Product Quality Bulletin

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Bulletin No 121	**Testing Water Separation Properties of Jet fuel (Revised MSEP Protocol)**	15 May 2019

TESTING WATER SEPARATION PROPERTIES OF JET FUEL DOWNSTREAM OF POINT OF MANUFACTURE (REVISED MSEP PROTOCOL)

This protocol supersedes the version of the JIG MSEP Protocol issued as Bulletin 65

Background

Surfactants are typically polar materials that can adsorb on the surfaces of filter/coalescers interfering with water removal efficiency. Surfactants can also lift rust and other solid particulate from surfaces, thus increasing the solids level in the fuel. Surfactants can also act as dispersants, reducing the particle size of suspended solid and water droplets and this can significantly increase time for removal by settling. This reduction in particle size can result in solids and water droplets so fine that they pass through filters.

In order to help prevent contamination by transmission of solids and water in the manufacture and distribution of Jet Fuel to airports, the elimination or minimization of surfactants that can compromise the ability of fuel handling systems to remove dirt and water, i.e. harmful surfactants, is an important consideration.

Surfactants may be contaminants or deliberately added materials. Both Defence Standard 91-091 and ASTM D-1655 (the prime fuel specifications that make up the latest edition of AFQRJOS 'Checklist' Issue 30) require testing of water separation properties by Microseparometer (MSEP by ASTM D3948) and describe test limits with and without the addition of Static Dissipator Additive (SDA). A high rating suggests a fuel free of surfactants; a low rating indicates that harmful surfactants may be present. The reason that two limits are specified is that the test method (ASTM D3948) is sensitive to the presence of SDA, although testing has shown that SDA has a negligible impact on both filtration efficiency and settling.

Both primary specifications contain a statement indicating that results from MSEP (ASTM D3948) downstream of the point of manufacture are not to be used as the sole reason for rejection of fuel, but they can indicate a mandatory need for further diligent investigation. This statement is based on significant historical information where failing MSEP (ASTM D3948) results downstream of the manufacturing location have been found to be due to either poor test method precision, or presence of essentially non-harmful surfactants. Due to the potential for unnecessary supply disruption, a protocol for handling failing MSEP (ASTM D3948) results was introduced by JIG initially in Bulletin 14 (2007) and this has been updated by Bulletin 65 (2013 and 2014).

A review of user results of the MSEP Protocol has shown no failure of thermal stability testing from the data received where the MSEP result is between 50 and 60. It is concluded that thermal stability testing is not sufficiently sensitive to the presence of harmful surfactants.

Testing Developments

Industry activity to improve the precision of water separation testing has been ongoing for more than 20 years. The aim has been to improve precision, whilst maintaining a sensitivity to potentially harmful surfactants. Surfactants may be active at very low concentrations (below 1ppm) and this makes the development of new tests more challenging. In addition, there has been some focus on definition of

specification test limits that would correlate with actual disarming of the filter water separators in use in distribution today.

Two test methods have now undergone a rigorous evaluation by the industry and have demonstrated improved precision relative to MSEP (ASTM D3948) and a reduced sensitivity to non-harmful surfactants such as SDA. Correlation work has shown that both methods do detect harmful surfactants that can disarm current filter water separators although it is accepted that further work may be useful in this area.

These new methods are

- **Method ASTM D7224 – Standard Test Method for Determining Water Separation Characteristics of Kerosine-Type Aviation Turbine Fuels Containing Additives by Portable Separometer.**

- **Method ASTM D8073 (IP624) – Standard Test Method for Determination of Water Separation Characteristics of Aviation Turbine Fuel by Small Scale Water Separation Instrument.**

Both methods have already been adopted as suitable for water separation testing in some fuel specifications.

Test limits have been proposed as follows. (Note that this is a single limit value irrespective of the presence of SDA, as neither method has shown sensitivity to this additive)

- **Method ASTM D7224 – Minimum 85**

- **Method ASTM D8073 (IP624) – Minimum 88**

Revised JIG Protocol for Water Separation Testing Downstream of Point of Manufacture

Where water separation performance testing is conducted downstream of point of manufacture in facilities operating to the JIG Standards, the following protocol shall apply.

