Filtration Field Trials Update
Parker CDFX Water Barrier Filter

Members' Technical Forum April 2021

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PARKER-VELCON WATER BARRIER FIELD TRIAL

Currently 6 vehicles in 6 airports

Throughput challenges due to ongoing low volumes at sites

PARKER-VELCON WATER BARRIER FIELD TRIAL

Fuel delivered with <3ppm water content for all fuellings.

No downstream sensor warnings or alarms to date.

7 element changeouts on maximum DP from 4 vehicles at 4 separate locations .

- Fuel samples taken at DP changeout locations found to be within the normal range for filtration time and gravimetric test results.
- Filter monitors at the same trial locations showed no/little change in DP
- No increase in water in fuel to explain the DP rise.

FINDINGS TO DATE

Parker have carried out lab analysis on used elements from two of the vehicles that reached changeout dP to date.

Results were consistent:

- Maximum dP from field was repeated in lab.
- Element structural integrity tests all passed.
- Slug test and 50ppm water test as per 1588 passed.
- Membrane coloured brown with what appears to be ultrafine particulate.

Investigations so far have not established a reason for short filter life when in normal service with on-specification fuel.

JOINT INSPECTION GROUP

VARIED SUPPLY CHAINS

LOCATION #	SUPPLY SOURCE	PRIMARY TRANSPORT	INTERMEDIATE DEPOT	SECONDARY TRANSPORT	AIRPORT FILTRATION	INTO-PLANE
1	IMPORT BY SHIP	SHIP	TERMINAL	RAIL	FWS	REFUELLER
	LOCAL REFINERY	ROAD				
2	IMPORT BY SHIP	SHIP	TERMINAL	RAIL	FWS	DISPENSER
3	IMPORT BY SHIP	MULTI-PRODUCT PIPELINE	TERMINAL	DEDICATED PIPELINE	FWS	DISPENSER
	LOCAL REFINERY					
4	LOCAL REFINERY	ROAD			FWS	DISPENSER
5	IMPORT BY SHIP	RAIL			FWS	DISPENSER
	LOCAL REFINERY					
	LOCAL REFINERY	DEDICATED PIPELINE				
6	LOCAL REFINERY	MULTI-PRODUCT PIPELINES	TERMINAL	DEDICATED PIPELINE SPUR	CLAY TREATMENT + FWS	DISPENSER

PARKER-VELCON WATER BARRIER FIELD TRIAL

Location/ vehicle type[1]	#Days in vessel	# Days in service	Vessel Throughput ('000 litres)	Throughput per element ('000 litres)	#Outlet checks	#Outlet alarms
1 - Refueller	9	9	227[2]	16	0	0
	10	10	182[2]	13	0	0
	3	3	35[2]	2.5	0	0
2- Dispenser	66	45	3,606 [2]	113	0	0
	98	68	1.859[2]	58	0	0
3- Cart	180	27	3,339	124	0	1[3]
4- Dispenser	131	63	1,907[2]	87	0	0
5- Dispenser	85	16	295	8	0	0
6- Dispenser	89	89	8,670[2]	255	0	0

(1)Locations cover: Europe, South East Asia, Africa, Middle East and North America

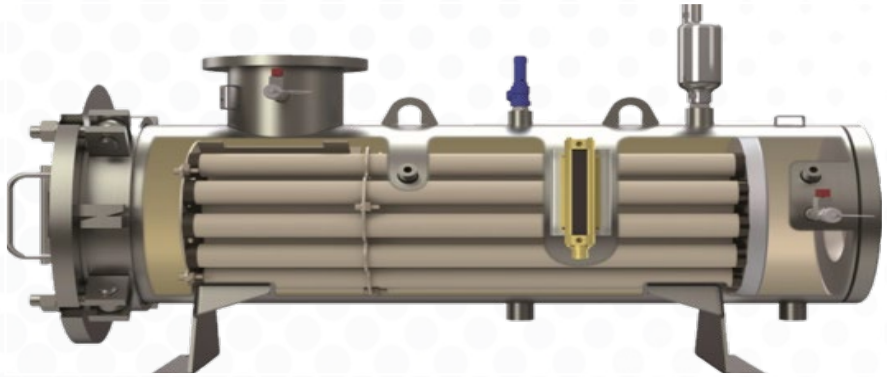
(2)Reached maximum changeout dP (22psi)

(3)Alarm related to EWS configuration, not related to WBF performance.

With such variable results with regards to throughput achieved before reaching changeout DP this raises the question:

*Is this technology **operationally suitable** for into-plane service at airports where annual volumes are larger those than shown in this data?*

WHAT DOES THIS MEAN FOR WBF IN THE STANDARDS?



Technology has operated reliably to date to remove water and particulate in the field trials.

This would support consideration for adoption into standards.

Potential boundaries to support adoption:

maximum repeated volumetric throughput achieved in field trials – linked to **surfactancy**

maximum repeated element service life achieved in field trials – linked to **MBG.**

ADOPTION VS SUITABILITY

CONSIDERATIONS FOR ADOPTION IN STANDARDS

- Sufficient operating data is required to make thorough evaluation.
- **Decision will be made by JIG/A4A/IATA** regarding adoption in their respective standards
- May be restricted in volumetric throughput per element and in service life.

DETERMINING SUITABILITY FOR APPLICATION

- **Assessed by end user.**
- Field trial results will continue to be shared to support the evaluation.
- Volumetric throughput at location should be considered

Examples of throughput per element calculations…

Hydrant dispenser at Hub airport:

	million litres	M usg
Typical annual vehicle throughput range, (2019) NOTE – based on elements changed out after 12 months	75 - 140	20 - 37
Number of elements in filter vessel	34	34
Approximate throughput per element in one year	**2.2 – 4.1**	0.6 - 1.1

Reminder…throughput **per element** achieved:

So far during field trials (M litres):

0.003 to 0.255

Examples of throughput per element calculations…

Hydrant dispenser at Regional airport:

	Million litres	M usg
Typical annual vehicle throughput range, (2019) NOTE – based on elements changed out after 12 months	15 - 30	4 - 8
Number of elements in filter vessel	14	14
Approximate throughput per element in one year	**1 - 2**	0.27 - 0.53

Reminder…throughput **per element** achieved:

So far during field trials (M litres):

0.003 to 0.255

Other Developments

Filtration Group (Facet)

- Developing a “Water Containment” Filter.
- Contains proprietary technology that has delayed development while IP issues have been resolved.
- Ongoing and lengthy discussions with EI AFFC and the engine/airframe OEMS about the suitability of the technology.
- The EI is not in a position yet to start writing a 15XX Specification.
- It is still uncertain whether this technology will reach the market.

Special Interest Group

- Was convened in 2016 with IATA, Manufacturers, OEMs and the supply community to plot a roadmap to eliminate SAP-based filtration from into-plane applications.
- When it issued its report in late 2017, it was expected that a number of new technologies would fill the gap.
- To date only one technology (DDF+EWS) has been adopted.
- The Industry remains committed to phasing out Filter Monitors.
- IATA to establish a Special Interest Ad-hoc Group (SIAG) find ways of accelerating the phase-out.

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