Minimum criteria to determine acceptability of additives for use in multi-product pipelines co-transporting jet fuel

3rd edition
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MINIMUM CRITERIA TO DETERMINE ACCEPTABILITY OF ADDITIVES FOR USE IN MULTI-PRODUCT PIPELINES CO-TRANSPORTING JET FUEL

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FOREWORD

The first edition of this publication, developed in conjunction with the UK Petroleum Industry Association’s Pipeline Additive Working Group, was published in November 1997. Experience gained by operators using the document led to improvements incorporated in the second edition in 2001.

This third edition has been prepared by the EI’s Aviation Committee in conjunction with organisations having interests in the pipeline transfer of petroleum fuels and additive manufacturers.

The testing outlined in this publication is intended to provide risk management information for use in the assessment of new additives prior to their actual use in a pipeline. It describes the minimum information required from suppliers and shippers of additive-containing products in multi-product pipeline systems that co-transport jet fuel. It is intended to demonstrate to pipeline operators and other interested parties that these products will not subsequently adversely affect jet fuel, or have an adverse effect on pipeline operations as part of an ordered management of change process.

This publication is intended for use internationally by pipeline operators, fuel suppliers and additive companies who are involved in fuel supply through multi-product pipelines where jet fuel is co-transported with other distillate fuels, gasoline grades and clean fuel components.

The key changes included in this third edition are:

− A new procedure involving assessment of the impact on filter/water separator water removal performance of a candidate additive. This ‘water mapping screening’ provides a risk managed approach to assessing additive suitability by reference to known additive impact on EI 1581 5th edition filter/water separator performance.
− As part of the management of change process, guidance for additional sampling on first use of the new additive in a pipeline system.

For the purposes of demonstrating conformance to this publication the words ‘shall’, ‘should’ and ‘may’ are used to qualify certain requirements or actions. The specific meaning of these words is as follows:

− ‘shall’ is used when the provision is mandatory;
− ‘should’ is used when the provision is recommended as good practice, and
− ‘may’ is used where the provision is optional.

Although it is anticipated that this publication will assist those involved in fuel supply through multi-product pipelines, the information contained in this publication is provided as guidance only. Whilst every reasonable care has been taken to ensure the accuracy of its contents, the EI, and the technical representatives listed in the acknowledgements, cannot accept any responsibility for any action taken, or not taken, on the basis of this information. The EI shall not be liable to any person for any loss or damage which may arise from the use of any of the information contained in any of its publications.

Suggested revisions are invited and should be submitted to the

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- Compañía Logística de Hidrocarburos (CLH)
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- PECOFacet

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1 INTRODUCTION, PURPOSE AND SCOPE

1.1 INTRODUCTION

It is a requirement that operators ensure that product entering a pipeline system is handled in a manner that protects and preserves the quality of the certified batch. A batch is defined as a distinct quantity of fuel that can be characterised by one set of test results. It is essential that the batch is homogeneous so that test results are representative of the product sampled. As a general guide, homogeneity is defined primarily by density where the variation is less than 3.0 kg/m³ across the batch.

It is the responsibility of the supplier (shipper) of the product to submit product that complies fully with the specification, including ‘traceability’ where required. Note that jet fuel meeting Defence Standard 91-91 or Joint Inspection Group Aviation fuel quality requirements for jointly operated systems (AFQRJOS) Check List requires full traceability from point of manufacture.

Factors that can impact product specification parameters include, but are not limited to: interface migration and subsequent interface cutting; cross-contamination management; product sequencing and additives in co-transported products that may trail back or forward due to surfactant action or solubility effects.

These requirements are particularly relevant for jet fuel where positive segregation is lost during pipeline transportation (i.e in multi-product pipelines). Further information on the requirements for the manufacture and distribution of Aviation fuels can be found in EJ/JIG Standard 1530 Quality assurance requirements for the manufacture, storage and distribution of aviation fuels to airports.

This publication has been developed primarily for multi-product pipeline systems that co-transport jet fuel.

There has been a long history of the use of additives and more recently non-hydrocarbon components, in products transported through multi-product pipelines, including those approved by regulatory authorities. Historically, many of these had no formal ‘approval’ testing, but have been accepted on the basis of long-term trouble-free operation in terms of their impact on other co-transported fuels, e.g. the use of anti-oxidants in gasolines, middle distillate cold flow improvers and cetane improvers in distillate products.

