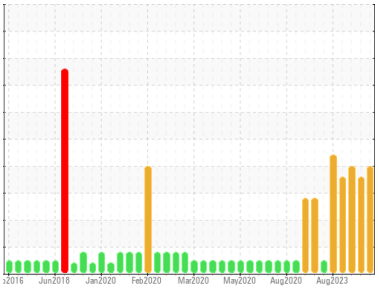
PROBLEM SUMMARY

Sample Rating Trend

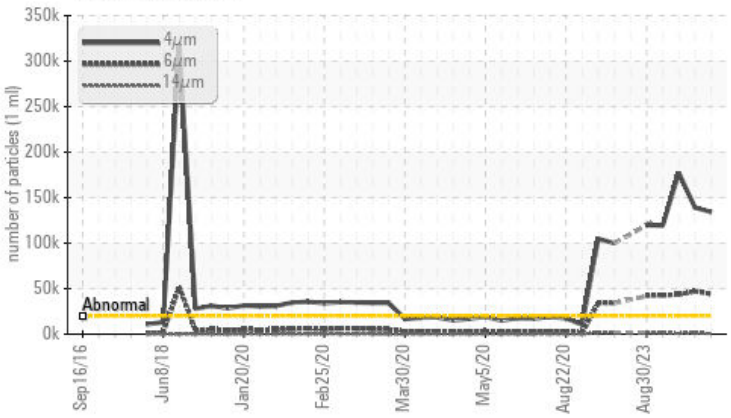


ISO

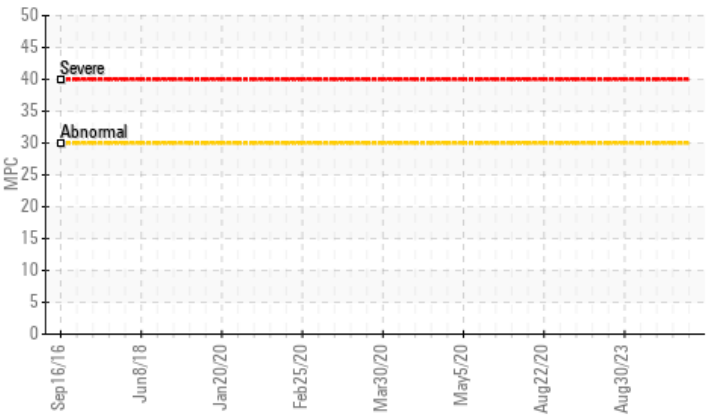
Area
Fwd Machinery Space [WO 450327061]
Machine Id
Pump - Fire Water (Stbd) - Gearbox (S/N Sample Tag PA-71001B-S2)
Component
Starboard Gearbox
Fluid
PETRO CANADA PREMIUM R&O 220 (98 LTR)

COMPONENT CONDITION SUMMARY

Particle Trend



Varnish Potential



RECOMMENDATION

Check seals and/or filters for points of contaminant entry. 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 you service the filters on this component. 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. NOTE: Please provide information regarding reservoir capacity, filter type and micron rating with next sample. Please submit a sample of the new (unused) oil to establish a baseline.

PROBLEMATIC TEST RESULTS

Sample Status				**SEVERE**	SEVERE	SEVERE
Particles >4µm		ASTM D7647	>20000	▲ **134235**	▲ 139168	▲ 177354
Particles >6µm		ASTM D7647	>5000	▲ **44139**	▲ 47007	▲ 43611
Oil Cleanliness		ISO 4406 (c)	>21/19/16	▲ **24/23/17**	▲ 24/23/17	▲ 25/23/17
MPC Varnish Potential	Scale	ASTM D7843(m)*	>15	▲ **45**	---	---

Customer Id: TERHAM
Sample No.: PC0080294
Lab Number: 02619452
Test Package: AOM 2

To manage this report scan the QR code

To discuss the diagnosis or test data:
Kevin Marson +1 (289)291-4644 x4644
Kevin.Marson@wearcheck.com

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

RECOMMENDED ACTIONS

Action	Status	Date	Done By	Description
Change Filter	---	---	?	We recommend you service the filters on this component.
Resample	---	---	?	Resample in 30-45 days to monitor this situation. Please submit a sample of the new (unused) oil to establish a baseline.
Information Required	---	---	?	NOTE: Please provide information regarding reservoir capacity, filter type and micron rating with next sample.
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 Seals	---	---	?	Check seals and/or filters for points of contaminant entry.
Filter Fluid	---	---	?	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.

