



# PROBLEM SUMMARY

## Sample Rating Trend

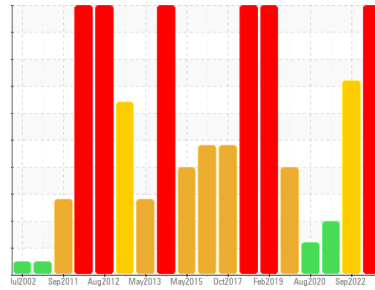
CONTAMINANT



Area  
**[02437560]**  
Machine Id  
**A5 - Thrust Bearing**

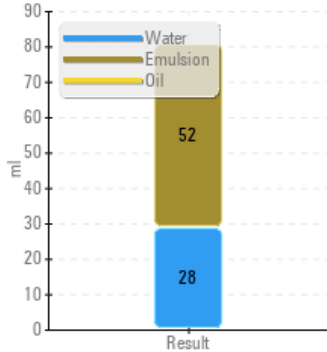
Component  
**Thrust Bearing**

Fluid  
**PETRO CANADA TURBOFLO R&O 46 (4920 LTR)**

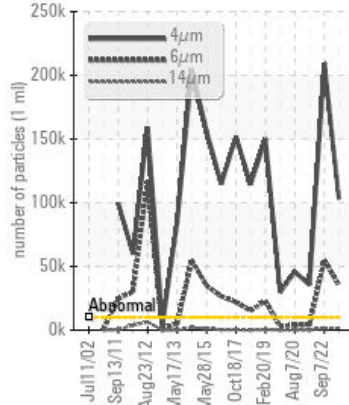


## COMPONENT CONDITION SUMMARY

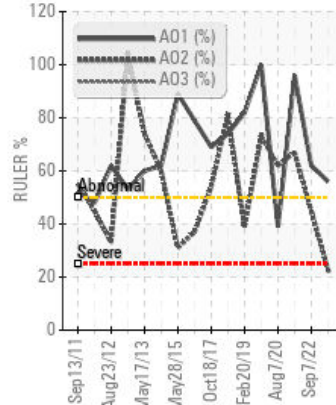
### Water Separability



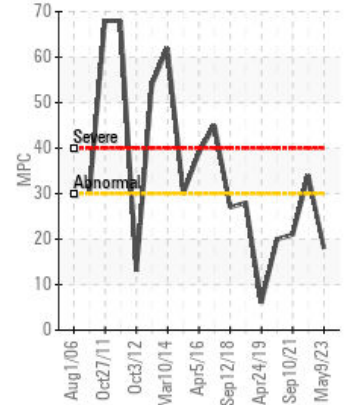
### Particle Trend



### Remaining Life (RULER)



### Varnish Potential



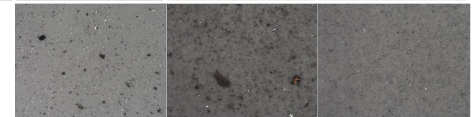
## RECOMMENDATION

We recommend that you perform vacuum distillation and/or air drying to attempt to remove any residual water and/or entrained gases from this oil that may be contributing to abnormal foaming and/or poor water separability. We advise that you check all areas where contaminants can enter the system. We advise that you perform a filter service, and use off-line filtration to improve the cleanliness of the system fluid. The air breather requires service. If unrated, we recommend that you replace with a suitable micron rated and/or desiccant air breather. If rated, we recommend that you service/replace the breather. Resample in 30-45 days to monitor this situation. No other corrective action is recommended at this time.

## PROBLEMATIC TEST RESULTS

Sample Status			SEVERE	SEVERE	ABNORMAL
Particles >4µm	ASTM D7647	>10000	103064	209422	35594
Particles >6µm	ASTM D7647	>2500	35233	54774	4234
Particles >14µm	ASTM D7647	>160	1734	1332	104
Particles >21µm	ASTM D7647	>40	400	251	22
Particles >38µm	ASTM D7647	>10	15	6	2
Oil Cleanliness	ISO 4406 (c)	>20/18/14	24/22/18	25/23/18	22/19/14
Anti-Oxidant 2	% ASTM D6971*	<25	23	45	67
MPC Varnish Potential	Scale ASTM D7843(m)*	>15	18	34	21
Separability	oil/h2o/em ASTM D1401*	41/39/0	0/28/52 (30)	42/38/0 (15)	41/39/0 (25)

PrntFilter



Customer Id: CHUCHU  
Sample No.: WC0786878  
Lab Number: 02579995  
Test Package: AOM 3



To manage this report scan the QR code

To discuss the diagnosis or test data:  
Bill Quesnel CLS,OMA II,MLA-III,LLA-I +1  
(289)291-4641 x4641  
[Bill.Quesnel@wearcheck.com](mailto:Bill.Quesnel@wearcheck.com)

