

DOD COALESCER QUALIFICATION TO MIL-F-52308J AMENDMENT 2

**INTERIM REPORT
TFLRF No. 398**

by
Gary B. Bessee

**U.S. Army TARDEC Fuels and Lubricants Research Facility
Southwest Research Institute® (SwRI®)
San Antonio, TX**

for
**U.S. Army TARDEC
Force Projection Technologies
Warren, Michigan**

Contract No. DAAE-07-99-C-L053 (WD48)

Approved for public release: distribution unlimited

June 2009

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Approved by:



**Steven D. Marty, P.E. Director
U.S. Army TARDEC Fuels and Lubricants
Research Facility (SwRI®)**

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14. ABSTRACT Aviation fuel filters are required for field operations and need to be qualified per military specifications. Currently, one supplier is qualified to provide aviation fuel filters meeting MIL-PRF-52308J Amendment 2. TARDEC would like to determine if other manufacturers have product that will also pass this test protocol. Four other manufacturers were recommended by TARDEC to obtain elements from and to evaluate per MIL-PRF-52308J Amendment 2. The objective of this project is to qualify additional suppliers coalescers to MIL-F-52308J Amendment 2 at the Army approved aviation filter test facility at Southwest Research Institute (SwRI), San Antonio, TX. Velcon had previously qualified a product meeting MIL-PRF-52308J Amendment 2. Products from additional manufacturers were evaluated to provide TARDEC with multiple vendors. The Kaydon elements did not pass the structural nor single element tests (SET). The PecoFacet elements failed both the single element (SET) and full-scale tests at the 3% water challenge. The Velcon elements pass all tests except the 3% water challenge during the full-scale test. The Parker Hannifin – Racor elements passed all of the tests and meet the requirements of MIL-PRF-52308J Amendment 2.					
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EXECUTIVE SUMMARY

Problems: The military has only one qualified producer of DoD aviation fuel filters

Objective: Provide the military with additional qualified aviation fuel filter supplier.

Importance of Project: Provide the military with elements in the field to properly filter aviation fuel.

Technical Approach: The technical approach was to utilize the currently approved test protocol to qualify product for the field.

Accomplishments: The test articles were evaluated and produced an additional supplier meeting MIL-PRF-52308J Amendment 2.

Military Impact: This program provided TARDEC with an additional supplier for aviation fuel filters meeting MIL-PRF-52308J Amendment 2 qualifications.

FOREWORD/ACKNOWLEDGMENTS

The U.S. Army TARDEC Fuel and Lubricants Research Facility (TFLRF) located at Southwest Research Institute (SwRI), San Antonio, Texas, performed this work during the period May 2008 through December 2008 under Contract No. DAAE-07-99-C-L053. The U.S. Army Tank-Automotive RD&E Center, Force Projection Technologies, Warren, Michigan administered the project. Mr. Luis Villahermosa (AMSRD-TAR-D/MS110) served as the TARDEC contracting officer's technical representative. Mr. Kenneth Walther (AMSRD-TAR-D/210, MS110), Fuel and Water Support Team, TARDEC, served as the project technical monitor.

The author would like to acknowledge the assistance of Messrs. Raymond Lemes, Chad Vollmer, and Max Reinhard, Jr., SwRI, for conducting the filtering testing and Mmes. Rebecca Emmot and Dianna Barrera for editing and processing the report.

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1.0 INTRODUCTION AND BACKGROUND

Aviation fuel filters are required for field operations and need to be qualified per military specifications. Currently, one supplier is qualified to provide aviation fuel filters meeting MIL-PRF-52308J Amendment 2. TARDEC would like to determine if other manufacturers have product that will also pass this test protocol. Four other manufacturers were recommended by TARDEC to obtain elements from and to evaluate per MIL-PRF-52308J Amendment 2. The other manufacturers included:

- PecoFacet International
- Kaydon Corporation
- Parker Hannifin–Racor
- New Ventures, Inc.

2.0 OBJECTIVE AND APPROACH

The objective of this project is to qualify additional supplier's coalescers to MIL-F-52308J Amendment 2 at the Army approved aviation filter test facility at Southwest Research Institute (SwRI), San Antonio, TX. The government provided separators as necessary, including the single element test, and full-scale test vessels.

3.0 TEST FACILITY AND MATERIALS

The SwRI aviation filter test facility has been certified by Vic Hughes (Vic Hughes Associates, Ltd.) and approved by Force Projection Technologies (TARDEC) as an Army approved aviation filter test facility. The facility is ISO 17025 certified.

SwRI requested and procure forty-six (46) coalescer filter elements from each of the following potential vendors:

- PecoFacet Internation
- Kaydon Corporation
- Parker Hannifin – Racor
- New Ventures, Inc.

New Ventures did not have a product off-the-shelf to be evaluated for this program. Per TARDEC's approval, Velcon provided a fourth product to evaluate that was similar to the previously qualified product.

PecoFacet elements failed the initial evaluation and they provided new elements for the re-run evaluation.

4.0 TEST METHODOLOGY

SwRI conducted, on each vendor submission, the First Article inspection as described in Section 4, ¶4.2 of MIL-PRF-52308J, and summarized in Table 1, which includes the following:

1. Three (3) samples subjected to Examination ¶4.5.1 followed by Structural Strength ¶4.5.2.
2. Two (2) samples were subjected to Examination ¶ 4.5.1 followed by Differential Pressure, Operational Performance ¶4.5.3.
3. Eighteen (18) samples were subjected to Examination ¶4.5.1 followed by Environmental ¶4.5.4, which includes the following and in this order:
 - A. Transit Drop, ¶4.5.4.1
 - B. Resistance to Fuel, High Temp, ¶4.5.4.2
 - C. Resistance to Fuel, Low Temp, ¶ 4.5.4.3
 - D. Resistance to Salt Water, ¶4.5.4.4
 - E. Post-environmental Performance, ¶ 4.5.4.5

Per MIL-PRF-52308J, the test vessels are defined in ¶4.4.1 and provided by TARDEC, and the test fuel is defined in ¶ 4.4.2. Elements tested were designated as Class M elements per MIL-PRF-52308J, and were tested using Category M fuel and additive package per ¶ 4.4.2.

The exceptions to the procedures were:

The separators supplied and used for the testing were 200 mesh screen, conductive plastic end cap design, part number SI-522 supplied by Velcon Filters Inc, as an alternate design to drawing 13216E2773, approved under ECP TACV-2336.

5.0 TEST DATA

A summary of the test results is shown in Table 1, with the supporting data provided below. The data sheets for all of the evaluations are shown in the Appendix.

Table 1. Test Results of Candidate DOD Aviation Fuel Filters per MIL-PRF-52308J

Parameter	PecoFacet	PecoFacet - Rerun	Kaydon	Racor	Velcon
Examination	Pass	Fail	Pass	Pass	Pass
Structural	Fail/Pass	Pass	Fail	Pass	Pass
Single Element	Fail	Pass	Fail	Pass	Pass
Transit Drop	Pass	n/a	n/a	Pass	Pass
Resistance to Fuel – High Temperature	Pass	Fail	n/a	Pass	Pass
Resistance to Fuel – Low Temperature	Pass	Fail	n/a	Pass	Pass
Resistance to Fuel – Salt Water	Pass	Fail	n/a	Pass	Pass
Visual Post Examination	Pass	Fail	n/a	Pass	Pass
Full-Scale test	Fail	Fail	n/a	Pass	Fail

5.1 Examination per ¶4.5.1

All of the elements were visually inspected per ¶4.5.1, Table 2. All of the elements met the required specification except the Kaydon elements that did not have any identification markings on the outer sock, Figure 1.