Industry experience in the use of non-aviation approved (pipeline and ground fuel) corrosion inhibitors (CIs), and drag reducing additives (DRAs) demonstrates the need to prevent these additives impacting the quality of jet fuel. In addition, research work by the Coordinating Research Council² has demonstrated that the red marker dye used in many gas oil/diesel fuels worldwide can also have detrimental effects on the performance of jet fuel in aircraft where cross-contamination has occurred. Recent experience has even shown that apparently innocuous materials can be detrimental to jet fuel. As a general principle, additives should never be injected into the pipeline transport system during pumping of jet fuel unless the additive has been specifically approved for jet fuel use.

² CRC Report No. 639 Jet fuel contamination with diesel fuel dyes
Non-surface active additives can normally be satisfactorily controlled by interface cutting and additive injection control. Therefore, this publication is primarily directed at controlling surface active additives.

Pipeline operators generally require suppliers to be able to demonstrate that a new additive will not affect the quality of other products, particularly jet fuel, being transported within the pipeline system prior to actual pipeline use.

Therefore, the information generated in accordance with this publication should be used as part of a risk assessment that is undertaken to establish that no additional pipeline handling is required and ‘normal’ pipeline operation is appropriate. The basis of the risk analysis is a combination of laboratory testing of a potential contamination level in jet fuel and then a performance evaluation against a known reference surfactant. Management of change processes are recommended for initial use of the additive.

1.2 PURPOSE

This publication describes the evaluation of key considerations necessary for pipeline operators to determine the acceptability of specific additives in fuels transported through multi-product pipeline systems co-transporting jet fuel. The focus is potential harm to jet fuel properties from surfactant action. No additional warranty for the performance of any additive shall be inferred.

The objective is to enable additive manufacturers, fuel suppliers and pipeline operators to demonstrate to all concerned parties, including independent competent assessors, that a new additive contained in a fuel transported in the pipeline will not:

− adversely affect jet fuel being co-transported in the pipeline;
− have any adverse effects on the normal and long-term operation of the pipeline, or
− result in contamination of other products in the co-transport system.

Any contra-indications emerging from the assessment procedure described herein shall be fully investigated and appropriate action taken. The additive shall not be accepted for pipeline use pending the outcome of such investigation.

1.3 SCOPE

The objective of this publication is to define the minimum requirements for generating sufficient information to give an acceptable degree of confidence that a product containing a proposed new additive is suitable for transportation by multi-product pipeline that co-transport jet fuel.

This publication contains minimum requirements and recommendations for:

− Establishing a profile of relevant information from the additive manufacturer, including test methods and any previous pipeline experience, to assess its likely surface activity.
− A minimum regime of laboratory testing to demonstrate and assess the effect on key specification properties in jet fuel (where jet fuel is one of the fuel products co-transported.).
Water mapping screening to demonstrate that samples taken after transit through a multi-product pipeline, following a parcel of product containing this additive would exhibit no significant adverse effects due to the demonstrated control of surfactancy.

Management of change guidance for initial use of new additives in a pipeline system co-transporting jet fuel.

For further information on:
- recommended operating practices to minimise interface migration;
- product sequencing and interface cutting;
- sampling regimes and in-line monitoring equipment, and
- additive injection controls,

see EI/JIG 1530.

This publication is concerned with the potential adverse effects caused by additives present in non-aviation products on parcels of jet fuel.

The following classes of additive are generally excluded from the need for testing in accordance with this publication, on the basis that they have been used in multi-product pipelines for many years without issue in relation to trail-back (surfactancy) phenomena:

- middle distillate cold flow improvers – EVA type and wax anti-settling additives (WASA);
- marker dyes (e.g. Coumarin, Azo dyes);
- antioxidants;
- drag reducers;
- middle distillate cetane improvers, and
- metallic anti-knock additives in petrol.

Note: Marker dyes and drag reducers are known to have detrimental effects on aircraft engine operation. As part of risk management, any formulation changes or new chemistries should be evaluated for potential trail back.

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These require application of specific injection controls where jet fuel is adjacent to the product containing PDR.