To change component or sample information:  
Gloria Gonzalez +1 (289)291-4643 x4643  
[gloria.gonzalez@wearcheck.com](mailto:gloria.gonzalez@wearcheck.com)

## RECOMMENDED ACTIONS

Action	Status	Date	Done By	Description
Change Filter	---	---	?	We advise that you perform a filter service, and use off-line filtration to improve the cleanliness of the system fluid.
Resample	---	---	?	Resample in 30-45 days to monitor this situation.
Check Breathers	---	---	?	The air breather requires service. If unrated, we recommend that you replace with a suitable micron rated and/or desiccant air breather. If rated, we recommend that you service/replace the breather.
Check Dirt Access	---	---	?	We advise that you check all areas where contaminants can enter the system.
Check Fluid Source	---	---	?	Confirm the source of the lubricant being utilized for top-up/fill.
Filter Fluid	---	---	?	We advise that you perform a filter service, and use off-line filtration to improve the cleanliness of the system fluid. We recommend that you perform vacuum distillation and/or air drying to attempt to remove any residual water and/or entrained gases from this oil that may be contributing to abnormal foaming and/or poor water separability.

## HISTORICAL DIAGNOSIS

### ISO



#### 07 Sep 2022 Diag: Bill Quesnel

We advise that you check all areas where contaminants can enter the system. We advise that you perform a filter service, and use off-line filtration to improve the cleanliness of the system fluid. The air breather requires service. If unrated, we recommend that you replace with a suitable micron rated and/or desiccant air breather. If rated, we recommend that you service/replace the breather. We recommend that you use electrostatic filtration to remove insolubles from the oil and to reduce the levels of varnish in the system. Alternatively draining a percentage of the oil and topping up with fresh oil (sweetening the oil) may provide a reduction in the varnish potential level. Resample in 30-45 days to monitor this situation. All component wear rates are normal. The direct-reading & analytical ferrographic results are normal indicating no abnormal wear in the system. Particles >14µm are severely high. Particles >6µm are severely high. Particles >4µm are severely high. Oil Cleanliness are severely high. MPC Varnish Potential contamination levels are abnormally high. Particles >21µm are abnormally high. MPC (Membrane Patch Colorimetry) test indicates a moderate concentration of varnish present. The water content is negligible. The AN level is acceptable for this fluid. The oil is still serviceable provided that the contaminant(s) can be reduced to acceptable levels.

[view report](#)



### OFF SPEC



#### 10 Sep 2021 Diag: Bill Quesnel

We recommend that you perform vacuum distillation and/or air drying to attempt to remove any residual water and/or entrained gases from this oil that may be contributing to abnormal foaming and/or poor water separability. We recommend you service the filters on this component. We recommend an early resample to monitor this condition. No other corrective action is recommended at this time. All component wear rates are normal. The direct-reading & analytical ferrographic results are normal indicating no abnormal wear in the system. Particles >4µm are abnormally high. Particles >6µm are notably high. MPC Varnish Potential contamination levels are marginally high. MPC (Membrane Patch Colorimetry) test indicates a light concentration of varnish present. The water content is negligible. Water Separability results (ASTM D1401) indicate good water shedding properties. Foaming Tendency stage I (ASTM D892) result is abnormal indicating a tendency for oil foaming. The Air Release Value (ASTM D3427) indicates that the oil has good deaeration properties. Linear Sweep Voltammetry (RULER – ASTM D6971) testing indicates normal levels of anti-oxidants present in the oil. The Rotating Pressure Vessel Oxidation Test (RPVOT – ASTM D2272) result indicates suitable amounts of anti-oxidant(s) present in the oil. The AN level is acceptable for this fluid. The oil is still serviceable provided that the contaminant(s) can be reduced to acceptable levels.

[view report](#)



### INSOLUBLES



#### 07 Aug 2020 Diag: Bill Quesnel

We recommend you service the filters on this component. We recommend an early resample to monitor this condition. No other corrective action is recommended at this time. All component wear rates are normal. The direct-reading & analytical ferrographic results are normal indicating no abnormal wear in the system. Particles >4µm are abnormally high. Particles >6µm are notably high. MPC Varnish Potential contamination levels are marginally high. MPC (Membrane Patch Colorimetry) test indicates a light concentration of varnish present. The water content is negligible. Water Separability results (ASTM D1401) indicate good water shedding properties. The Air Release Value (ASTM D3427) indicates that the oil has good deaeration properties. Foaming Tendency and Stability (ASTM D892) results all within normal range. Linear Sweep Voltammetry (RULER – ASTM D6971) testing indicates normal levels of anti-oxidants present in the oil. The Rotating Pressure Vessel Oxidation Test (RPVOT – ASTM D2272) result indicates suitable amounts of anti-oxidant(s) present in the oil. The AN level is acceptable for this fluid. The condition of the oil is suitable for further service.