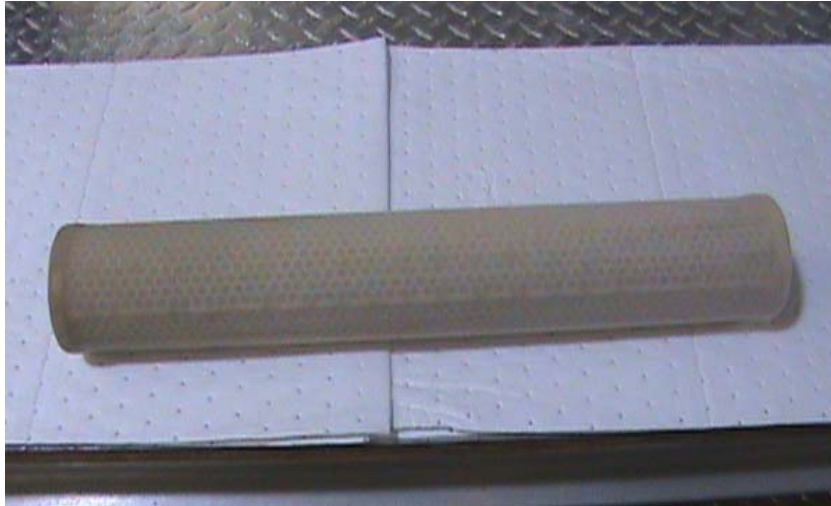


Figure 1. Kaydon Coalescer Without Identification Markings

5.2 Structural Strength

The structural integrity of all of the candidate elements was evaluated in duplicate. All candidate elements passed this evaluation with the exception of the Kaydon elements (Figure 2). Both elements failed at between 25–30 psid. The elements are required to hold 75 psid for 5 minutes.



Figure 2. Kaydon Elements Failing Structural Integrity Test

5.3 Single Element Test (SET)

All candidate elements were evaluated per ¶4.5.3. The Kaydon element failed this evaluation after 115 minutes into the evaluation, Figure 3. Note that the failed coalescer also caused structural damaged to the separator. Since the Kaydon elements failed both the structural and SET, no further testing was performed on these elements.

The PecoFacet element failed this test and was re-run twice. All three evaluations failed the SET tests. The first element failed at glued seam, whereas the second and third SET tests both failed during the 3% water challenge.



Figure 3. Failed Single Element Test (SET) – Kaydon

5.4 Environmental Testing

The environmental testing was performed on all of the candidate elements except Kaydon. The environmental testing consisted of the following tests:

- Transit drop test
- Resistance to fuel – high temperature: 140°F for 100 hours

- Resistance to fuel – low temperature: –25°F for 100 hours
- Resistance to salt water for 72 hours
- Post-environmental performance: visual and full-scale test

For all of the tests except the transit tests, 18 elements were soaked according to the parameters described in ¶ 4.5.4.2 through 4.5.4.4.

All candidate elements passed the transit drop, resistance to fuel (both hot and cold temperature), salt water, and visual post inspection.

The PecoFacet and Velcon elements failed at the 3% water challenge. The Parker Hannifin–Racor elements passed the full test protocol. Mr. Jeff Stewart, Parker Hannifin–Racor was present to witness their full-scale test.

The re-run of the PecoFacet elements was performed and witnessed by Mr. Ron McDowell (single element test) and Mr. Charles Lindsey (full-scale test). The new elements did pass the single element and structural tests. However, measurements of the end-caps revealed many of the holes were out of tolerance (too small). The specification is 1.190 – 1.205 inches. The out-of-inspection values ranged from 1.179 to 1.860 inches, Table 2.

Table 2. PecoFacet End Cap Analysis

Element	Printed End Diameter, inches	Non-Printed End Diameter, inches	Printed End Deformation	Non-Printed End Deformation
1	1.186	1.199	No	No
2	1.182	1.200	Yes	No
3	1.186	1.200	Yes	No
4	1.182	1.202	Yes	No
5	1.182	1.198	Yes	No
6	1.181	1.200	Yes	No
7	1.199	1.179	No	Yes

8	1.196	1.183	No	Yes
9	1.179	1.199	Yes	No
10	1.179	1.197	Yes	No
11	1.201	1.201	No	No
12	1.181	1.201	Yes	Yes
13	1.202	1.183	No	Yes
14	1.196	1.180	No	Yes
15	1.204	1.183	No	Yes
16	1.200	1.181	No	Yes
17	1.200	1.182	No	Yes
18	1.185	1.199	Yes	No

During the environmental testing, deformation of the end caps occurred. It appears PecoFacet received a bad batch of end caps as only one cap per elements was deformed and discolored, Figures 4-6.



Figure 4. Deformed end cap on a PecoFacet coalescer after environmental testing



Figure 5. Discoloration of PecoFacet coalescer end caps



Figure 6. Torn o-ring in PecoFacet end cap

6.0 CONCLUSIONS

Velcon had previously qualified a product meeting MIL-PRF-52308J Amendment 2. Products from additional manufacturers were evaluated to provide TARDEC with multiple vendors. The Kaydon elements did not pass the structural nor single element tests (SET). The PecoFacet

elements failed both the single element (SET) and full-scale tests at the 3% water challenge. The re-run with new elements did pass the SET test but failed the environmental and full-scale evaluations. The Velcon elements pass all tests except the 3% water challenge during the full-scale test. The Parker Hannifin–Racor elements passed all of the tests and meet the requirements of MIL-PRF-52308J Amendment 2.

APPENDIX

5th Edition Single Element Data Sheet

Test Specification: API/IP 1581 5th Edition				SET: ☒						Date: 11/6/08			
Test No. 43				Full-Scale: ☐									
Vessel:				Filter/Coalescer: Kaydon				Separator: Velcon				Type: ☒ -S ☐ S-LD	
Additive Addition				Model: C220049				Model: SI522				Manufacturing Date:	
Category:		M-100 ☐				M ☒				C ☐			
Tank Volume	Gallons	Additive	Conc. (Mg/L)	Amount Added	k (pS/m)	Additive	Conc. (Mg/L)	Amount Added	k (pS/m)	Additive	Conc. (Mg/L)	Amount Added	k (pS/m)
Beginning	9,050	A	256			D	2,0	68.5 g	629	I	1,0		
Ending		B	0,15%			B	0,15%	13.6 gal		II	15		
		C	15			C	15	513.9 g					
Used		D	2,0										
Mixing Time: 30 minutes						WISM		Before	After				
Element Conditioning:		☒ in-Situ		☐ External				94	83				
Phase	Cum. Test Time (minutes)	Time (minutes)	Fuel Flow Rate (gpm)	ΔP (psid)	k (pS/m)	Water Flow Rate ☒ mL/min ☐ gpm	Water Concent. (ppm)	Solids Rate ☒ mg/L ☐ mg/gal	Filter Sample ID	Solids Concent. Affluent (mg/L)	Solids Concent. Effluent (mg/L)	Sample Size	Temp ☐ °C ☒ °F
Start-up	0	0	20.2	1.2	603	0	<1						71
Water 0,01%	5	0	20	1.2	604	7.6	1.5						
	10	5	20	1.7	571	7.6	1.5						
	15	10 s/s	20.2	1.8	463	7.6	2.5						
	25	20 s/s	20.2	2	582	7.6	2.5						
	35	30 s/s	20	2	604	7.6	3						72

