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BULLETIN NO. 147

Water Barrier Filtration (CDFX B)

5 April 2023

THIS BULLETIN IS ADDRESSED TO ALL MEMBERS WITH INTO-PLANE OPERATIONS.

IT INTRODUCES A CONTROLLED ACCEPTANCE* OF 2" WATER BARRIER FILTRATION (WBF) QUALIFIED TO EI1588 2ND EDITION [CDFX – 2XXB OR CDFX-B] INTO THE JIG STANDARDS, TO SUPPLEMENT THE FILTRATION TECHNOLOGIES CURRENTLY ACCEPTED BY JIG. ENTITIES OPERATING IN ACCORDANCE WITH JIG STANDARDS MAY START USING THE TESTED WBF LISTED BELOW IN ACCORDANCE WITH THE PROCEDURES STIPULATED IN THIS DOCUMENT, WHICH FORM PART OF THE CURRENT JIG STANDARDS WITH IMMEDIATE EFFECT.

**CONTROLLED ACCEPTANCE: BEING ADOPTION WITH A MAXIMUM ELEMENT SERVICE LIFE OF 6 MONTHS WITH THE OPTION TO EXTEND UP TO 12 MONTHS PROVIDING STIPULATED INSPECTION CRITERIA PROVIDED IN THIS BULLETIN ARE MET. THE TERMS OF THE CONTROLLED ACCEPTANCE WILL BE REVIEWED BY JIG WITH A VIEW TO EXTEND THE SERVICE LIFE OF THE ELEMENTS IF THE OPERATING DATA GATHERED SUPPORTS THIS POSITION.*

BACKGROUND:

The aviation industry has worked continuously over the past several years to develop and evaluate new technology to replace Super Absorbent Polymer (SAP)-based filter monitors (FM), without the need for vessel configuration changes (drop-in replacement elements). The ultimate objective remains unchanged: to eliminate SAP-based filtration from all aviation fuel handling applications for the reasons explained in JIG Bulletin 105 and further detailed in Bulletin 132. **Reminder that filter monitors will be removed from the JIG Standards by 1st July 2023.**

As previously communicated, before new filtration technology can be adopted in JIG standards, it shall be successfully qualified against the relevant industry specifications, undergo a robust technical evaluation, and subsequently be subjected to field trial where it is assessed against the Filtration Field Trial Protocol criteria specifically designed to confirm the suitability of the technology for the intended application.

Following the conclusion of the joint industry field trials on the first version (CDFX-A) of this technology (which was not suitable for inclusion in JIG standards), JIG with the support of the manufacturer has just completed its evaluation of the updated version, CDFX-B.

FIELD TRIAL SUMMARY

EI 1588 qualified water barrier filters remove free water, and solid particulates from fuel. The element contains a hydrophobic layer within the element itself which repels free water on the filter's upstream side. The WBF elements do not adsorb or retain water. The elements are designed such that, after termination of flow, free water collected on the upstream side of the element may fall to the bottom of the vessel where it can be drained-off (note that the elements are a pleated media construction, so some water will not positively drain when elements are mounted horizontally). The element is designed so that any solid particulates are retained on the element media.

The review of the field evaluation results by the JIG Filtration Working Group and Operations Committee, has confirmed that in the environments in which these elements were tested, for the duration of the service life experienced under trial, the level of water and dirt reaching the aircraft in mobile applications was within acceptable limits. Users should note that, as with previous Field Trials, elements did not experience any high water fuelling challenges comparable to those that the elements have passed during the required Energy Institute laboratory qualification tests.

Laboratory testing of CDFX-B elements at the completion of the trials confirmed that they met all of the acceptance criteria defined in the field trial protocol. However, the variable service life experienced under trial has limited our ability to conduct an evaluation of certain aspects for the entire length of its expected service life. These include the structural integrity, long-term propensity for microbial growth when these elements are used in wet systems and potential for disarming of the water separating characteristics. Some elements remain in service and are being



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monitored to provide more information in these areas to support further updates to the controlled acceptance of this technology.