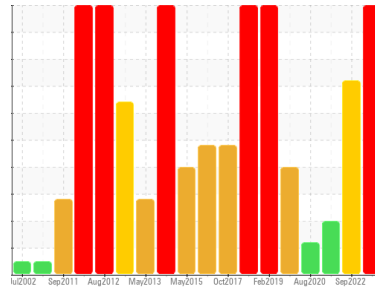
[view report](#)





# OIL ANALYSIS REPORT

Sample Rating Trend



CONTAMINANT



Area  
[02437560]

Machine Id  
**A5 - Thrust Bearing**

Component  
**Thrust Bearing**

Fluid  
**PETRO CANADA TURBOFLO R&O 46 (4920 LTR)**

## DIAGNOSIS

### Recommendation

We recommend that you perform vacuum distillation and/or air drying to attempt to remove any residual water and/or entrained gases from this oil that may be contributing to abnormal foaming and/or poor water separability. We advise that you check all areas where contaminants can enter the system. We advise that you perform a filter service, and use off-line filtration to improve the cleanliness of the system fluid. The air breather requires service. If unrated, we recommend that you replace with a suitable micron rated and/or desiccant air breather. If rated, we recommend that you service/replace the breather. Resample in 30-45 days to monitor this situation. No other corrective action is recommended at this time.

### Wear

All component wear rates are normal. The direct-reading & analytical ferrographic results are normal indicating no abnormal wear in the system.

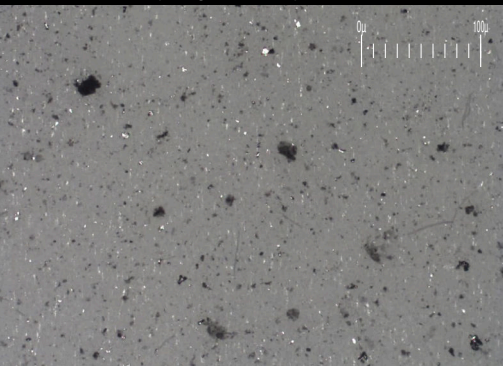
### Contaminants

There is a high amount of particulates (2 to 100 microns in size) present in the oil. MPC (Membrane Patch Colorimetry) test indicates a light concentration of varnish present. Water Separability results (ASTM D1401) are poor and indicate that the oil will form emulsions with water. The water content is negligible.

### 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. The oil is still serviceable provided that the contaminant(s) can be reduced to acceptable levels.

Particle Filter (Magn: 200 x)



## SAMPLE INFORMATION

method	limit/base	current	history1	history2
Sample Number	Client Info	<b>WC0786878</b>	WC0679958	WC0575664
Sample Date	Client Info	<b>09 May 2023</b>	07 Sep 2022	10 Sep 2021
Machine Age	hrs	<b>0</b>	0	0
Oil Age	hrs	<b>0</b>	0	0
Oil Changed	Client Info	<b>N/A</b>	N/A	N/A
Sample Status		<b>SEVERE</b>	SEVERE	ABNORMAL

## WEAR METALS

method	limit/base	current	history1	history2	
PQ	ASTM D8184*	<b>0</b>	0	0	
Iron	ppm	ASTM D5185(m) >85	<b>&lt;1</b>	1	<1
Chromium	ppm	ASTM D5185(m) >20	<b>0</b>	0	0
Nickel	ppm	ASTM D5185(m) >20	<b>&lt;1</b>	<1	<1
Titanium	ppm	ASTM D5185(m)	<b>0</b>	0	0
Silver	ppm	ASTM D5185(m)	<b>0</b>	0	<1
Aluminum	ppm	ASTM D5185(m) >40	<b>&lt;1</b>	<1	<1
Lead	ppm	ASTM D5185(m) >60	<b>3</b>	3	5
Copper	ppm	ASTM D5185(m) >7	<b>&lt;1</b>	<1	<1
Tin	ppm	ASTM D5185(m) >40	<b>0</b>	0	<1
Antimony	ppm	ASTM D5185(m)	<b>0</b>	0	<1
Vanadium	ppm	ASTM D5185(m)	<b>0</b>	0	0
Beryllium	ppm	ASTM D5185(m)	<b>0</b>	0	0
Cadmium	ppm	ASTM D5185(m)	<b>0</b>	0	0

## ADDITIVES

method	limit/base	current	history1	history2	
Boron	ppm	ASTM D5185(m)	<b>0</b>	<1	<1
Barium	ppm	ASTM D5185(m)	<b>0</b>	0	0
Molybdenum	ppm	ASTM D5185(m)	<b>0</b>	0	0
Manganese	ppm	ASTM D5185(m)	<b>0</b>	0	0
Magnesium	ppm	ASTM D5185(m)	<b>0</b>	<1	0
Calcium	ppm	ASTM D5185(m) 0	<b>&lt;1</b>	<1	<1
Phosphorus	ppm	ASTM D5185(m) 3	<b>4</b>	3	5
Zinc	ppm	ASTM D5185(m) 0	<b>2</b>	1	1
Sulfur	ppm	ASTM D5185(m)	<b>146</b>	144	142
Lithium	ppm	ASTM D5185(m)	<b>&lt;1</b>	<1	<1

