

Clarifier

What is EI 1588?

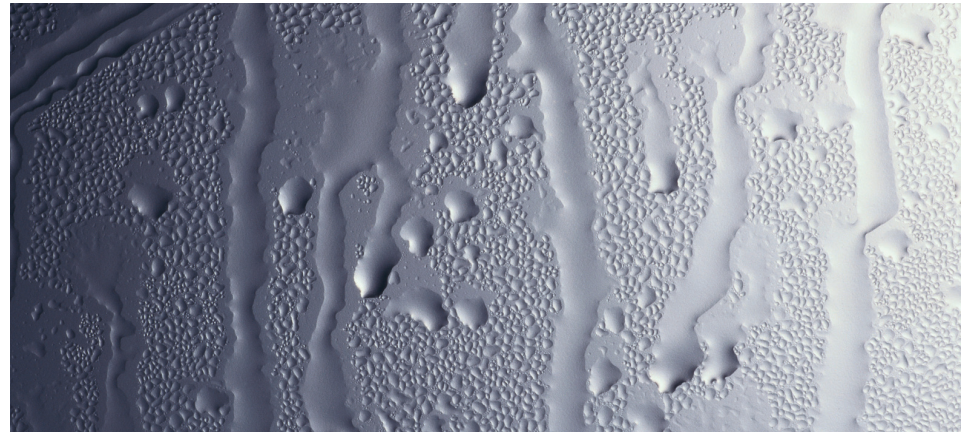
When questions began surfacing on the long-term viability of super absorbing polymer (SAP), Parker Velcon began working on a project to develop a new monitor replacement technology. Key elements for the success of the project were:

1. Eliminate the use of all SAP (or any other absorbent type material) in order to eliminate the possibility of fuel contamination
2. Maintain the same size of the existing 2 inch and 6 inch monitor products
3. Retain the same flow rate for both the 2 inch and 6 inch products
4. Preserve the rejection performance for emulsified water, slug water and dirt/solids
5. Extend on-stream life

Laboratory testing to date has demonstrated that the new Parker Velcon monitor replacement (water barrier technology) meets all five of these very tough design and performance requirements.



How Does the Water Barrier Technology Work?



Into-plane refueling has the following contamination characteristics:

- Dirt level tends to be low
- Emulsified water is typically in low levels
- Water slugs are a dangerous condition

The current technology deployed through EI1583 monitors work very well in defending all three types of contamination. The current EI1583 technology uses a single layer of synthetic media to remove dirt/solid from the fuel, while two separate layers of SAP in the monitor block emulsified water and water slugs.

Parker Velcon's new water barrier technology is a high surface area, single layer, high efficiency hydrophobic barrier. This single barrier is fully effective against all three forms of contamination listed above. The barrier can be described as a "Super Separator". Just as the hydrophobic separator blocks coalesced water in an EI1581 filter water separator, the water barrier blocks emulsified

water by using a hydrophobic barrier with much smaller pores (<0.5um). As microscopic water droplets are blocked on the surface of the hydrophobic barrier, these small water droplets begin to coalesce and on the water barrier surface. Gravity then pulls the larger coalesced droplets to the bottom of the housing where they can be easily drained. This works in the same fashion as rain droplets collecting, growing and falling on a window during a light rain. A truly remarkable aspect of the water barrier is that it's hydrophobic surface also blocks water slugs at over 7 bar (102 psid). In addition, the barrier's fine pores are also very effective in removing dirt from the fuel as well. This hydrophobic filtration layer works very well in effectively containing all three forms of contamination for into-plane refueling.

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How Will the New Technology Be Tested?

Working with the Energy Institute (EI) and our industry partners, Parker Velcon has worked to create a new meaningful testing specification for the water barrier technology (EI1588 now in draft form and circulating within the EI filtration committee). Most of the test criteria for this new specification was directly copied from the current EI1583 7th edition specification. We believe that this new EI1588 specification properly challenges the product's attributes in a laboratory setting, clearing it for field evaluation.

We will be working very closely with industry leaders and partners to develop and conduct the field evaluations soon after we complete the laboratory qualification process. We are committed to working with our industry leaders and partners to assure clear communication of the laboratory and field evaluation results.

Test	Title	EI1583 7th	EI1588 1st
1	Media Migration & Starting Differential Pressure	✘	✘
2	50 ppm at rated flow	✘	✘
3	Water slug at rated flow	✘	✘
4	Mechanical Integrity of saturated element	✘	✘
5	Water slug at 10% rated flow	✘	✘
6	Solids test	✘	✘
7	Mechanical integrity of solids contaminated element	✘	✘
8	Freeze/thaw test	✘	✘
9	Full water immersion tests	✘	✘
10	Partial water immersion tests	✘	✘
11	Compatibility test	✘	✘
12	50 ppm water test, low flow	✘	✘
13	Full Scale vessel 50 ppm water test	✘	✘
14	Full Scale vessel water slug test	✘	✘
15	50 ppm with saline solution	✘	✘
16	Slug test at rated flow with saline solution	✘	✘
17	End to end element resistance	✘	✘
18	End cap adhesion integrity test	✘	✘