1) **Testing shall be done using either**
    a. **ASTM D7224 with a minimum limit of 85, or**
    b. **ASTM D8073 (IP624) with a minimum limit of 88.**
2) **For a period of 12 months from the date of this bulletin ASTM D3948 may also be used.**
    a. **If the result is between 60 and 70 a duplicate test shall be run. Enter the average MSEP result from the second sample onto the test certificate. Subject to all other properties meeting specification requirements the certificate can be issued. The Batch may be released without recourse to other Shipper(s) involved at the location concerned, subject to local procedures. The local Re-certifying authority shall endorse the certificate. "MSEP result within precision limits of the test method". All shippers at the location should be advised of this occurrence retrospectively.**

b. If the result of ASTM D3948 testing is less than 60 a confirmation test shall be run using either ASTM D7224 or ASTM D8073 (IP624). If the result of the confirmation test is greater than 85 for ASTM D7224 or 88 for ASTM D8073 (IP624), this result shall be entered onto the test certificate. Subject to all other properties meeting specification requirements the certificate can be issued. The Batch may be released without recourse to other Shipper(s) involved at the location concerned, subject to local procedures.

3) **If results for ASTM D7224 or ASTM D8073 (IP624) testing are found below the stated minimum limits, the fuel shall be quarantined pending an investigation to determine the source of the failure.**
4) **Where the source of failure cannot be identified after investigation, remediation actions such as, but not limited to clay treating or dilution may be used to achieve the required minima for ASTM D7224 or D8073 (IP624). (Note that clay treatment and/or dilution may result in loss of electrical conductivity in the fuel batch, which may need subsequent correction by redosing SDA.)**
5) **Where remediation is not feasible the product should be downgraded.**

This bulletin supersedes the requirements in JIG 2 for recertification testing of water separation characteristics detailed in Section 2.3.4b, and periodic testing detailed in Section 2.3.4c.

This bulletin supersedes the requirements in EI/JIG 1530 1st edition for downstream testing of water separation characteristics (recertification and certificate of analysis) detailed in Sections 4.5.5 and 4.5.6.

Throughout transfers of fuel associated with batches released under this protocol, special care should be taken to ensure that water draining is done in accordance with JIG Standards 1, 2 and EI/JIG 1530 to further ensure that the fuel is free of excess water and dirt when delivered into aircraft.

Subject to the endorsement of all shippers at a specific location the above protocol shall be advised to their recertification laboratory(s) for automatic implementation. However, ensuring the integrity of on grade “fit for purpose” Jet Fuel is at all times the paramount consideration. Nothing in this protocol shall be deemed to override this principle. All shippers retain the right, in the absence of positive evidence of an investigation and any subsequent suitable corrective/preventative action, to ultimately withdraw their support for the use of this protocol.

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Actions to Implement this Bulletin (See Table 2 for Action Type Codes)

Action Description	Action Type	Target Completion Date
The revised protocol defined in this Bulletin is effective immediately. Where water separation performance testing is conducted downstream of point of manufacture in facilities operating to the JIG Standards, the revised protocol defined in this Bulletin shall apply. For a period of 12 months from the date of this bulletin ASTM D3948 may also be used, as specified in this Bulletin.	JS	31 May 2020

Table 2 Action Type Codes

Action Types	JIG Bulletin Action Type Definition
JS	Change to JIG Standard – to be adopted by JV and/or Operator to continue to meet the JIG Standard(s) (JIG 1, 2, 4, EI/JIG 1530 and the JIG HSSE Management System).
RA	Required Action to implement one off verification or checks outlined in the table of actions.
RP	JIG Recommended Practice which the JV should consider adopting as its own practice (**).
I	Issued for information purposes only.
Note (**) - If the JV agreements require any of the JIG Standards and/or any of the JIG Common Processes as the governing operational standard then adoption of changes to applicable JIG Standards and/or Common Processes should not be considered optional by the JV Board.	