## CONTAMINANTS

method	limit/base	current	history1	history2	
Silicon	ppm	ASTM D5185(m) >20	<b>2</b>	7	<1
Sodium	ppm	ASTM D5185(m)	<b>0</b>	<1	0
Potassium	ppm	ASTM D5185(m) >20	<b>&lt;1</b>	<1	<1
Water	%	ASTM D6304* >2	<b>0.001</b>	0.016	0.001
ppm Water	ppm	ASTM D6304*	<b>7.8</b>	161.7	10.3

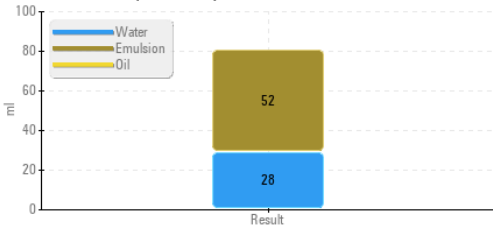
## INFRA-RED

method	limit/base	current	history1	history2	
Soot %	%	ASTM D7844*	<b>0</b>	0	0
Nitration	Abs/cm	ASTM D7624*	<b>1.8</b>	1.7	1.6
Sulfation	Abs/.1mm	ASTM D7415*	<b>12.1</b>	11.4	11.7

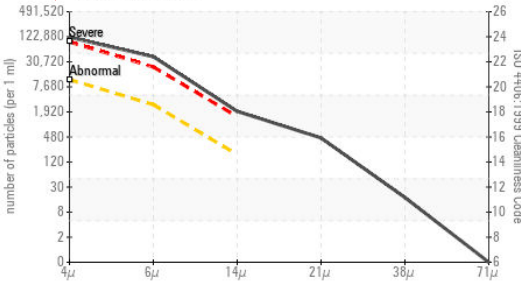


# OIL ANALYSIS REPORT

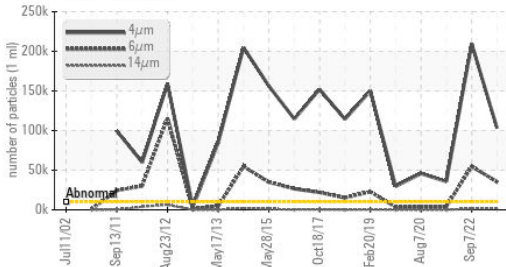
## Water Separability



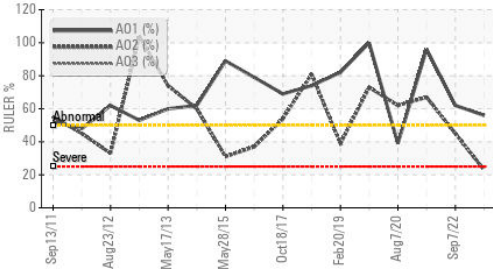
## Particle Count



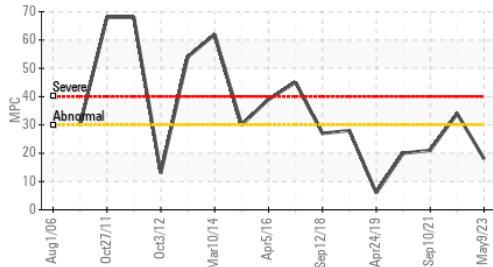
## Particle Trend



## Remaining Life (RULER)



## Varnish Potential



FLUID CLEANLINESS	method	limit/base	current	history1	history2
Particles >4µm	ASTM D7647	>10000	103064	209422	35594
Particles >6µm	ASTM D7647	>2500	35233	54774	4234
Particles >14µm	ASTM D7647	>160	1734	1332	104
Particles >21µm	ASTM D7647	>40	400	251	22
Particles >38µm	ASTM D7647	>10	15	6	2
Particles >71µm	ASTM D7647	>3	0	0	0
Oil Cleanliness	ISO 4406 (c)	>20/18/14	24/22/18	25/23/18	22/19/14

FLUID DEGRADATION	method	limit/base	current	history1	history2
Oxidation	Abs./1mm	ASTM D7414*	2.4	2.9	2.7
Acid Number (AN)	mg KOH/g	ASTM D974*	0.12	0.08	0.08
Anti-Oxidant 1	%	ASTM D6971*	<25	56	62
Anti-Oxidant 2	%	ASTM D6971*	<25	23	45
MPC Varnish Potential	Scale	ASTM D7843(m)*	>15	18	34

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	HAZY	NORML
Odor	scalar	Visual*	NORML	NORML	NORML
Emulsified Water	scalar	Visual*	>2	NEG	NEG
Free Water	scalar	Visual*		NEG	NEG

