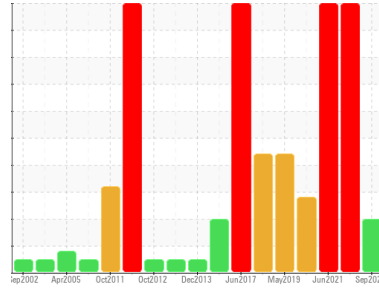




OIL ANALYSIS REPORT

Sample Rating Trend



DEGRADATION



Area
[02437560]

Machine Id
A11 - Thrust Bearing

Component
Thrust Bearing

Fluid
PETRO CANADA TURBOFLO R&O 46 (5705 LTR)

DIAGNOSIS

Recommendation

We recommend an early resample to monitor this condition. Diagnostician's note: Whatever corrective actions you took has improved the separability and foaming of the oil. The one anti-oxidant is almost depleted. Recommend retesting in 6 months to monitor.

Wear

All component wear rates are normal. The ferrography results are normal indicating no abnormal wear in the system.

Contaminants

The system cleanliness is acceptable for your target ISO 4406 cleanliness code. The water content is negligible. The system and fluid cleanliness is acceptable.

Oil Condition

Linear Sweep Voltammetry (RULER- ASTM D6971) testing indicates a low amount of one of the anti-oxidants present in the oil, however, the other anti-oxidant(s) are still performing adequately. Rust Prevention test (ASTM D665) indicates the oil retains good anti-corrosion properties. The AN level is acceptable for this fluid.

SAMPLE INFORMATION

method	limit/base	current	history1	history2
Sample Number	Client Info	WC0844620	WC	WC0308172
Sample Date	Client Info	14 Sep 2023	26 Apr 2022	09 Jun 2021
Machine Age	hrs	0	0	0
Oil Age	hrs	0	0	0
Oil Changed	Client Info	N/A	N/A	N/A
Sample Status		ABNORMAL	SEVERE	SEVERE

WEAR METALS

method	limit/base	current	history1	history2	
PQ	ASTM D8184*	0	0	0	
Iron	ppm	ASTM D5185(m) >85	1	2	2
Chromium	ppm	ASTM D5185(m) >20	0	0	0
Nickel	ppm	ASTM D5185(m) >20	0	0	<1
Titanium	ppm	ASTM D5185(m)	0	0	0
Silver	ppm	ASTM D5185(m)	0	0	0
Aluminum	ppm	ASTM D5185(m) >40	<1	0	0
Lead	ppm	ASTM D5185(m) >60	<1	<1	<1
Copper	ppm	ASTM D5185(m) >7	<1	<1	<1
Tin	ppm	ASTM D5185(m) >40	0	<1	<1
Antimony	ppm	ASTM D5185(m)	0	<1	0
Vanadium	ppm	ASTM D5185(m)	0	0	0
Beryllium	ppm	ASTM D5185(m)	0	0	0
Cadmium	ppm	ASTM D5185(m)	0	0	0

ADDITIVES

method	limit/base	current	history1	history2	
Boron	ppm	ASTM D5185(m)	0	<1	<1
Barium	ppm	ASTM D5185(m)	0	0	0
Molybdenum	ppm	ASTM D5185(m)	0	0	0
Manganese	ppm	ASTM D5185(m)	0	0	0
Magnesium	ppm	ASTM D5185(m)	<1	0	0
Calcium	ppm	ASTM D5185(m) 0	<1	0	0
Phosphorus	ppm	ASTM D5185(m) 3	1	2	1
Zinc	ppm	ASTM D5185(m) 0	<1	<1	1
Sulfur	ppm	ASTM D5185(m)	34	43	36
Lithium	ppm	ASTM D5185(m)	<1	<1	<1

CONTAMINANTS

method	limit/base	current	history1	history2	
Silicon	ppm	ASTM D5185(m) >20	0	0	0
Sodium	ppm	ASTM D5185(m)	0	0	0
Potassium	ppm	ASTM D5185(m) >20	<1	<1	<1
Water	%	ASTM D6304* >2	0.001	0.00	0.001
ppm Water	ppm	ASTM D6304*	6	0.00	11.8