Phase	Cum. Test Time (minutes)	Time (minutes)	Fuel Flow Rate (gpm)	ΔP (psid)	k (pS/m)	Water Flow Rate ☒ mL/min ☐ gpm	Water Concent. (ppm)	Solids Rate ☒ mg/L ☐ mg/gal	Filter Sample ID	Solids Concent. Affluent (mg/L)	Solids Concent. Effluent (mg/L)	Sample Size	Temp ☐ °C ☒ °F
Solids Holding Test (Continued until reaching 115 kPa (22.5 psid))	35	0	20	1.5	602								72
	50	15	20	2.5				19	2		0	4L	72
		15 s/s	20.1	2.8				19	3		0.5	4L	
	65	30	20	5.1	611			19	4		0.025	4L	
		30 s/s	20.2	6				19	5		0.05	4L	
	80	45	20.2	8.2				19	6		0.15	4L	
		45 s/s	20.2	9.6				19	7		0.075	4L	
	85	50	20.2	9.6									
	95	60	20.1	11.1	624			19	8		0	4L	73
		60 s/s	20.2	12.2				19	9		0.15	4L	
	110	75	20.1	13.7				19	10		0	4L	
	75 s/s	20.2	14.6				19	11		0.125	4L		

Phase	Cum. Test Time (minutes)	Time (minutes)	Fuel Flow Rate (gpm)	ΔP (psid)	k (pS/m)	Water Flow Rate ■ mL/min □ gpm	Water Concent. (ppm)	Solids Rate ■ mg/L □ mg/gal	Filter Sample ID	Solids Concent. Affluent (mg/L)	Solids Concent. Effluent (mg/L)	Sample Size	Temp □ °C ■ °F
Water Coalescence Test - 0.01%	110	0	20.2	14	627	7.6	1						74
	112	2	20	20.4		7.6	2						
	115	4	20			7.6	>12						74
	125	15											
		30 s/s											
	155	45											
	170	60 s/s											
	185	75											
		90 s/s											
	215	105											
		120 s/s											
	245	135											
Water Coalescence Test - 3%		150 s/s											
	260	0											
	262	2											
	265	5											
		10 s/s											
		20 s/s											
	290	30											

5th Edition Single Element Data Sheet

Test Specification: API/IP 1581 5th Edition				SET: ☒						Date: 11/13/08			
Test No.				Full-Scale: ☐									
Vessel:				Filter/Coalescer: Facet		Separator: Velcon				Type: ☒ -S ☐ S-LD			
Additive Addition				Model: TC-C0152		Model: SI522				Manufacturing Date:			
Category:		M-100 ☐				M ☒				C ☐			
Tank Volume	Gallons	Additive	Conc. (Mg/L)	Amount Added	k (pS/m)	Additive	Conc. (Mg/L)	Amount Added	k (pS/m)	Additive	Conc. (Mg/L)	Amount Added	k (pS/m)
Beginning	9,050	A	256			D	2,0	68.5 g	629	I	1,0		
Ending		B	0,15%			B	0,15%	13.6 gal		II	15		
		C	15			C	15	513.9 g					
Used		D	2,0										
Mixing Time: 30 minutes						WISM		Before	After				
Element Conditioning:		☒ in-Situ		☐ External				95	85				
Phase	Cum. Test Time (minutes)	Time (minutes)	Fuel Flow Rate (gpm)	ΔP (psid)		Water Flow Rate ☒ mL/min ☐ gpm	Water Concent. (ppm)	Solids Rate ☐ mg/L ☐ mg/gal	Filter Sample ID	Solids Concent. Affluent (mg/L)	Solids Concent. Effluent (mg/L)	Sample Size	Temp ☐ °C ☒ °F
Start-up	0	0	20	4	564	0	<1						72
Water 0,01%	5	0	20	4	600	7.6	1						
	10	5	19.9	4.6		7.6	2						
	15	10 s/s	20	5.2		7.6	2						
	25	20 s/s	20.2	6.2		7.6	4						
	35	30 s/s	20.1	7.1	638	7.6	4						73
Phase	Cum. Test Time (minutes)	Time (minutes)	Fuel Flow Rate (gpm)	ΔP (psid)	k (pS/m)	Water Flow Rate ☒ mL/min ☐ gpm	Water Concent. (ppm)	Solids Rate ☒ mg/L ☐ mg/gal	Filter Sample ID	Solids Concent. Affluent (mg/L)	Solids Concent. Effluent (mg/L)	Sample Size	Temp ☐ °C ☒ °F
Solids Holding Test (Continued until reaching 115 kPa (22,5 psid))	35	0	20.1	6.1	651								73
	50	15	20	9.9				19	2		0.2	4L	73
		15 s/s	20.2	8.1				19	3		1.75	4L	
	65	30	20.1	8.4	651			19	4		8.875	4L	
		30 s/s	20.2	5.9				19	5		4.85	4L	
	80	45	20.2	6				19	6		7.575	4L	
		45 s/s	20.4	5.8				19	7		12.425	4L	
	85	50	20.2	5.6									
	95	60	20.3	5.8	661			19	8		11.05	4L	74
		60 s/s	20.4	5.8				19	9		9.5	4L	
110	75	20.2	5.6				19	10		8.275	4L		
	75 s/s						19	11					

++

Notes/Comments:

Test terminated at 75 minutes during solids challenge due to apparent element failure

Phase	Cum. Test Time (minutes)	Time (minutes)	Fuel Flow Rate (gpm)	ΔP (psid)	k (pS/m)	Water Flow Rate ■ mL/min □ gpm	Water Concent. (ppm)	Solids Rate ■ mg/L □ mg/gal	Filter Sample ID	Solids Concent. Affluent (mg/L)	Solids Concent. Effluent (mg/L)	Sample Size	Temp □ °C ■ °F
Water Coalescence Test - 0.01%	110	0											
	112	2											
	115	5											
	125	15											
		30 s/s											
	155	45											
	170	60 s/s											
	185	75											
		90 s/s											
	215	105											
		120 s/s											
	245	135											
		150 s/s											
Water Coalescence Test - 3%	260	0											
	262	2											
	265	5											
		10 s/s											
		20 s/s											
	290	30											