FLUID PROPERTIES	method	limit/base	current	history1	history2
Visc @ 40°C	cSt	ASTM D7279(m)	44.4	44.9	44.9
Visc @ 100°C	cSt	ASTM D7279(m)	6.72	6.9	6.9
Viscosity Index (VI)	Scale	ASTM D2270*	104	109	109
Separability	oil/h2o/em	ASTM D1401*	41/39/0	0/28/52 (30)	42/38/0 (15)
Air Release Time	min	ASTM D3427*	3.5	7.00	9.30
Foam Tendency	I/II/III	ASTM D892*	10	360/50/20	10/60/0
Foam Stability	I/II/III	ASTM D892*	0	0/0/0	0/0/0
ASTM Color	scalar	ASTM D1500*	0.5	L1.0	<1.0
Rust Prevention	PASS/FAIL	ASTM D665*	PASS	PASS	PASS
Oxidation Test (RPVOT)	minutes	ASTM D2272*	400	618	727

SEDIMENT	method	limit/base	current	history1	history2
Pentane Insolubles	%	ASTM D893(m)*	0.031	0.042	0.027
Toluene Insolubles	%	ASTM D893(m)*	0.010	0.011	0.024



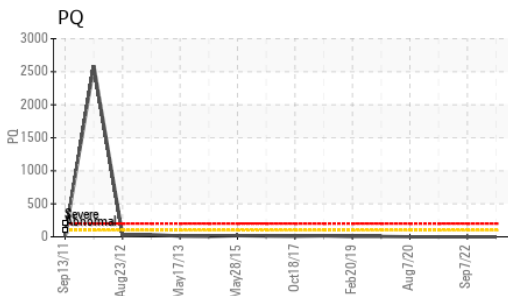
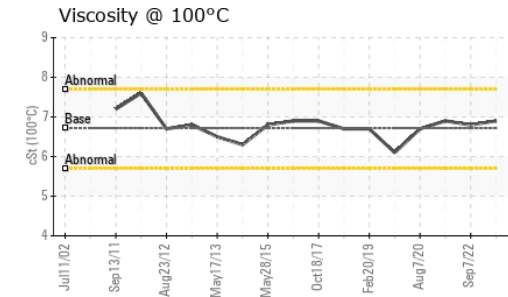
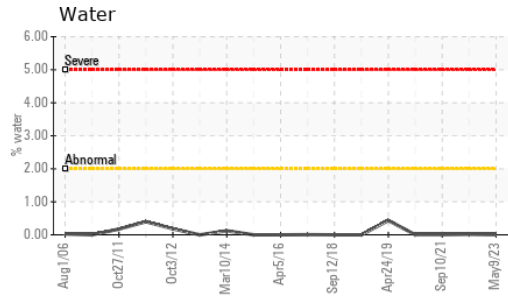
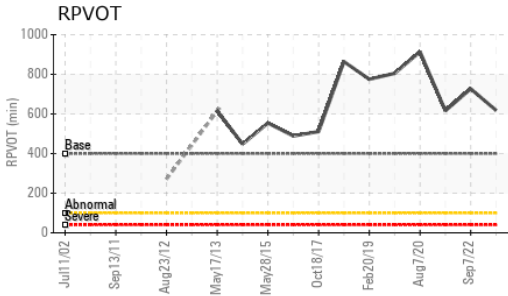
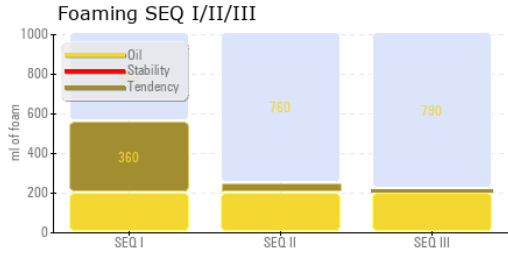
**Laboratory** : WearCheck - C8-1175 Appleby Line, Burlington, ON L7L 5H9  
**Sample No.** : WC0786878  
**Lab Number** : 02579995  
**Unique Number** : 5633055  
**Test Package** : AOM 3 ( Additional Tests: BottomAnalysis, FilterPatch, PrtFilter, Tollnsol )

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.