Benefits of the Water Barrier Technology

- Absolutely NO SAP or other absorbent materials that could potentially shed contaminants into the fuel system components
- Effective contamination containment for dirt/solids removal, emulsified water and slug water
- Currently, the recommend change-out interval is one year for EI1583 monitors. The new water barrier technology has shown to have improved life in laboratory testing. The recommended change out period will be determined upon completion of the field evaluations.
- Due to the porosity of the barrier material, the effluent fuel is extremely clean. Laboratory tests have shown that the barrier is even effective in the removal of many micro-organisms that can be present in fuel. This may be a benefit to companies who defuel aircraft and may have concerns with unknown aircraft fuel tank cleanliness.
- Testing has shown that the barrier material is effective for fuel with DiEGME and suitable for Category M fuel.

Water Barrier Technology End User Process Changes

With our new Water Barrier Technology, the water is rejected from the fuel on the water barrier surface, the water coalesces into larger droplets and gravity pulls the water droplets to the bottom of the housing. Good practice guidelines require that all monitor housings be drained daily through the drain on the bottom of the housing. During this daily sump draining, any coalesced and accumulated water in the housing will be drained/removed from the system.

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EI1588 Frequently Ask Questions (FAQ's)

Will the user need to change/modify their housing before using EI1588 products?

Our new water and dirt barrier technology will not require any modification to your existing vessel or flow rate. It will require that you update your vessel nameplate indicating that the vessel has been converted to a EI1588 technology. In addition, ATA 103 and JIG Bulletin mandate dP gauge to use a pressure limiting switch.

Why doesn't the new water barrier technology require water sump?

For a Filter Water Separator (EI1581), water is coalesced and collected in the housing sump. Sumps are needed on Filter Water Separators because the separator material pores are large (50-70 micron). If the water from the sump reaches the separator, the water could intrude through the separator and flow downstream of the vessel. Parker Velcon water barrier technology uses a hydrophobic barrier with very tight pore sizes (<0.5 um). Due to the water barrier's small pores, the collected water could fill the housing but will not pass downstream of the barrier. Given the technology's superior hydrophobic attributes, the monitor housing itself acts as its own sump.

How long will the water barrier products last in service?

Currently, the recommended change out interval for an EI1583 monitor is one year. This recommended life was driven by the concerns that the longer SAP based products were in a fueling system, the greater the risk of possible SAP shedding. Since Parker Velcon's water barrier technology does not contain SAP, the concern for possible SAP shedding is eliminated.

Laboratory testing on our water barrier technology to date has shown that the product's service life will likely exceed capacity of the current

monitor technology, while improving the downstream effluent quality. We believe cartridge life could be increased beyond 1 year.

Will the user need to install an EI1598 electronic sensor downstream?

Parker Velcon believes that our water barrier technology offers a superior solution for water slugs, emulsified water and solids/dirt removal when compared to the currently deployed EI1583 monitor technology. Since the currently deployed technology doesn't warrant the use of an electronic sensor, we don't believe that our new water barrier should either.

Pending information from field trials, we don't believe that EI1588 monitor will require EI1598 sensor.

An EI1598 electronic sensor could be added to a fueling system if a user wants to increase their level of fueling safety and security. Parker Velcon will soon be offering a cost effective EI1598 sensor to the marketplace to compliment and add to our water barrier technology.

Is the water barrier material new?

No. Although the barrier is new to the aviation fuels market, this material has decades of proven success in markets such as: Pharmaceuticals, Semiconductor, Food & Beverage and High Purity Industrial Chemicals within very demanding applications. Our testing to date indicates that the barrier is fit for purpose with aviation fuel and will perform well.

Will Parker Velcon be developing water barriers in two-inch and six-inch sizes?

Yes. Our goal is to focus on completing the qualification of the two-inch product before beginning on our formal work for both five and six-inch products. We are confident that this technology is fit for purpose and will offer the same advantages for alternate sized products and applications as well.

When will this be available to the marketplace?

A draft of EI1588 is currently under review by the Energy Institute and awaiting formal approval. The specification should be released sometime in the first quarter of 2018. We will work to complete our product qualification soon after the specification is released. In parallel, we will work with key industry partners to develop the plan for field trials.

We have been asked to provide additional technical and application information on water barrier technology. Our goal is to publish periodic bulletins updating the market on the technology and its development. Future Clarifier newsletters will contain the following topics:

- Difference between Hydrophilic and Hydrophobic Coalescing
- The improved surfactant resistance of our Water Barrier Technology
- Test results from solids/dirt removal in laboratory testing
- Test results from emulsified and slug water removals (including pictures and videos)

If you have any other questions about Parker Velcon water barrier technology, please send them to vfsales@velcon.com and we will answer them in future communications as we proceed with our product development.