5th Edition Single Element Data Sheet

Test Specification: API/IP 1581 5th Edition				SET: ☒						Date: 11/19/08			
Test No.				Full-Scale: ☐									
Vessel:		Filter/Coalescer: Racor				Separator: Velcon				Type: ☒ -S ☐ S-LD			
Additive Addition		Model: CP-20452-J				Model: SI522				Manufacturing Date:			
Category:		M-100 ☐				M ☒				C ☐			
Tank Volume	Gallons	Additive	Conc. (Mg/L)	Amount Added	k (pS/m)	Additive	Conc. (Mg/L)	Amount Added	k (pS/m)	Additive	Conc. (Mg/L)	Amount Added	k (pS/m)
Beginning	9,050	A	256			D	2,0	68.5 g	629	I	1,0		
Ending		B	0,15%			B	0,15%	13.6 gal		II	15		
		C	15			C	15	513.9 g					
Used		D	2,0										
Mixing Time: 30 minutes						WISM		Before	After				
Element Conditioning:		☒ in-Situ		☐ External				96	86				
Phase	Cum. Test Time (minutes)	Time (minutes)	Fuel Flow Rate (gpm)	ΔP (psid)	k (pS/m)	Water Flow Rate ☒ mL/min ☐ gpm	Water Concent. (ppm)	Solids Rate ☐ mg/L ☐ mg/gal	Filter Sample ID	Solids Concent. Affluent (mg/L)	Solids Concent. Effluent (mg/L)	Sample Size	Temp ☐ °C ☒ °F
Start-up	0	0	20	1.8	584	0	1						70
Water 0,01%	5	0	19.9	1.8	586	7.6	1						
	10	5	20	2.2		7.6	2						
	15	10 s/s	20.2	2.6		7.6	2						
	25	20 s/s	20	3.2		7.6	2						
	35	30 s/s	20.1	3.1	603	7.6	2						70
Phase	Cum. Test Time (minutes)	Time (minutes)	Fuel Flow Rate (gpm)	ΔP (psid)	k (pS/m)	Water Flow Rate ☒ mL/min ☐ gpm	Water Concent. (ppm)	Solids Rate ☒ mg/L ☐ mg/gal	Filter Sample ID	Solids Concent. Affluent (mg/L)	Solids Concent. Effluent (mg/L)	Sample Size	Temp ☐ °C ☒ °F
Solids Holding Test (Continued until reaching 115 kPa (22.5 psid))	35	0	20	2.7	601								70
	50	15	20	3.5				19	2		0.025	4L	71
		15 s/s	20.1	3.7				19	3		0.05	4L	
	65	30	20	4.6	614			19	4		0	4L	
		30 s/s	20	4.9				19	5		0	4L	
	80	45	20	6.5				19	6		0	4L	
		45 s/s	20	7.2				19	7		0.05	4L	
	85	50	20	7.4									
	95	60	19.9	8.3	634			19	8		0.05	4L	72
		60 s/s	20	8.9				19	9		0	4L	
	110	75	20	9.4				19	10		0.275	4L	
	75 s/s	20.1	9.5				19	11		0.45	4L		

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Phase	Cum. Test Time (minutes)	Time (minutes)	Fuel Flow Rate (gpm)	ΔP (psid)	k (pS/m)	Water Flow Rate ■ mL/min □ gpm	Water Concent. (ppm)	Solids Rate ■ mg/L □ mg/gal	Filter Sample ID	Solids Concent. Affluent (mg/L)	Solids Concent. Effluent (mg/L)	Sample Size	Temp □ °C ■ °F
Water Coalescence Test - 0.01%	110	0	20	9	642	7.6	1						73
	112	2	19.8	10.7		7.6	1						
	115	5	20	11.1		7.6	2						
	125	15	20	11.9	649	7.6	2						73
		30 s/s	20	12.5		7.6	3						
	155	45	20	13		7.6	3						
	170	60 s/s	20.2	13.3	652	7.6	6						
	185	75	20	13.6		7.6	7						
		90 s/s	20.1	13.8		7.6	7.5						74
	215	105	20	14.1	676	7.6	2.5						
		120 s/s	20	14.2		7.6	2.5						
	245	135	20	14.5		7.6	2.5						
		150 s/s	20.1	14.7		7.6	4						
Water Coalescence Test - 3%	260	0	20.2	12	685	0	2						
	262	2	20.2	19.7		2,270	5						75
	265	5	20	20.4		2,270	3						
		10 s/s	20.2	22.1	---	2,270	>12						
		20 s/s	20	26.3		2,270	2						
	290	30	20.1	33.7		2,270	3						75

5th Edition Single Element Data Sheet

Test Specification: API/IP 1581 5th Edition				SET: ☒						Date: 11/17/08			
Test No.				Full-Scale: ☐									
Vessel:				Filter/Coalescer: Velcon				Separator: Velcon				Type: ☒ -S ☐ S-LD	
Additive Addition				Model: TE08-083				Model: SI522				Manufacturing Date:	
Category:		M-100 ☐				M ☒				C ☐			
Tank Volume	Gallons	Additive	Conc. (Mg/L)	Amount Added	k (pS/m)	Additive	Conc. (Mg/L)	Amount Added	k (pS/m)	Additive	Conc. (Mg/L)	Amount Added	k (pS/m)
Beginning	9,050	A	256			D	2,0	68.5 g	629	I	1,0		
Ending		B	0,15%			B	0,15%	13.6 gal		II	15		
		C	15			C	15	513.9 g					
Used		D	2,0										
Mixing Time: 30 minutes						WISM		Before	After				
Element Conditioning:		☒ in-Situ		☐ External				95	84				
Phase	Cum. Test Time (minutes)	Time (minutes)	Fuel Flow Rate (gpm)	ΔP (psid)	k (pS/m)	Water Flow Rate ☒ mL/min ☐ gpm	Water Concent. (ppm)	Solids Rate ☐ mg/L ☐ mg/gal	Filter Sample ID	Solids Concent. Affluent (mg/L)	Solids Concent. Effluent (mg/L)	Sample Size	Temp ☐ °C ☒ °F
Start-up	0	0	20	3.4	548	0	1						62
Water 0,01%	5	0	19.8	3.4	547	7.6	1						
	10	5	19.9	3.6		7.6	1						
	15	10 s/s	20.2	3.9		7.6	1						
	25	20 s/s	20	4.2		7.6	1.5						
	35	30 s/s	20	4.5	545	7.6	2						61
Phase	Cum. Test Time (minutes)	Time (minutes)	Fuel Flow Rate (gpm)	ΔP (psid)	k (pS/m)	Water Flow Rate ☒ mL/min ☐ gpm	Water Concent. (ppm)	Solids Rate ☒ mg/L ☐ mg/gal	Filter Sample ID	Solids Concent. Affluent (mg/L)	Solids Concent. Effluent (mg/L)	Sample Size	Temp ☐ °C ☒ °F
Solids Holding Test (Continued until reaching 115 kPa (22,5 psid))	35	0	19.9	4.4	547								62
	50	15	19.9	4.4				19	2		0.175	4L	62
		15 s/s	20.1	4.6				19	3		0.05	4L	
	65	30	20	4.3	562			19	4		0	4L	
		30 s/s	20.1	4.4				19	5		0	4L	
	80	45	20	4.5				19	6		0	4L	
		45 s/s	20	4.6				19	7		0.175	4L	
	85	50	20.1	4.5									
	95	60	20	4.9	583			19	8		0	4L	63
		60 s/s	20.2	5.1				19	9		0.05	4L	
110	75	20	6				19	10		0	4L		
	75 s/s	20.1	6.4				19	11		0	4L		