**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

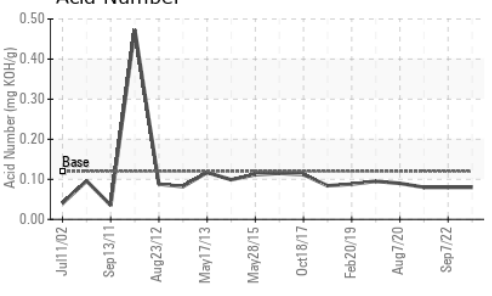
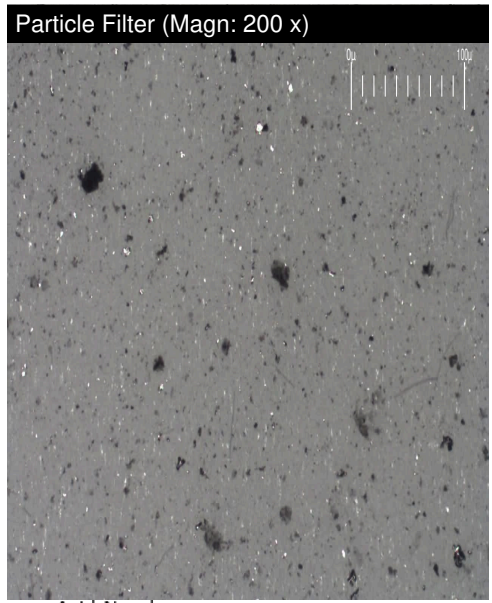
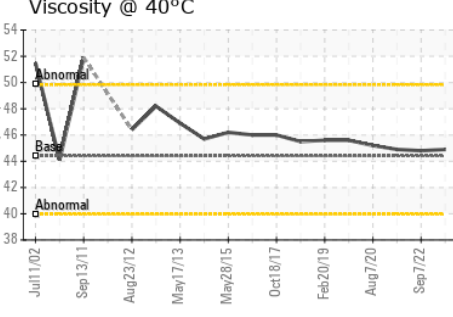
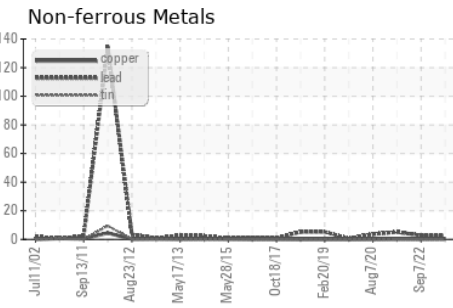
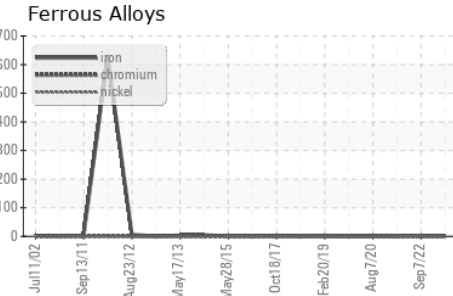


# OIL ANALYSIS REPORT



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.** : WC0786878 **Received** : 01 Sep 2023  
**Lab Number** : 02579995 **Diagnosed** : 18 Sep 2023  
**Unique Number** : 5633055 **Diagnostician** : Bill Quesnel  
**Test Package** : AOM 3 ( Additional Tests: BottomAnalysis, FilterPatch, PrtFilter, Tollnsol )

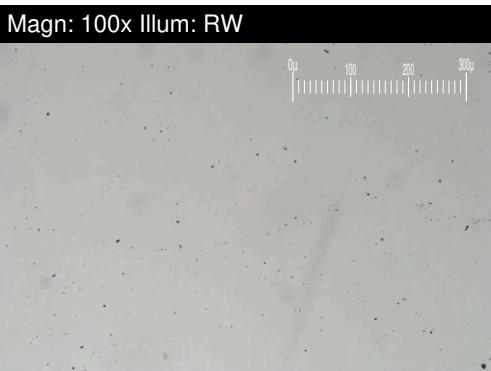
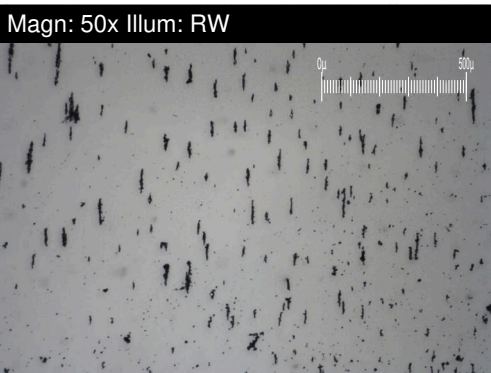
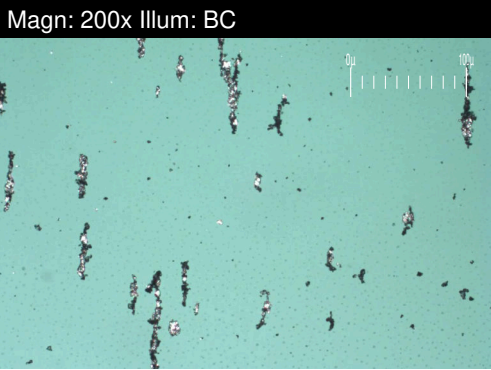
**Nalcor Energy - Churchill Falls**  
 PO Box 310  
 Churchill Falls, NL  
 CA A0R 1A0  
 Contact: Robert Noel  
 robertnoel@nlh.nl.ca  
 T: (709)925-8294  
 F: (709)925-8220

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.