INFRA-RED

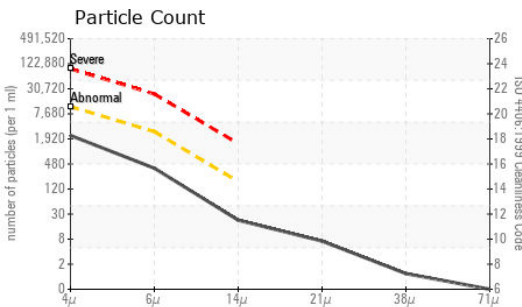
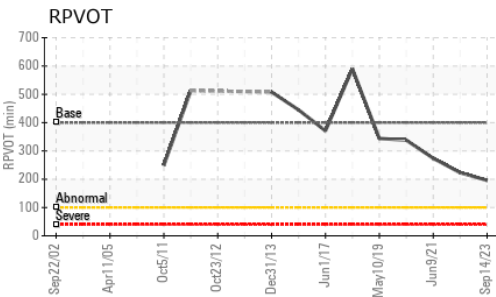
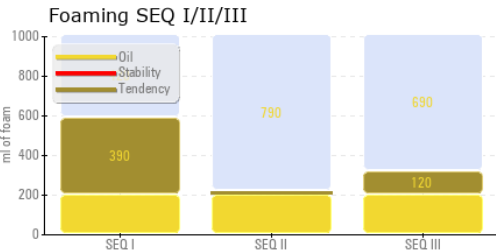
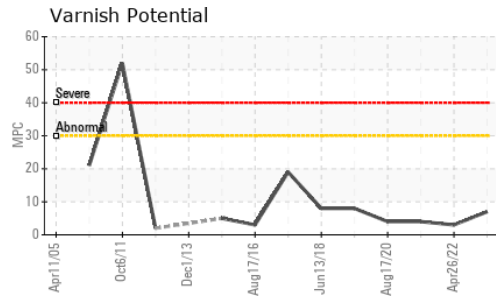
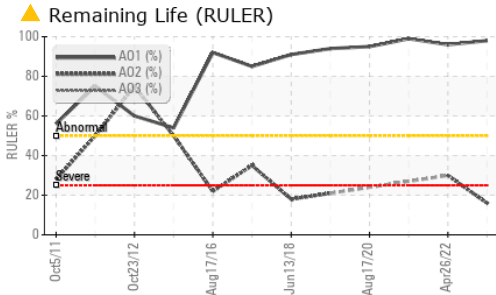
method	limit/base	current	history1	history2	
Soot %	%	ASTM D7844*	0	0	0
Nitration	Abs/cm	ASTM D7624*	1.5	1.8	1.7
Sulfation	Abs/.1mm	ASTM D7415*	10.5	12.9	11.0

Particle Filter (Magn: 200 x)





OIL ANALYSIS REPORT



Laboratory Sample No. : WC0844620
Lab Number : 02604628
Unique Number : 5697713
Test Package : AOM 3 (Additional Tests: BottomAnalysis, FilterPatch, PrtFilter, Tollnsol)

: WearCheck - C8-1175 Appleby Line, Burlington, ON L7L 5H9
Received : 21 Dec 2023
Diagnosed : 11 Jan 2024
Diagnostician : Bill Quesnel

Nalcor Energy - Churchill Falls
 PO Box 310
 Churchill Falls, NL
 CA A0R 1A0
 Contact: Robert Noel
 robertnoel@nlh.nl.ca
 T: (709)925-8294
 F: (709)925-8220

To discuss this sample report, contact Customer Service at 1-800-268-2131.
 Test denoted (*) outside scope of accreditation, (m) method modified, (e) tested at external lab.
 Validity of results and interpretation are based on the sample and information as supplied.

FLUID CLEANLINESS	method	limit/base	current	history1	history2
Particles >4µm	ASTM D7647	>10000	2031	5707	3893
Particles >6µm	ASTM D7647	>2500	334	1410	738
Particles >14µm	ASTM D7647	>160	19	81	74
Particles >21µm	ASTM D7647	>40	6	16	28
Particles >38µm	ASTM D7647	>10	1	0	4
Particles >71µm	ASTM D7647	>3	0	0	0
Oil Cleanliness	ISO 4406 (c)	>20/18/14	18/16/11	20/18/14	19/17/13