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Phase	Cum. Test Time (minutes)	Time (minutes)	Fuel Flow Rate (gpm)	ΔP (psid)	k (pS/m)	Water Flow Rate ■ mL/min □ gpm	Water Concent. (ppm)	Solids Rate ■ mg/L □ mg/gal	Filter Sample ID	Solids Concent. Affluent (mg/L)	Solids Concent. Effluent (mg/L)	Sample Size	Temp □ °C ■ °F
Water Coalescence Test - 0.01%	110	0	20	6.5	487	7.6	2						64
	112	2	20	6.7		7.6	2						
	115	5	20	7.7		7.6	2.5						
	125	15	20	8.7	590	7.6	3						64
		30 s/s	20.2	8.7		7.6	3						
	155	45	20	9.2		7.6	3						
	170	60 s/s	20.2	9.2	597	7.6	3						
	185	75	20	9.6		7.6	3						
		90 s/s	20.2	9.6		7.6	3						66
	215	105	20.2	9.9	611	7.6	3						
		120 s/s	20.2	9.9		7.6	3						
	245	135	20	10.1		7.6	3						
Water Coalescence Test - 3%		150 s/s	20.1	10.2		7.6	3						
	260	0	20.1	8.3	619	0	3						
	262	2	20.2	13.9		2,270	10						68
	265	5	19.9	16.3		2,270	2						
		10 s/s	20	18.3	613	2,270	3						
		20 s/s	20.2	24.8		2,270	11						
	290	30	20.2	30.4		2,270	11						68

5th Edition Single Element Data Sheet

Test Specification: API/IP 1581 5th Edition				SET: ☒						Date: 11/24/08			
Test No.				Full-Scale: ☐									
Vessel:		Filter/Coalescer: Velcon				Separator: Velcon				Type: ☒ -S ☐ S-LD			
Additive Addition		Model: TE08-083				Model: SI522				Manufacturing Date:			
Category:		M-100 ☐				M ☒				C ☐			
Tank Volume	Gallons	Additive	Conc. (Mg/L)	Amount Added	k (pS/m)	Additive	Conc. (Mg/L)	Amount Added	k (pS/m)	Additive	Conc. (Mg/L)	Amount Added	k (pS/m)
Beginning	9,050	A	256			D	2,0	68.5 g	629	I	1,0		
Ending		B	0,15%			B	0,15%	13.6 gal		II	15		
		C	15			C	15	513.9 g					
Used		D	2,0										
Mixing Time: 30 minutes						WISM		Before	After				
Element Conditioning:		☒ in-Situ		☐ External				96	84				
Phase	Cum. Test Time (minutes)	Time (minutes)	Fuel Flow Rate (gpm)	ΔP (psid)	k (pS/m)	Water Flow Rate ☒ mL/min ☐ gpm	Water Concent. (ppm)	Solids Rate ☐ mg/L ☐ mg/gal	Filter Sample ID	Solids Concent. Affluent (mg/L)	Solids Concent. Effluent (mg/L)	Sample Size	Temp ☐ °C ☒ °F
Start-up	0	0	20	3.2	590	0	1						70
Water 0,01%	5	0	20	3.1	614	7.6	1.5						
	10	5	20	3.4		7.6	2						
	15	10 s/s	20.2	3.6		7.6	2						
	25	20 s/s	20.2	4.2		7.6	3						
	35	30 s/s	20.2	4.4	601	7.6	3						69
Phase	Cum. Test Time (minutes)	Time (minutes)	Fuel Flow Rate (gpm)	ΔP (psid)	k (pS/m)	Water Flow Rate ☒ mL/min ☐ gpm	Water Concent. (ppm)	Solids Rate ☒ mg/L ☐ mg/gal	Filter Sample ID	Solids Concent. Affluent (mg/L)	Solids Concent. Effluent (mg/L)	Sample Size	Temp ☐ °C ☒ °F
Solids Holding Test (Continued until reaching 115 kPa (22.5 psid))	35	0	19.9	4	606								69
	50	15	20	4.2				19	2		0.05	4L	70
		15 s/s	20.2	4.2				19	3		0.025	4L	
	65	30	20.2	4.2	607			19	4		0	4L	
		30 s/s	19.8	4.2				19	5		0.1	4L	
	80	45	20	4.8				19	6		0.125	4L	
		45 s/s	20.2	5.2				19	7		0.075	4L	
	85	50	20	5.5									
	95	60	19.9	6	600			19	8		0.025	4L	70
		60 s/s	20	7.2				19	9		0.05	4L	
110	75	20	8.4				19	10		0.1	4L		
	75 s/s	20	8.5				19	11		0.125	4L		

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Phase	Cum. Test Time (minutes)	Time (minutes)	Fuel Flow Rate (gpm)	ΔP (psid)	k (pS/m)	Water Flow Rate ■ mL/min □ gpm	Water Concent. (ppm)	Solids Rate ■ mg/L □ mg/gal	Filter Sample ID	Solids Concent. Affluent (mg/L)	Solids Concent. Effluent (mg/L)	Sample Size	Temp □ °C ■ °F
Water Coalescence Test - 0.01%	110	0	20	8.4	487	7.6	1						71
	112	2	20.2	9.9		7.6	2						
	115	5	20	10.2		7.6	2						
	125	15	20	11.3	590	7.6	2						71
		30 s/s	20.2	11.9		7.6	2						
	155	45	20	12.4		7.6	2						
	170	60 s/s	20.2	13	597	7.6	3						
	185	75	19.9	13.2		7.6	3						
		90 s/s	20.2	13.8		7.6	3						73
	215	105	20	14.2	611	7.6	3						
		120 s/s	20.2	14.9		7.6	3						
	245	135	20.2	15.2		7.6	3						
Water Coalescence Test - 3%		150 s/s	20.2	15.6		7.6	3						
	260	0	20.2	10.5	619	0	3						
	262	2	19.8	20.8		2,270	4						74
	265	5	19.9	24.2		2,270	1						
		10 s/s	19.8	29.4	613	2,270	2						
		20 s/s	20	36.6		2,270	5						
	290	30	19.9	45.9		2,270	7						74