# FERROGRAPHY REPORT

Area  
**[02437560]**  
 Machine Id  
**A5 - Thrust Bearing**

Component  
**Thrust Bearing**  
 Fluid  
**PETRO CANADA TURBOFLO R&O 46 (4920 LTR)**

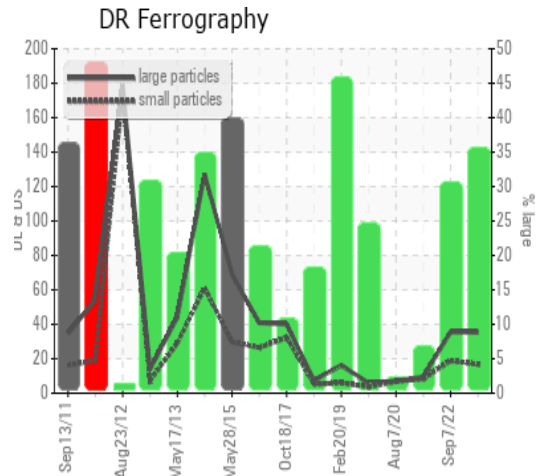


DR-FERROGRAPHY		method	limit/base	current	history1	history2
Large Particles		DR-Ferr*		35.4	35.6	9.4
Small Particles		DR-Ferr*		16.8	18.9	8.2
Total Particles		DR-Ferr*	>---	52.2	54.5	17.6
Large Particles Percentage	%	DR-Ferr*		35.6	30.6	6.8
Severity Index		DR-Ferr*		658	595	11.3

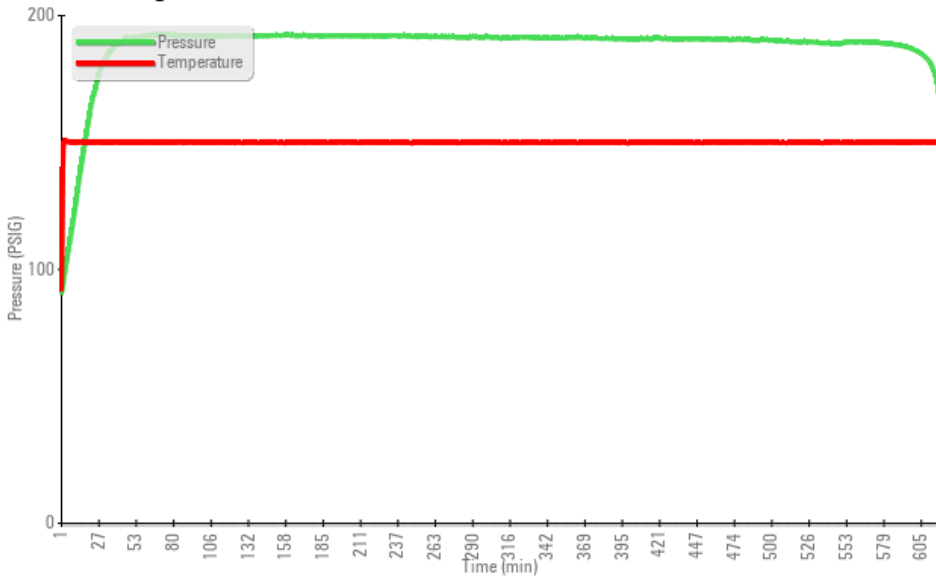
FERROGRAPHY		method	limit/base	current	history1	history2
Ferrous Rubbing	Scale 0-10	ASTM D7684*		3	3	2
Ferrous Sliding	Scale 0-10	ASTM D7684*				
Ferrous Cutting	Scale 0-10	ASTM D7684*				
Ferrous Rolling	Scale 0-10	ASTM D7684*		1	1	1
Ferrous Break-in	Scale 0-10	ASTM D7684*				
Ferrous Spheres	Scale 0-10	ASTM D7684*				
Ferrous Black Oxides	Scale 0-10	ASTM D7684*		1		
Ferrous Red Oxides	Scale 0-10	ASTM D7684*				
Ferrous Corrosive	Scale 0-10	ASTM D7684*			1	1
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*				
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*		1	2	2

### WEAR

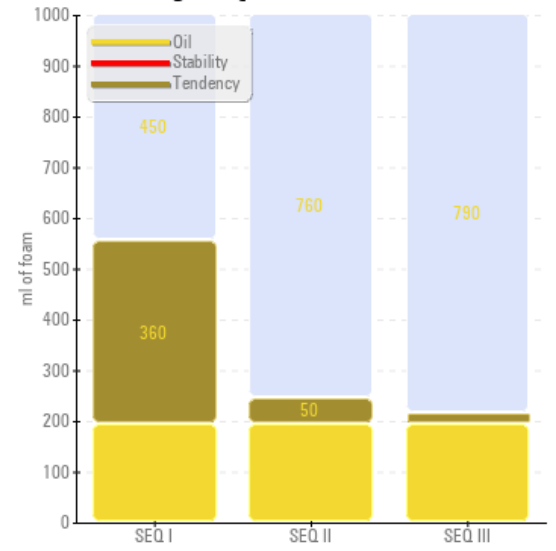
All component wear rates are normal. The direct-reading & analytical ferrographic results are normal indicating no abnormal wear in the system.