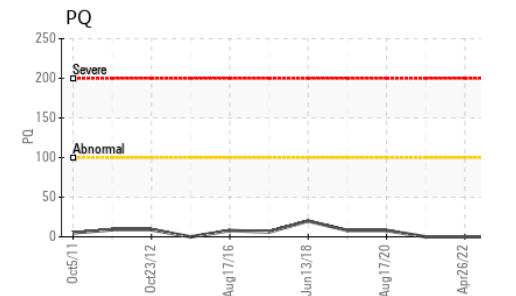
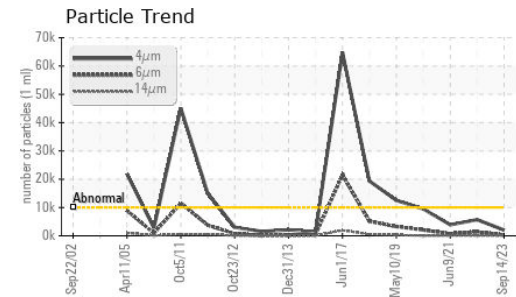
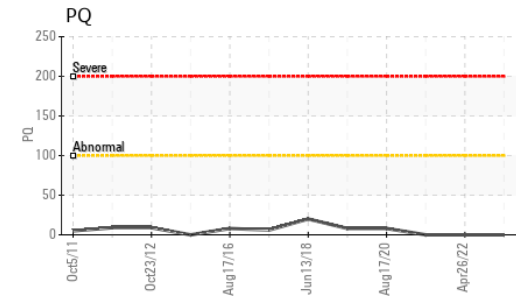
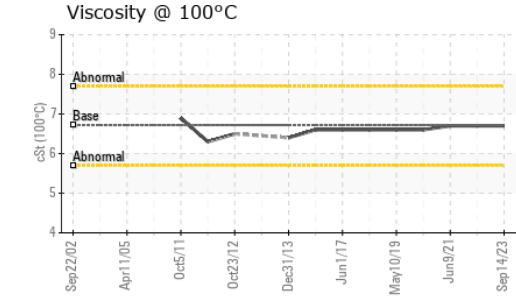
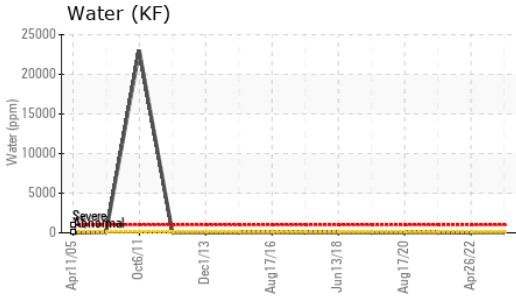
FLUID DEGRADATION	method	limit/base	current	history1	history2
Oxidation	Abs./1mm	ASTM D7414*	2.1	2.7	2.5
Acid Number (AN)	mg KOH/g	ASTM D974*	0.09	0.08	0.07
Anti-Oxidant 1	%	ASTM D6971*	98	96	99
Anti-Oxidant 2	%	ASTM D6971*	▲ 16	30	---
MPC Varnish Potential	Scale	ASTM D7843(m)*	7	3	4

VISUAL	method	limit/base	current	history1	history2
White Metal	scalar	Visual*	NONE	NONE	NONE
Yellow Metal	scalar	Visual*	NONE	NONE	NONE
Precipitate	scalar	Visual*	NONE	NONE	NONE
Silt	scalar	Visual*	NONE	NONE	NONE
Debris	scalar	Visual*	NONE	NONE	NONE
Sand/Dirt	scalar	Visual*	NONE	NONE	NONE
Appearance	scalar	Visual*	NORML	NORML	NORML
Odor	scalar	Visual*	NORML	NORML	NORML
Emulsified Water	scalar	Visual*	NEG	NEG	NEG
Free Water	scalar	Visual*	NEG	NEG	NEG

FLUID PROPERTIES	method	limit/base	current	history1	history2
Visc @ 40°C	cSt	ASTM D7279(m)	44.4	44.1	44.1
Visc @ 100°C	cSt	ASTM D7279(m)	6.72	6.7	6.7
Viscosity Index (VI)	Scale	ASTM D2270*	104	104	104
Separability	oil/h ₂ o/lem	ASTM D1401*	41/39/0	43/37/0 (30)	37/12/31 (30)
Air Release Time	min	ASTM D3427*	3.5	4.00	4.40
Foam Tendency	I/II/III	ASTM D892*	10	390/20/120	560/40/570
Foam Stability	I/II/III	ASTM D892*	0	0/0/0	90/0/0
ASTM Color	scalar	ASTM D1500*	0.5	<2.0	<1.5
Rust Prevention	PASS/FAIL	ASTM D665*	PASS	▲ FAIL	PASS
Oxidation Test (RPVOT)	minutes	ASTM D2272*	400	196	223