Based on the field trial learnings, the WBF listed below are adopted into JIG standards with immediate effect, under controlled acceptance according to the procedures defined in this document.

Filter	Parker Velcon product number
Water Barrier Element, 2" Qualified to EI 1588 2nd Edition.	Model No: CDFX – 2XXB

Note that qualification of 5" and 6" diameter WBF (ACOX) to EI 1588 is pending. JIG will provide a further communication on these when qualified.

FAILURE MODES AND EFFECTS ANALYSIS (FMEA).

A Failure Modes and Effects Analysis (FMEA) study of this technology in into plane fuelling equipment was conducted. The resulting report has been used in the development of the operating parameters and guidance included in this document.

INTRODUCTION OF WATER BARRIER TECHNOLOGY AS A REPLACEMENT OPTION FOR FILTER MONITORS.

The Water Barrier Filters listed above are adopted into JIG standards with immediate effect, under Controlled Acceptance and according to the procedures defined in this document. All filter technologies for Into-plane operations approved by JIG, are listed in Appendix 1 of this JIG Bulletin.

Users of JIG standards are reminded that JIG does not issue equipment or material approvals. It is the sole responsibility of user companies to decide whether the equipment is acceptable for their use, suitable for their operating environment and conditions (i.e., understand the element service life expectancy for their site/supply chain), conduct their own technology evaluation to determine the location-specific operational impacts and where its deemed necessary subject elements to additional field service evaluation before considering any large-scale adoption of the technology.

Operators should note the variable service life experienced during this JIG field trial and consider this in the context of their own operations ([JIG Filtration web-page](#)). Whilst all fuel delivered during the field trials was clear and bright and without detectable particulate or free water downstream of the filter vessel, the WBF elements showed susceptibility to premature solid particulate matter plugging, especially ultra-fine material, compared to other filtration types. Operators should weigh this potential impact against the known performance of other technologies.

REQUIREMENTS FOR WBF – CHANGES TO JIG STANDARDS

In addition to general operating requirements there are some differences in how WBF technology is used: service life (inspection and changeout frequency), dP correction is not applicable (as there is no correction algorithm) and the dP may temporarily rise in the presence of water in fuel and fall again for subsequent fuelling operations if water has in the meantime been drained from the filter vessel (see Appendix 2). This is considered normal operation for WBF technology in the presence of free water. However, a sudden fall in dP may signal a structural failure or bypass.

Although the field trials did not show any evidence of microbial activity, JIG does not have enough data and long-term experience to reliably assess the susceptibility of WBF to MBG. It is important that users and fuelling operators understand that filtration that repels water and holds it upstream in the filter vessel can be prone to MBG, particularly



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given that this technology uses pleated media and therefore in horizontal applications may not positively drain water to the vessel low point for removal. Evidence of microbial growth within fuelling equipment is not acceptable within JIG standards (see JIG Technical Information Document #1 on Microbial Monitoring for further guidance).

Water Barrier elements can be installed in existing filter monitor vessels without the need for any modification to the vessel. For new vessels intended for use with water barrier elements, consideration should be given to specifying a sump, in line with the good practice recommendation of EI1596. Users should also consider whether water barrier systems should be implemented in conjunction with a quantitative electronic free water sensor (EI1598) and/or qualitative bulk water sensor (EI 1592).

A Differential Pressure (dP) limiting device is mandatory with this technology. It shall be fitted to all vessels using 2" WBF elements. The dP limiting device shall be set to activate no higher than the maximum dP of 22psi.

References JIG 1: 3.1.4.1; 6.6.1 (f); A5.2.2

References JIG 4: 7.2.1; 10.4.2; A5.2.2, A11.1

Service Life: WBF elements have a maximum service life of 6 months. Service life may be extended up to 12 months provided that the 6-month mandatory inspection shows:

- Structural integrity (Remove and Inspect all elements per Appendix 4 of this JIG Bulletin)
- No evidence of MBG
- All Operational and Routine Maintenance has been followed as described in Appendix 2, 3 and 4 of this Bulletin.