HISTORICAL DIAGNOSIS

16 Jan 2024 Diag: Kevin Marson

ISO

Check seals and/or filters for points of contaminant entry. 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 you service the filters on this component. Resample in 30-45 days to monitor this situation.All component wear rates are normal. There is a high amount of silt (particulates < 14 microns in size) 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

06 Dec 2023 Diag: Kevin Marson

ISO

Check seals and/or filters for points of contaminant entry. 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 you service the filters on this component. Resample in 30-45 days to monitor this situation.All component wear rates are normal. There is a high amount of silt (particulates < 14 microns in size) 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

13 Oct 2023 Diag: Kevin Marson

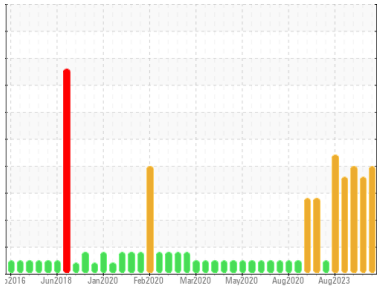
ISO

Check seals and/or filters for points of contaminant entry. 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 you service the filters on this component. Confirm the source of the lubricant being utilized for top-up/fill. Resample in 30-45 days to monitor this situation.All component wear rates are normal. There is a high amount of silt (particulates < 14 microns in size) present in the oil. Additive levels indicate the addition of a different brand, or type of 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

OIL ANALYSIS REPORT

Sample Rating Trend



ISO

Area
Fwd Machinery Space [WO 450327061]
Machine Id
Pump - Fire Water (Stbd) - Gearbox (S/N Sample Tag PA-71001B-S2)
Component
Starboard Gearbox
Fluid
PETRO CANADA PREMIUM R&O 220 (98 LTR)

DIAGNOSIS

Recommendation

Check seals and/or filters for points of contaminant entry. 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 you service the filters on this component. 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. NOTE: Please provide information regarding reservoir capacity, filter type and micron rating with next sample. Please submit a sample of the new (unused) oil to establish a baseline.

Wear

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

Contaminants

There is a high amount of silt (particulates < 14 microns in size) present in the oil. MPC (Membrane Patch Colorimetry) test indicates a moderate concentration of varnish present.

Oil Condition

The AN level is acceptable for this fluid. The oil is still serviceable provided that the contaminant(s) can be reduced to acceptable levels.

SAMPLE INFORMATION		method	limit/base	current	history1	history2
Sample Number		Client Info		**PC0080294**	PC	PC0076275
Sample Date		Client Info		**20 Feb 2024**	16 Jan 2024	06 Dec 2023
Machine Age	hrs	Client Info		**0**	0	0
Oil Age	hrs	Client Info		**0**	0	0
Oil Changed		Client Info		**N/A**	N/A	N/A
Sample Status				**SEVERE**	SEVERE	SEVERE

WEAR METALS		method	limit/base	current	history1	history2
PQ		ASTM D8184*		**0**	0	0
Iron	ppm	ASTM D5185(m)	>150	**6**	6	6
Chromium	ppm	ASTM D5185(m)	>10	**0**	0	0
Nickel	ppm	ASTM D5185(m)	>10	**<1**	<1	<1
Titanium	ppm	ASTM D5185(m)		**0**	0	0
Silver	ppm	ASTM D5185(m)		**0**	0	0
Aluminum	ppm	ASTM D5185(m)	>5	**1**	<1	<1
Lead	ppm	ASTM D5185(m)	>65	**<1**	<1	<1
Copper	ppm	ASTM D5185(m)	>80	**<1**	<1	<1
Tin	ppm	ASTM D5185(m)	>8	**0**	0	0
Antimony	ppm	ASTM D5185(m)	>5	**0**	0	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