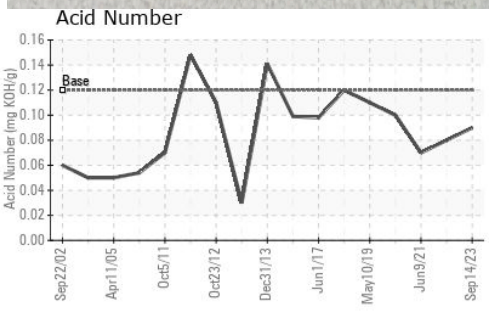
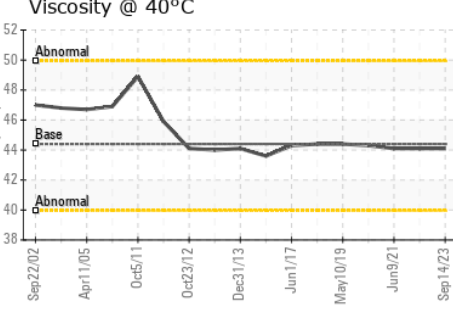
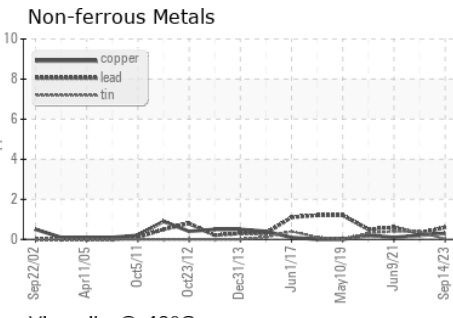
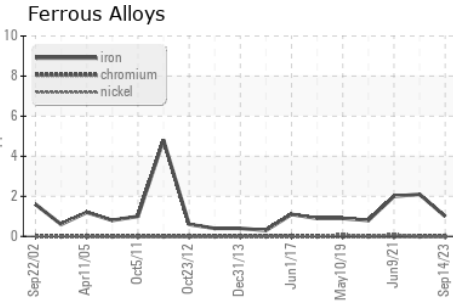
SEDIMENT	method	limit/base	current	history1	history2
Pentane Insolubles	%	ASTM D893(m)*	0.187	0.053	0.113
Toluene Insolubles	%	ASTM D893(m)*	0.011	0.038	0.076

OIL ANALYSIS REPORT



SAMPLE IMAGES	method	limit/base	current	history1	history2
Color					
Bottom					
PrtFilter					
MPC					

GRAPHS



Laboratory : WearCheck - C8-1175 Appleby Line, Burlington, ON L7L 5H9
Sample No. : WC0844620 **Received** : 21 Dec 2023
Lab Number : 02604628 **Diagnosed** : 11 Jan 2024
Unique Number : 5697713 **Diagnostician** : Bill Quesnel
Test Package : AOM 3 (Additional Tests: BottomAnalysis, FilterPatch, PrtFilter, Tollnsol)

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FERROGRAPHY REPORT

Area
[02437560]
 Machine Id
A11 - Thrust Bearing
 Component
Thrust Bearing
 Fluid
PETRO CANADA TURBOFLO R&O 46 (5705 LTR)

