focussed on the dangers arising from co-transport in multiproduct pipelines, particularly surface effects on the pipewall. Bulletin 16 highlighted the dangers of very low level bulk contamination with biodiesel.

JIG Bulletins 15 and 16 are available at www.jointinspectiongroup.org

Since those bulletins were issued, there have been a number of developments and the purpose of this bulletin is to provide an update on progress on this issue.

Firstly, the <5 mg/kg (ppm) limit agreed with the aircraft and engine manufacturers (OEMs) has now been incorporated into the DEF STAN specification for Jet A-1 (see DEF STAN 91-91 Issue 6 Amendment 1 at www.dstan.mod.uk).

Secondly, recognising that the 5 ppm limit will not provide sufficient headroom for normal operations, an industry-funded approval programme has been launched. An approval for up to 100 ppm of FAME in jet fuel is being sought from the OEMs. This project is coordinated by the UK Energy Institute, and an update on progress by Geoff Bishop, the project leader is attached.

The EI update also describes other initiatives in this area including the EI task force set up to develop better test methods, recommendations for tank cleaning procedures to prevent FAME carryover on ships and a study on the impact of FAME on microbiological growth. The EI is also leading work to look at the impact on FAME contamination on filtration.

This bulletin will be followed by further communications from the JIG PQ Committee to ensure all stakeholders are fully aware of what is happening on this important topic.

JIG Product Quality Committee



October 08

**Energy Institute Joint Industry Project
Seeking OEM approvals for 100 mg/kg fatty acid methyl ester
(FAME) in aviation turbine fuel**

Status Report 1

Background

The shipment of biodiesel fuel through multiproduct distribution systems – pipelines, ships, barges, etc. – is now a common occurrence in Europe and is increasing in other parts of the world. Pipeline trials have shown that the bio-component, FAME (Fatty Acid Methyl Ester), can adhere to metal surfaces and be subsequently desorbed by a following jet fuel parcel, thus contaminating it with low levels of FAME. Thus, fuel handling operations need to be carefully controlled and measures introduced to ensure that such cross-contamination is avoided as far as is practicably possible. However, it is recognised by the industry that trace levels of FAME will inevitably find their way into jet fuel and, as its presence in jet fuel is not approved by the aircraft engine and airframe manufacturers (OEMs), a programme of work is required to demonstrate that the presence of FAME in jet fuel will not compromise aircraft safety nor adversely affect aircraft operation.

To avoid supply disruption at airports, fuel supply companies, via the Joint Inspection Group Product Quality Committee, have been working with the OEMs (including GE, Pratt & Whitney, Rolls Royce, Honeywell, Snecma, Airbus and Boeing) to establish and conduct a testing programme aimed at the approval of 100 mg/kg FAME in aviation turbine fuel. This work has been formalised as an Energy Institute Joint Industry Project, established at the request of the members of the JIG PQ committee, to provide the framework to facilitate the testing required by the OEMs and progress it to conclusion.

JIP Participants

Verbal agreement to participate has been received from the following companies/organisations:

Oil companies: BP, Chevron, ExxonMobil, Shell, Total

Military/Government: US DESC (via CRC), UK MoD (via QinetiQ), UK Department for Transport

Pipeline Companies: TRAPIL, CEPMA

Signature of the JIP Participation Agreement and the first financial contributions from the above are at various stages of completion. Discussions are ongoing with a number of other companies, and further participants are actively being sought.

EI-JIP08-010 For dissemination to members of the Joint Inspection Group (JIG) and companies affiliated with Members of JIG.

Communication

The EI has established a microsite on its website <http://www.energyinst.org.uk>, specifically for JIP participants, to house all project documentation. Access to this site is limited to paid-up JIP participants and is controlled by the EI (contact Martin Hunnybun for access).

Status reports such as this one will be circulated more widely amongst the aviation fuel community on a regular basis.



JIP Status – September 2008

The Programme Document detailing the engine OEMs' requirements for a test programme to approve 100mg/kg in jet fuel has now been finalised. It is divided into two stages:

1. Specification and fit-for-purpose (laboratory) testing of FAME blends
2. Engine Risk Mitigation Programme, comprising:

- Fuel Thermal Stability Simulator Test Hot-end material testing
- Engine Altitude Relight/Cold Start
- APU Altitude Relight/Cold Start
- Emissions and Combustor Exit Traverse Test
- Engine Endurance Test
- Fuel Nozzle Spray Pattern Impact
- Cold Flow Properties

In common with industry practice, all testing will be conducted at 4x the required approval level (i.e. 400 mg/kg) and will follow the ASTM Standard Practice for Additive Approval. The stepwise programme begins with laboratory tests, to be followed by rig and engine tests.

It has been agreed that the testing required by the OEM programme will be conducted using 400 mg/kg of a FAME cocktail comprising equal proportions of the most common four FAMEs – rapeseed, soy, palm and tallow.

A contract has been placed with Intertek Services, Sunbury, UK to conduct the required laboratory testing for fuel specification and fit-for-purpose properties. Two base fuels will be used, Merox and hydroprocessed, and testing will be conducted not only on the FAME cocktail but also on the individual FAMEs at 400 mg/kg. Results should be available by the end of November.

A contract is also being placed with SwRI, San Antonio, to conduct additional lab testing on an “absolute worst case” FAME which will comprise “yellow grease” (used cooking oil) and tallow, and will be doped with impurities to bring it to the limits of the (ASTM) FAME specification.

The Boeing Materials Laboratory is planning a programme for airframe related materials compatibility testing of FAME blends. Additional, engine related, materials compatibility testing is being planned by Honeywell.

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Rolls-Royce has scheduled an altitude re-light/cold start test to be conducted in January 2009; results should be available in February. It is the intention that the test results from RR will be accepted by other engine OEMs, such that testing need not be conducted a further three times.



Update on other EI Projects on FAME

FAME Test Method Development – The ruggedness trial on four candidate test methods for measuring FAME content down to 5mg/kg was successfully conducted by an EI Task Group in Aug/Sept. Results were discussed at a workshop held on Oct 7th. It was evident that further development is required to make these techniques more robust before they can be published as IP Proposed Methods (PM) before year-end 2008. Following the required improvements, it is planned to conduct full round robins in Q1/Q2 2009 to generate precision data.

Implications of Biofuels on Microbiological Spoilage and Corrosion within the Fuel Distribution Chain and End Use – A laboratory testing exercise will be commenced in Q4 2008 with completion early in Q1 2009. Although primarily aimed at biodiesel fuel, the test matrix will include two different jet fuel blends containing 400mg/kg of a FAME cocktail.

EI HM 50 Petroleum products Guidelines for the cleaning of ships' tanks and lines – Drafting of a new EI publication is ongoing. It will include recommendations for cleaning following FAME cargoes. The draft will be circulated to JIG PQ Committee members for review in October 08.

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