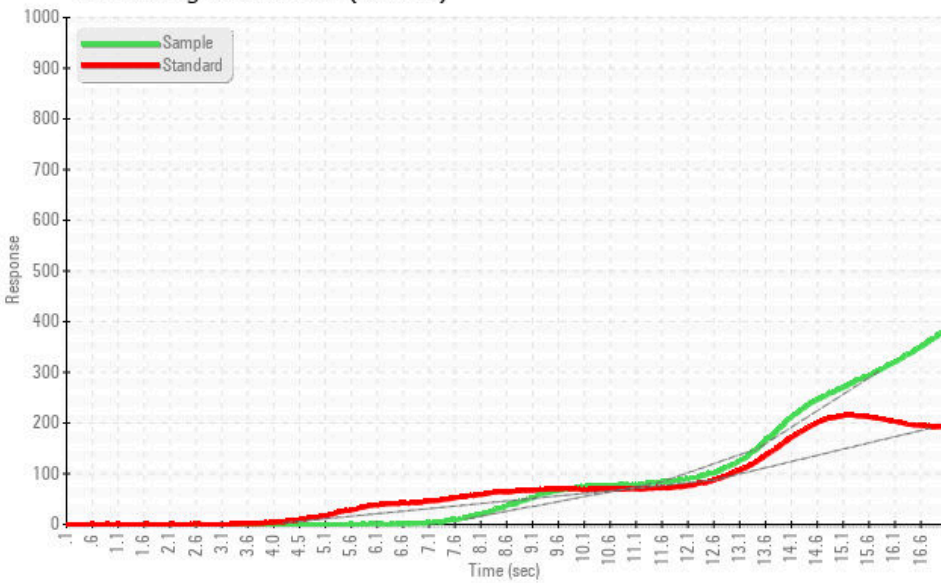
### Rotating Pressure Vessel Oxidation Test



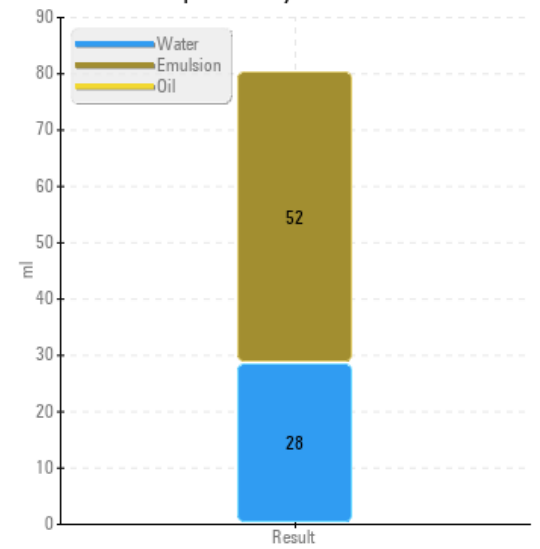
### Foaming SEQ I/II/III



### Remaining Useful Life (RULER)



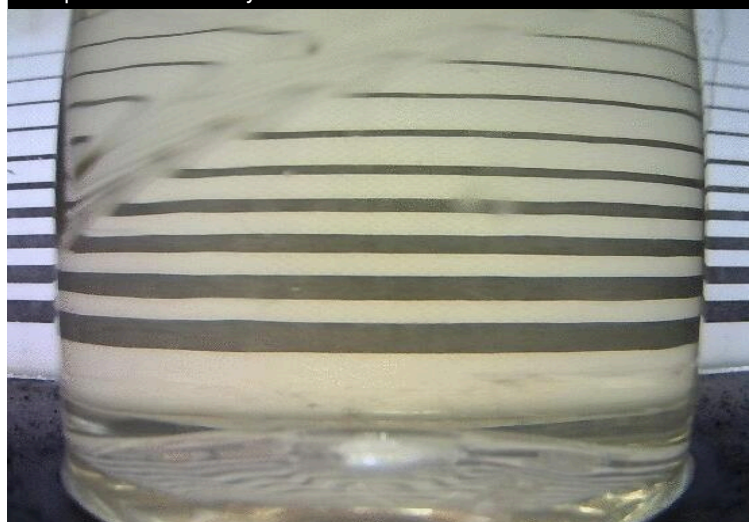
### Water Separability



### MPC (Varnish Test)



### Sample Color & Clarity



*This page left intentionally blank*