5th Edition Single Element Data Sheet

Test Specification: API/IP 1581 5th Edition				SET: ☒						Date: 11/27/08			
Test No.				Full-Scale: ☐									
Vessel:		Filter/Coalescer: Facet				Separator: Velcon				Type: ☒ -S ☐ S-LD			
Additive Addition		Model: TC-C0152				Model: SI522				Manufacturing Date:			
Category:		M-100 ☐				M ☒				C ☐			
Tank Volume	Gallons	Additive	Conc. (Mg/L)	Amount Added	k (pS/m)	Additive	Conc. (Mg/L)	Amount Added	k (pS/m)	Additive	Conc. (Mg/L)	Amount Added	k (pS/m)
Beginning	9,050	A	256			D	2,0	68.5 g	629	I	1,0		
Ending		B	0,15%			B	0,15%	13.6 gal		II	15		
		C	15			C	15	513.9 g					
Used		D	2,0										
Mixing Time: 30 minutes						WISM		Before	After				
Element Conditioning:		☒ in-Situ		☐ External				97	85				
Phase	Cum. Test Time (minutes)	Time (minutes)	Fuel Flow Rate (gpm)	ΔP (psid)	k (pS/m)	Water Flow Rate ☒ mL/min ☐ gpm	Water Concent. (ppm)	Solids Rate ☐ mg/L ☐ mg/gal	Filter Sample ID	Solids Concent. Affluent (mg/L)	Solids Concent. Effluent (mg/L)	Sample Size	Temp ☐ °C ☒ °F
Start-up	0	0	20	4.1	588	0	1						72
Water 0,01%	5	0	20	4.2	597	7.6	1.5						
	10	5	20	5.3		7.6	2						
	15	10 s/s	20	6.1		7.6	2						
	25	20 s/s	20	7		7.6	2						
	35	30 s/s	20	7.2	576	7.6	2						70
Phase	Cum. Test Time (minutes)	Time (minutes)	Fuel Flow Rate (gpm)	ΔP (psid)	k (pS/m)	Water Flow Rate ☒ mL/min ☐ gpm	Water Concent. (ppm)	Solids Rate ☒ mg/L ☐ mg/gal	Filter Sample ID	Solids Concent. Affluent (mg/L)	Solids Concent. Effluent (mg/L)	Sample Size	Temp ☐ °C ☒ °F
Solids Holding Test (Continued until reaching 11.5 kPa (22.5 psid))	35	0	20	6.9	590								70
	50	15	20	9.3				19	2		0.125	4L	70
		15 s/s	20.1	9.2				19	3		0	4L	
	65	30	20	11.1	591			19	4		0	4L	
		30 s/s	20.1	11.4				19	5		0.05	4L	
	80	45	19.9	12.4				19	6		0.025	4L	
		45 s/s	20.1	12.6				19	7		0	4L	
	85	50	20	13.1									
	95	60	20	13.7	597			19	8		0.05	4L	70
		60 s/s	20	14.1				19	9		0.025	4L	
110	75	19.9	14.6				19	10		0.075	4L		
	75 s/s	20	14.9				19	11		0	4L		

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Phase	Cum. Test Time (minutes)	Time (minutes)	Fuel Flow Rate (gpm)	ΔP (psid)	k (pS/m)	Water Flow Rate ■ mL/min □ gpm	Water Concent. (ppm)	Solids Rate ■ mg/L □ mg/gal	Filter Sample ID	Solids Concent. Affluent (mg/L)	Solids Concent. Effluent (mg/L)	Sample Size	Temp □ °C ■ °F
Water Coalescence Test - 0.01%	110	0	19.9	14.5	594	7.6	1.5						70
	112	2	20	15.5		7.6	2						
	115	5	20.2	17.7		7.6	2						
	125	15	20.1	19.8	599	7.6	2						70
		30 s/s	20.2	20.3		7.6	3						
	155	45	19.8	21.3		7.6	3						
	170	60 s/s	20.2	21.8	607	7.6	3						
	185	75	20	22.7		7.6	3						
		90 s/s	20.2	22.8		7.6	3						70
	215	105	20	23.8	605	7.6	3						
		120 s/s	20	23.7		7.6	3						
	245	135	19.8	24.5		7.6	4						
		150 s/s	20.2	24.3		7.6	4						
Water Coalescence Test - 3%	260	0	20.2	22	608	0	3						
	262	2	19.8	35.1		2,270	4						71
	265	5	19.9	37.5		2,270	>20						
		10 s/s	20	42.5	---	2,270	20						
		20 s/s	20	49.2		2,270	>60						
	290	30	20	58.8		2,270	>60						71

5th Edition Full Scale Data Sheet

Test Specification: API/IP 1581 5th Edition				SET: ☐						Date: 3/3/09			
Test No.				Full-Scale: ☒									
Vessel:		Filter/Coalescer: Facet				Separator: Velcon				Type: ☒ -S ☐ S-LD			
Additive Addition		Model: TC-C0152				Model: SI522				Manufacturing Date:			
Category:		M-100 ☐				M ☒				C ☐			
Tank Volume	8000	Additive	Conc. (Mg/L)	Amount Added	k (pS/m)	Additive	Conc. (Mg/L)	Amount Added	k (pS/m)	Additive	Conc. (Mg/L)	Amount Added	k (pS/m)
		A	256			D	2,0	60.5	445	I	1,0		
		B	0,15%			B	0,15%	12		II	15		
		C	15			C	15	454.2					
		D	2,0										
Mixing Time: 30 minutes						WISM		Before	After add.				
Element Conditioning:		☒ in-Situ		☐ External									
Phase	Cum. Test Time (minutes)	Time (minutes)	Fuel Flow Rate (gpm)	ΔP (psid)	k (pS/m)	Water Flow Rate ☒ mL/min ☐ gpm	Water Concent. (ppm)	Solids Rate ☐ mg/L ☐ mg/gal	Filter Sample ID	Solids Concent. Affluent (mg/L)	Solids Concent. Effluent (mg/L)	Sample Size	Temp ☐ °C ☒ °F
Media Migration	0	0	37	0.9	58								59
	10	10	36	0.9									
	20	20	38	1									
	30	30	38	0.9	180				1				60
Phase	Cum. Test Time (minutes)	Time (minutes)	Fuel Flow Rate (gpm)	ΔP (psid)	k (pS/m)	Water Flow Rate ☒ mL/min ☐ gpm	Water Concent. (ppm)	Solids Rate ☒ mg/L ☐ mg/gal	Filter Sample ID	Solids Concent. Affluent (mg/L)	Solids Concent. Effluent (mg/L)	Sample Size	Temp ☐ °C ☒ °F
0.01% Water Addition	30	0	350	5.4		0	1						
	35	5	352	7	364	132.5	3						
	40	10	351	7.2		132.5	2						61
	45	15 s/s	350	7.7		132.5							61
	50	20	355	8		132.5	6						62
	60	30	353	8.4	417	132.5							62
	60	30 s/s	357	8.7		132.5	6						
Phase	Cum. Test Time (minutes)	++Time (minutes)	Fuel Flow Rate (gpm)	ΔP (psid)	k (pS/m)	Water Flow Rate ☒ mL/min ☐ gpm	Water Concent. (ppm)	Solids Rate ☒ mg/L ☐ mg/gal	Filter Sample ID	Solids Concent. Affluent (mg/L)	Solids Concent. Effluent (mg/L)	Sample Size	Temp ☐ °C ☒ °F
Solids Holding Testing	60	0	354	8.2				0				4L	
	75	15	349	9.5				19	2		0.1	4L	
		15 s/s	350	9.6				19	3		0.175	4L	64
	90	30	349	10.2				19	4		0.2	4L	
		30 s/s	347	10.5				19	5		0.15	4L	
	105	45	355	11.3				19	6		0.125	4L	66
		45 s/s	349	11.4				19	7		0.125	4L	