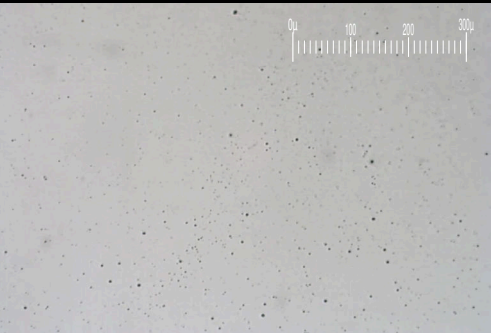
Magn: 200x Illum: BC



Magn: 50x Illum: RW



Magn: 100x Illum: RW

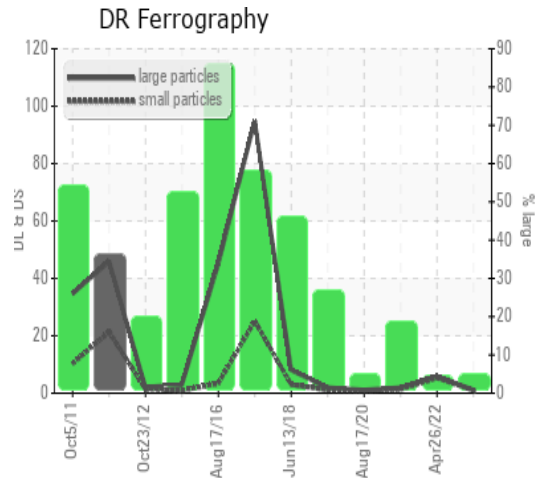


DR-FERROGRAPHY		method	limit/base	current	history1	history2
Large Particles		DR-Ferr*		1.1	5.8	1.9
Small Particles		DR-Ferr*		1.0	5.3	1.3
Total Particles		DR-Ferr*	>---	2.1	11.1	3.2
Large Particles Percentage	%	DR-Ferr*		4.8	4.5	18.7
Severity Index		DR-Ferr*		0	3	1.1

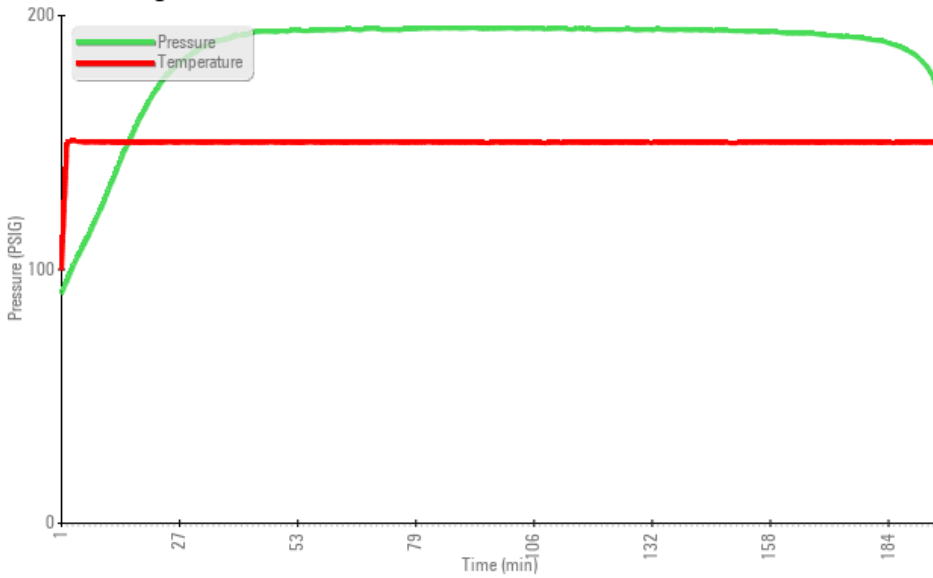
FERROGRAPHY		method	limit/base	current	history1	history2
Ferrous Rubbing	Scale 0-10	ASTM D7684*		2	1	1
Ferrous Sliding	Scale 0-10	ASTM D7684*				
Ferrous Cutting	Scale 0-10	ASTM D7684*				
Ferrous Rolling	Scale 0-10	ASTM D7684*		1	1	
Ferrous Break-in	Scale 0-10	ASTM D7684*				
Ferrous Spheres	Scale 0-10	ASTM D7684*				
Ferrous Black Oxides	Scale 0-10	ASTM D7684*				
Ferrous Red Oxides	Scale 0-10	ASTM D7684*				
Ferrous Corrosive	Scale 0-10	ASTM D7684*				
Ferrous Other	Scale 0-10	ASTM D7684*				
Nonferrous Rubbing	Scale 0-10	ASTM D7684*				
Nonferrous Sliding	Scale 0-10	ASTM D7684*				
Nonferrous Cutting	Scale 0-10	ASTM D7684*				
Nonferrous Rolling	Scale 0-10	ASTM D7684*				
Nonferrous Other	Scale 0-10	ASTM D7684*				
Carbonaceous Material	Scale 0-10	ASTM D7684*				
Lubricant Degradation	Scale 0-10	ASTM D7684*			2	
Sand/Dirt	Scale 0-10	ASTM D7684*		1	1	1
Fibres	Scale 0-10	ASTM D7684*				
Spheres	Scale 0-10	ASTM D7684*				
Other	Scale 0-10	ASTM D7684*		2		1

