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TRANSPORT OF BIODIESEL IN MULTIPRODUCT PIPELINES

Background

Jet fuel has been successfully transported in multi-product pipelines for many years. The practice represents an efficient, practical and environmentally sound option for transporting large volumes of jet fuel over long distances. Quality assurance procedures for handling interfaces between products together with laboratory testing requirements are well established and quality incidents are rare.

The introduction of biodiesel into many countries, either by government mandate or customer demand, is challenging this status quo. The main issue is that the bio-component in biodiesel (FAME - Fatty Acid Methyl Ester) is a surface-active material. This means that, in theory, it can adsorb on to pipe walls as the biodiesel passes and then desorb off the wall into the following grade which can be jet fuel. This possibility immediately raises two questions:

1) Does carryover of FAME occur in practice, and if so, how much is carried over?
2) At what concentration does FAME in jet fuel affect fuel performance characteristics and therefore its suitability for use?

Legislation around the world dictating the inclusion of varying concentrations of bio-components in transport fuels already has resulted in biodiesel being transported in some multi-product pipelines. The legislation will result in increasing quantities of biodiesel movements in the multi-product pipeline system from early in 2008. Therefore this bulletin sets out guidance for multi-product pipeline operators to minimize the potential carry over of trace levels of FAME whilst further work on jet fuel containing FAME is carried out.

Current situation

Given the potential impact on supply integrity to large jointly operated airports in certain regions worldwide in the short to medium term, the JIG Product Quality Committee has been coordinating action in this area.

In the absence of reliable data on FAME carryover, previous Oil Industry advice was not to follow biodiesel with jet fuel. It was advised that a buffer (non-aviation) product should be used in between biodiesel and jet fuel. This was never a long-term sustainable option because biodiesel volumes are increasing, but it was a prudent short-term measure. Two recent developments mean that this advice can now be modified.

Recent B-10 (biodiesel) pipeline trials have been conducted in France by the Trapil pipeline company using the worst case operating scenario. A trace level of FAME carryover (trail back) was identified and quantified in the following Jet batch.

In addition, the JIG PQ committee members have tested samples of Jet fuel containing up to 400ppm of FAME for their impact on Jet fuel specification properties. Test results from the samples taken during the Trapil trial and the JIG PQ committee investigation shows no degradation of Jet fuel specification characteristics for the different types of FAME tested.

The results from the pipeline trial and the JIG PQ committee test work have been shared with the major turbine engine OEMs (GE, P&W, RR and Honeywell) who have confirmed that the currently accepted minimum level of detection of 5ppm can be considered as zero for the purposes of interpreting the Jet Fuel Specifications. This reflects the conservative nature of the industry and the fact that the Jet specification is a performance standard.

Multi-product Pipeline Operation Update

The JIG PQ Committee recommends the following update to the Oil Industry advice previously given:

Multi-product pipeline operators should adopt procedures for Jet pipeline movements that demonstrate the average level of FAME in Jet batches resulting from preceding biodiesel movements does not exceed 5ppm. Each pipeline operator should verify that the procedures are effective for the Jet movements following biodiesel. The verification should be based on the maximum agreed level of FAME in biodiesel transported in the pipeline that will be followed by Jet fuel under the worst case operating scenario. Suggested mitigation procedures would include, but not be limited to one or more of the following:

- Minimum Jet Fuel batch sizes
- Modified interface cutting
- Controlled product sequencing
- Use of non-FAME containing buffers

Data from the Trapil trial indicates that in similar pipeline configurations, control of minimum Jet Fuel batch size alone, may be sufficient to control FAME levels below the detection limit. Nevertheless, each pipeline operation needs to critically evaluate their own system under their worst case scenario as noted above.

Future Plans

Renewable transport fuels legislation around the world is already making an impact on the operation of bulk fuel transport systems and it will likely become of greater significance from early in 2008. Therefore, the JIG PQ committee believes that maintaining procedures that hold trace levels of FAME to the current minimum level of detection (5ppm) are not operationally practical or sustainable in the longer term. The industry needs to establish what level FAME in Jet fuel affects its suitability for use.

The initial test results provide some confidence that trace levels of FAME up to 100ppm may be acceptable.

The JIG PQ Committee has recently initiated a process with the OEMs and the Specification Authorities to approve the presence of FAME at levels that will provide optimum flexibility for multi-product pipeline operators involved in the co-transport of biodiesels and Jet fuels. It is hoped that this process can be completed without delay to facilitate the implementation of the various renewable transport fuel legislation requirements and help maintain unconstrained pipeline operations.