Phase	Cum. Test Time (minutes)	Time (minutes)	Fuel Flow Rate (gpm)	ΔP (psid)	k (pS/m)	Water Flow Rate ■ mL/min □ gpm	Water Concent. (ppm)	Solids Rate ■ mg/L □ mg/gal	Filter Sample ID	Solids Concent. Affluent (mg/L)	Solids Concent. Effluent (mg/L)	Sample Size	Temp □ °C ■ °F
0.01% Water Addition	105	0	354	11.4	440	0	2						66
	107	2	352	12.5		132.5	9						67
	110	5	352	12.6		132.5	7						66
	120	15	350	12.8	462	132.5	9						67
	135	30 s/s	349	12.8		132.5	10						66
	150	45	349	13.3		132.5	8						66
	165	60 s/s	349	13.3	504	132.5	9						66
	180	75	350	13.5		132.5	8						66
	195	90 s/s	349	13.5		132.5	10						66
Water Coalescence Test - 3%	195	0	353	12.1	515	0	2						67
	197	2	349	16.3		39.7 lpm	>24						66
	200	5	347	16.6		39.7 lpm	>60						66
	205	10											
	210	15											

5th Edition Full Scale Data Sheet

Test Specification: API/IP 1581 5th Edition				SET: ☐						Date: 12/22/08			
Test No.				Full-Scale: ☒									
Vessel:				Filter/Coalescer: Facet				Separator: Velcon				Type: ☒ -S ☐ S-LD	
Additive Addition				Model: TC-C0152				Model: SI522				Manufacturing Date:	
Category:		M-100 ☐				M ☒				C ☐			
Tank Volume	Gallons	Additive	Conc. (Mg/L)	Amount Added	k (pS/m)	Additive	Conc. (Mg/L)	Amount Added	k (pS/m)	Additive	Conc. (Mg/L)	Amount Added	k (pS/m)
	10,440	A	256			D	2,0	79 g	910	I	1,0		
		B	0,15%			B	0,15%	15.7 gal		II	15		
		C	15			C	15	592.8 g					
		D	2,0										
Mixing Time: 30 minutes						WISM		Before	After add.				
Element Conditioning:		☒ in-Situ		☐ External				94	83				
Phase	Cum. Test Time (minutes)	Time (minutes)	Fuel Flow Rate (gpm)	ΔP (psid)	k (pS/m)	Water Flow Rate ☒ mL/min ☐ gpm	Water Concent. (ppm)	Solids Rate ☐ mg/L ☐ mg/gal	Filter Sample ID	Solids Concent. Affluent (mg/L)	Solids Concent. Effluent (mg/L)	Sample Size	Temp ☐ °C ☒ °F
Media Migration	0	0	35	1.2	590								45
	10	10	33	1.5									
	20	20	34	1.5									
	30	30	36	1.5	582				1				45
Phase	Cum. Test Time (minutes)	Time (minutes)	Fuel Flow Rate (gpm)	ΔP (psid)	k (pS/m)	Water Flow Rate ☒ mL/min ☐ gpm	Water Concent. (ppm)	Solids Rate ☒ mg/L ☐ mg/gal	Filter Sample ID	Solids Concent. Affluent (mg/L)	Solids Concent. Effluent (mg/L)	Sample Size	Temp ☐ °C ☒ °F
0.01% Water Addition	30	0	350	606	557	0	2						
	35	5	351	7.7	555	132.5	1						
	40	10	350	8		132.5	2						45
	45	15 s/s	350	8.1		132.5							45
	50	20	348	8.4		132.5	2						45
	60	30	352	8.9	551	132.5							45
	60	30 s/s	350	8.5		132.5	2						
Phase	Cum. Test Time (minutes)	++Time (minutes)	Fuel Flow Rate (gpm)	ΔP (psid)	k (pS/m)	Water Flow Rate ☒ mL/min ☐ gpm	Water Concent. (ppm)	Solids Rate ☒ mg/L ☐ mg/gal	Filter Sample ID	Solids Concent. Affluent (mg/L)	Solids Concent. Effluent (mg/L)	Sample Size	Temp ☐ °C ☒ °F
Solids Holding Testing	60	0	350	8.1				0				4L	
	75	15	350	10.1				19	2		0.025	4L	
		15 s/s	350	9.9				19	3		0.025	4L	45
	90	30	348	11.7				19	4		0.15	4L	
		30 s/s	349	11.7				19	5		0.075	4L	
	105	45	350	13.6				19	6		0.1	4L	45
		45 s/s	351	13.4				19	7		0.1	4L	

Phase	Cum. Test Time (minutes)	Time (minutes)	Fuel Flow Rate (gpm)	ΔP (psid)	k (pS/m)	Water Flow Rate ■ mL/min □ gpm	Water Concent. (ppm)	Solids Rate ■ mg/L □ mg/gal	Filter Sample ID	Solids Concent. Affluent (mg/L)	Solids Concent. Effluent (mg/L)	Sample Size	Temp □ °C ■ °F
0.01% Water Addition	105	0	350	13	536	0	2						46
	107	2	349	14.5		132.5	2						46
	110	5	350	14.8		132.5	3						46
	120	15	348	15.2	542	132.5	3						46
	135	30 s/s	350	15.2		132.5	3						46
	150	45	350	16		132.5	4						46
	165	60 s/s	350	15.9	526	132.5	4						46
	180	75	349	16.7		132.5	4						47
	195	90 s/s	351	16.7		132.5	4						47
Water Coalescence Test - 3%	195	0	350	14.5	492	0	1						47
	197	2	353	29.1		39.7 lpm	>24						48
	200	5	350	30.7		39.7 lpm	>24						48
	205	10	347	36.4	540	39.7 lpm	>24						48
	210	15	351	40.2		39.7 lpm	>24						48

5th Edition Full Scale Data Sheet

Test Specification: API/IP 1581 5th Edition				SET: ☐						Date: 12/17/08			
Test No.				Full-Scale: ☒									
Vessel:		Filter/Coalescer: Racor CP-20452-J				Separator: Velcon				Type: ☒ -S ☐ S-LD			
Additive Addition		Model: CP-20452-J				Model: SI522				Manufacturing Date:			
Category:		M-100 ☐				M ☒				C ☐			
Tank Volume	Gallons 10,440	Additive	Conc. (Mg/L)	Amount Added	k (pS/m)	Additive	Conc. (Mg/L)	Amount Added	k (pS/m)	Additive	Conc. (Mg/L)	Amount Added	k (pS/m)
		A	256			D	2,0	79 g	581	I	1,0		
		B	0,15%			B	0,15%	15.7 gal		II	15		
		C	15			C	15	592.8 g					
		D	2,0										
Mixing Time: 30 minutes						WISM		Before	After add.				
Element Conditioning:		☒ in-Situ		☐ External				96	86				
Phase	Cum. Test Time (minutes)	Time (minutes)	Fuel Flow Rate (gpm)	ΔP (psid)	k (pS/m)	Water Flow Rate ☒ mL/min ☐ gpm	Water Concent. (ppm)	Solids Rate ☐ mg/L ☐ mg/gal	Filter Sample ID	Solids Concent. Affluent (mg/L)	Solids Concent. Effluent (mg/L)	Sample Size	Temp ☐ °C ☒ °F
Media Migration	0	0	35	0.5	523								54
	10	10	35	0.5									
	20	20	35	0.5									
	30	30	35	0.5	521				1				54
Phase	Cum. Test Time (minutes)	Time (minutes)	Fuel Flow Rate (gpm)	ΔP (psid)	k (pS/m)	Water Flow Rate ☒ mL/min ☐ gpm	Water Concent. (ppm)	Solids Rate ☒ mg/L ☐ mg/gal	Filter Sample ID	Solids Concent. Affluent (mg/L)	Solids Concent. Effluent (mg/L)	Sample Size	Temp ☐ °C ☒ °F
0.01% Water Addition	30	0	351	2.9		0	2						
	35	5	349	3.7		132.5	7						
	40	10	351	3.9		132.5	2						51
	45	15 s/s	350	4.2		132.5	2						51
	50	20	350	4.3		132.5	2						51
	60	30	352	4.5		132.5	2						50
	60	30 s/s	352	4.4		132.5	2						
Phase	Cum. Test Time (minutes)	Time (minutes)	Fuel Flow Rate (gpm)	ΔP (psid)	k (pS/m)	Water Flow Rate ☒ mL/min ☐ gpm	Water Concent. (ppm)	Solids Rate ☒ mg/L ☐ mg/gal	Filter Sample ID	Solids Concent. Affluent (mg/L)	Solids Concent. Effluent (mg/L)	Sample Size	Temp ☐ °C ☒ °F
Solids Holding Testin	60	0	350	4.1				0				4L	
	75	15	351	5.8				19	2		0.1	4L	
	115	15 s/s	349	5.8				19	3		0	4L	50
	90	30	349	7.7				19	4		0.175	4L	
		30 s/s	349	7.7				19	5		0	4L	
	105	45	348	9				19	6		0	4L	50
		45 s/s	349	9.2				19	7		0.075	4L	