Any failure of the above criteria shall be reported to JIG immediately (filtration@jig.org).

MANAGEMENT OF CHANGE (MOC)

Operators converting to the WBF replacement option defined above are expected to exercise due diligence in the development and implementation of appropriately authorized Management of Change (References: JIG 1, 1.7; JIG 1.8; JIG 4, 1.9).

The following aspects shall be included in this exercise, but not limited to:

- Operator awareness training about the operation of WBF
- Operator awareness training of the dP readings and monitoring of WBF elements. Contrary to other technologies the dP may rise in the presence of water in fuel and fall again for subsequent fuelling operations if water has in the meantime been drained from the filter vessel. However, a sudden fall in dP may signal a structural failure or bypass.
- Local procedures and forms to be reviewed and updated accordingly (e.g. to reflect the maximum dP limit of 22psi).
- Correct segregation and installation of filter elements particularly in mixed fleets. Operators shall take into account the risk, among others, of:
 - a) inadvertently installing a non-water retaining technology such as DDF into a vessel prepared for WBF use
 - b) inadvertently installing Filter Monitors into a vessel prepared for WBF with dP limiting devices set at 22psi.
- Microbial monitoring should form part of a controlled service introduction, especially where the fuel supply is known to be wet. Elements are to be replaced if microbial contamination is detected (due to the elements pleated construction and black outer sleeve, it may not be possible to visually detect MBG).

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ACTIONS TO IMPLEMENT THIS BULLETIN (SEE TABLE 2 FOR ACTION TYPE CODES)

Action Description	Action Type	Effective date
Entities operating in accordance with JIG Standards may adopt WBF filtration technology with immediate effect, in accordance with the requirements detailed in this document	JS	Immediate
Operators adopting new technology shall conduct an MOC prior to adoption.	JS	Immediate
Operators adopting new technology should conduct a technology evaluation to ensure it is appropriate for the operating profile of their location.	RP	immediate

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.

If you have any questions about this Bulletin, please write to filtration@jig.org

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APPENDICES

Appendix 1 – List of Accepted filtration technology may be used

This table supplements the filtration options currently accepted in the **JIG 1** and **JIG 4 Standards**.

Application	Accepted options
Into-plane JET	FWS
	DDF+EWS
	WBF
	FM*
Into-plane AVGAS	FWS
	MF
	DDF
	WBF
	FM*

* Filter Monitors will be removed from JIG Standards on 1 July 2023

Appendix 2 – Operations

WBF Draining and sampling

Routinely (all equipment): For filters fitted with WBF, routine draining shall be carried out under pressure daily, as currently required by the JIG standards. WBF is a water separation technology, so water might be found in the filter during routine draining (JIG 1, 5.2.1; JIG 4, 9.2.1; Appendix 3 table of this Bulletin).

Sampling during fuelling operations: Sampling procedures during fuelling operations shall be carried out as currently required by the JIG standards (JIG 1, 5.3; and JIG 4 Table 3.4.2).

Differential Pressure monitoring and reporting

Monitoring and reporting of dP shall be performed as currently required by the JIG standards (although dP correction has not been defined for this technology).

In addition, there is a need to understand that WBF filtration dP may temporarily rise in the presence of water in fuel and fall again for subsequent fuelling operations if water has in the meantime been drained from the filter vessel.

However, as a sudden fall in dP may be an indication of a structural failure or bypass. Where water has not been observed in the filter low point draining, elements shall be replaced in such circumstances.

If a dP shutdown occurs due to water, any settled water may be drained from the vessel and if the dP subsequently reduces to an acceptable level, the elements may continue in operation.