WEAR

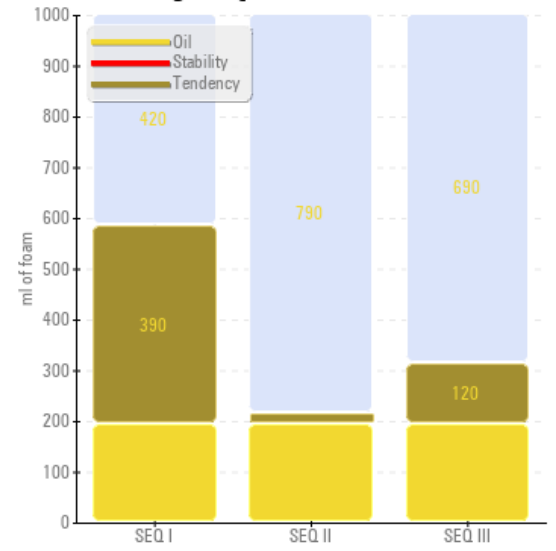
All component wear rates are normal. The ferrography results are normal indicating no abnormal wear in the system.



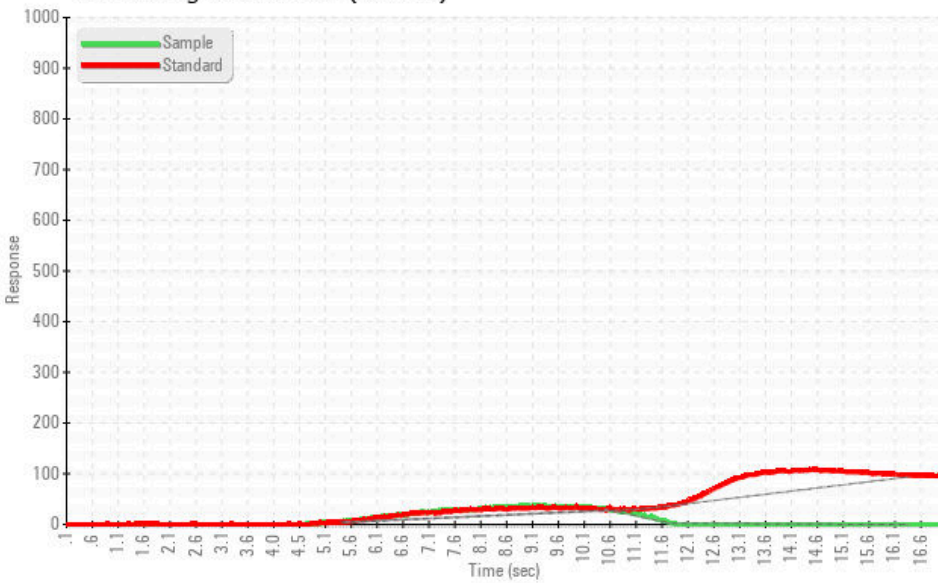
Rotating Pressure Vessel Oxidation Test



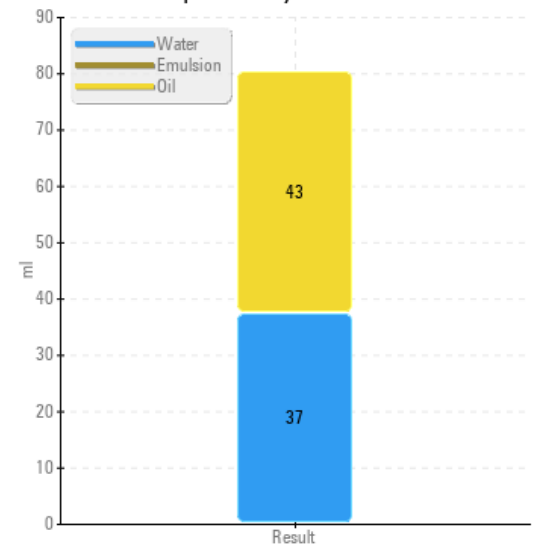
Foaming SEQ I/II/III



Remaining Useful Life (RULER)



Water Separability



MPC (Varnish Test)



Sample Color & Clarity



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