Phase	Cum. Test Time (minutes)	Time (minutes)	Fuel Flow Rate (gpm)	ΔP (psid)	k (pS/m)	Water Flow Rate ■ mL/min □ gpm	Water Concent. (ppm)	Solids Rate ■ mg/L □ mg/gal	Filter Sample ID	Solids Concent. Affluent (mg/L)	Solids Concent. Effluent (mg/L)	Sample Size	Temp □ °C ■ °F
0.01% Water Addition	105	0	352	8.9	439	0	1						50
	107	2	348	10.1		132.5	1						51
	110	5	350	10.1		132.5	2						51
	120	15	350	10.2	435	132.5	2						51
	135	30 s/s	350	10.2		132.5	2						51
	150	45	349	10.5		132.5	1						51
	165	60 s/s	350	10.5	425	132.5	2						51
	180	75	350	10.8		132.5	1						51
	195	90 s/s	350	10.5		132.5	2						52
Water Coalescence Test - 3%	195	0	350	9.6	420	0	1						52
	197	2	353	17.7		39.7 lpm	4						52
	200	5	348	18.5		39.7 lpm	3						52
	205	10	348	21.1	430	39.7 lpm	4						52
	210	15	349	22.6		39.7 lpm	4						52

5th Edition Full Scale Data Sheet

Test Specification: API/IP 1581 5th Edition				SET: ☐						Date: 12/13/08			
Test No.				Full-Scale: ☒									
Vessel:		Filter/Coalescer: Velcon				Separator: Velcon				Type: ☒ -S ☐ S-LD			
Additive Addition		Model: TE08-083				Model: SI522				Manufacturing Date:			
Category:		M-100 ☐				M ☒				C ☐			
Tank Volume	Gallons	Additive	Conc. (Mg/L)	Amount Added	k (pS/m)	Additive	Conc. (Mg/L)	Amount Added	k (pS/m)	Additive	Conc. (Mg/L)	Amount Added	k (pS/m)
	10,440	A	256			D	2,0	79 g	910	I	1,0		
		B	0,15%			B	0,15%	15.7 gal		II	15		
		C	15			C	15	592.8 g					
		D	2,0										
Mixing Time: 30 minutes						WISM		Before	After add.				
Element Conditioning:		☒ in-Situ		☐ External				98	86				
Phase	Cum. Test Time (minutes)	Time (minutes)	Fuel Flow Rate (gpm)	ΔP (psid)	k (pS/m)	Water Flow Rate ☒ mL/min ☐ gpm	Water Concent. (ppm)	Solids Rate ☐ mg/L ☐ mg/gal	Filter Sample ID	Solids Concent. Affluent (mg/L)	Solids Concent. Effluent (mg/L)	Sample Size	Temp ☐ °C ☒ °F
Media Migration	0	0	37.1	1	581								57
	10	10	36.5	1.2									
	20	20	35.9	1.2									
	30	30	35.7	1.1	511				1				57
Phase	Cum. Test Time (minutes)	Time (minutes)	Fuel Flow Rate (gpm)	ΔP (psid)	k (pS/m)	Water Flow Rate ☒ mL/min ☐ gpm	Water Concent. (ppm)	Solids Rate ☒ mg/L ☐ mg/gal	Filter Sample ID	Solids Concent. Affluent (mg/L)	Solids Concent. Effluent (mg/L)	Sample Size	Temp ☐ °C ☒ °F
0.01% Water Addition	30	0	350	4.5	413	0	2.5						
	35	5	350	5.1	427	132.5	3.5						
	40	10	349	5.2		132.5	3						56
	45	15 s/s	349	5.3		132.5							57
	50	20	349	5.4		132.5	4						57
	60	30	348	5.5	427	132.5							57
	60	30 s/s	350	5.5		132.5	4						
Phase	Cum. Test Time (minutes)	Time (minutes)	Fuel Flow Rate (gpm)	ΔP (psid)	k (pS/m)	Water Flow Rate ☒ mL/min ☐ gpm	Water Concent. (ppm)	Solids Rate ☒ mg/L ☐ mg/gal	Filter Sample ID	Solids Concent. Affluent (mg/L)	Solids Concent. Effluent (mg/L)	Sample Size	Temp ☐ °C ☒ °F
Solids Holding Testing	60	0	350	5.3				0				4L	
	75	15	349	6				19	2		0	4L	
	115	15 s/s	350	6				19	3		0	4L	59
	90	30	349	6.6				19	4		0.025	4L	
		30 s/s	350	6.5				19	5		0.1	4L	
	105	45	350	7.3				19	6		0.025	4L	60
		45 s/s	351	7.2				19	7		0.025	4L	

Phase	Cum. Test Time (minutes)	Time (minutes)	Fuel Flow Rate (gpm)	ΔP (psid)	k (pS/m)	Water Flow Rate ■ mL/min □ gpm	Water Concent. (ppm)	Solids Rate ■ mg/L □ mg/gal	Filter Sample ID	Solids Concent. Affluent (mg/L)	Solids Concent. Effluent (mg/L)	Sample Size	Temp □ °C ■ °F
0.01% Water Addition	105	0	351	7.1	498	0	2						61
	107	2	350	7.9		132.5	2						62
	110	5	350	7.8		132.5	2						62
	120	15	351	7.7	510	132.5	2						62
	135	30 s/s	350	7.7		132.5	2						63
	150	45	350	7.8		132.5	3						63
	165	60 s/s	350	7.8	504	132.5	2						63
	180	75	350	7.9		132.5	2						65
	195	90 s/s	350	7.8		132.5	2						65
Water Coalescence Test - 3%	195	0	350	7.1	560	0	2						66
	197	2	349	11		39.7 lpm	>24						66
	200	5	350	11.1		39.7 lpm	>24						67
	205	10	349	11.5	499	39.7 lpm	>24						67
	210	15	350	11.9		39.7 lpm	>24						67