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Appendix 3 – New WBF element Commissioning and Routine Maintenance

WBF element commissioning

When new WBF elements have been installed in fuellers and hydrant dispensers, product shall be flushed through the unit for at least 3 minutes at the maximum achievable flowrate, preferably back to storage via test rig to remove air bubbles, small fibres, etc. Following commissioning of new WBF elements, perform a filter membrane test to confirm cleanliness and each hose-end strainer shall then be inspected and cleaned before the unit is returned to service.

WBF Inspection and Routine Maintenance

The JIG requirements for routine maintenance shall be followed for vessels fitted with WBF elements. Additionally, in line with the controlled acceptance into the JIG standards after 6 months, the filter elements shall be removed for inspection in accordance with Appendix 4 of this Bulletin.

WBF element change criteria

WBF elements shall be replaced:

- If the differential pressure reaches 22 psi (1.5 bar) and cannot be lowered by draining water as per Appendix 2 of this Bulletin.
- If any CWD or EWS check finds 30ppm water downstream of filter vessel
- If there is a sudden drop in differential pressure without any obvious cause being found
- If flow rate falls to unacceptably low levels that cannot be substantiated by an investigation
- If acceptable filter membrane test results (downstream of filtration) cannot be obtained
- If unusual sediment is found downstream of the filter
- If elements are contaminated by microbiological growth (MBG) or MBG contamination of elements is suspected
- If filter inspection identifies issues with the condition or structural integrity of elements
- After reaching the 6-month maximum service life or up to 12 months where extended use per criteria in this bulletin is met.

Summary of routing test frequencies

Fuelling vehicles	TEST FREQUENCY						Reference (JIG 1, JIG 4)
	Daily	Weekly	Monthly	3-monthly	6-monthly	Other	
Filter draining	x						A5.2.1 / B147
Filter differential pressure	x						A5.2.2 / B147
Filter dP graphs		x					A5.2.2 / B147
Filter membrane colorimetric test #			x [#]				A5.2.3 / B147
Double membrane or gravimetric #					x [#]		A5.2.3 / B147
Filter internal inspection					x		A5.2.4 / B147
WBF element integrity check					x		B147
WBF element change					x*		B147 (App. 4)

* 1 Year if the extended use protocol of this Bulletin is followed.

Not required in JIG 4

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Appendix 4 – Procedure for WBF 6 monthly inspection and elements replacement

The below additional criteria for the 6 monthly inspection of the CDFX B are steps to be integrated into a site's existing operating procedure for filter vessel inspection / element change out (e.g., HSSE, PPE, Control of Work, etc).

These steps relate to the point in the procedure when the vessel is emptied and opened for examination. For elements being extended (e.g. after 6 months) follow all steps, where elements are to be removed from service follow steps 1-2 only.

Note general condition of vessel and elements when opening vessel. Record any abnormal conditions.

Removing all elements from the vessel for examination

1. Carefully remove each element holding the shoulder of the end caps, taking care not to touch the filter media, or place undue stress on the end caps. Avoid twisting elements during removal.
2. Inspect CDFX B Element:
 - a. Visually inspect full surface area of each element for condition, distortion or damage.
 - b. Check end caps structural integrity.
 - i. Holding the shoulder of each end cap gently twist in opposing directions (applying very little force – gentle finger strength only) to confirm that the end caps do not move and remain in position.

If visual inspection reveals any issues with element condition, or end cap movement is detected then all elements shall be replaced with new elements.

3. Check the O-ring on each element and ensure it is sitting tightly against the end cap. If the O-ring is loose or has any damage, carefully replace.
4. After checking, each element shall be immediately replaced into the vessel (before removing the next element for inspection). Wet the o-ring of each filter with clean fuel to help ensure a smooth, secure fit into the deckplate. Gently push the element with a twisting motion until end cap shoulder is flush against the deckplate.

Where no issues are identified, the service life may be extended up to 12 months.

If an issue is identified with any element, the full set shall be replaced.



Figure 1 – CDFX-B 2" WBF Element. Note that CDFX B Elements have a black sleeve, so it is easy to difference with DDF and other filtration technologies.

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