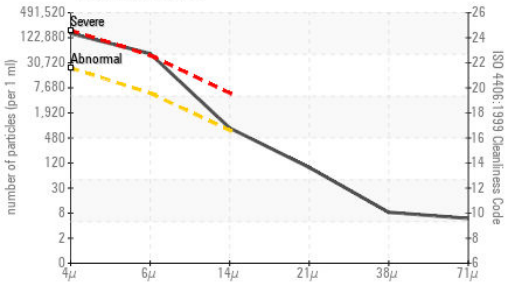
ADDITIVES		method	limit/base	current	history1	history2
Boron	ppm	ASTM D5185(m)		**3**	3	4
Barium	ppm	ASTM D5185(m)		**0**	0	0
Molybdenum	ppm	ASTM D5185(m)		**0**	0	0
Manganese	ppm	ASTM D5185(m)		**0**	0	0
Magnesium	ppm	ASTM D5185(m)	0	**<1**	1	<1
Calcium	ppm	ASTM D5185(m)		**7**	7	7
Phosphorus	ppm	ASTM D5185(m)	0	**31**	32	31
Zinc	ppm	ASTM D5185(m)		**4**	4	4
Sulfur	ppm	ASTM D5185(m)	500	**3374**	3430	3489
Lithium	ppm	ASTM D5185(m)		**<1**	<1	<1

CONTAMINANTS		method	limit/base	current	history1	history2
Silicon	ppm	ASTM D5185(m)	>20	**1**	3	1
Sodium	ppm	ASTM D5185(m)		**0**	0	<1
Potassium	ppm	ASTM D5185(m)	>20	**1**	<1	0
Water	%	ASTM D6304*	>0.2	**0.002**	---	---
ppm Water	ppm	ASTM D6304*	>2000	**18**	---	---

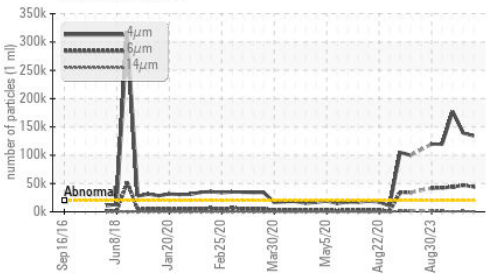
INFRA-RED		method	limit/base	current	history1	history2
Soot %	%	ASTM D7844*		**0**	---	---
Nitration	Abs/cm	ASTM D7624*		**2.4**	---	---
Sulfation	Abs/.1mm	ASTM D7415*		**12.0**	---	---

OIL ANALYSIS REPORT

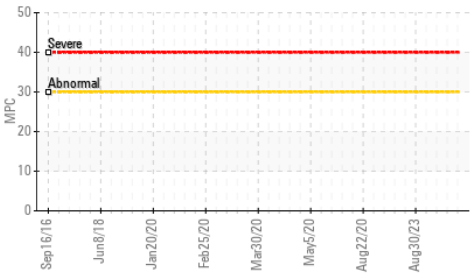
Particle Count



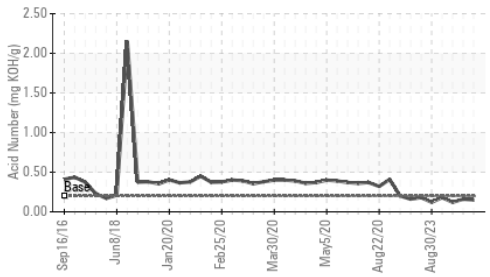
Particle Trend



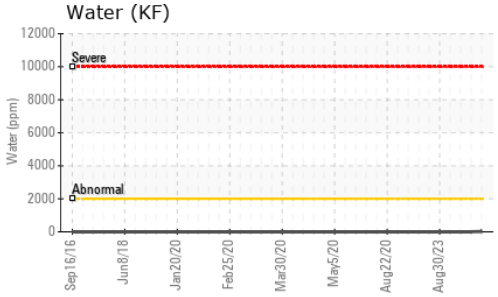
Varnish Potential



Acid Number



Water (KF)

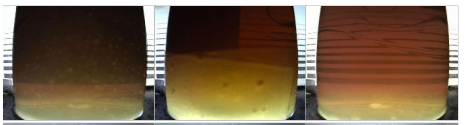
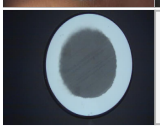


FLUID CLEANLINESS		method	limit/base	current	history1	history2
Particles >4µm		ASTM D7647	>20000	▲ **134235**	▲ 139168	▲ 177354
Particles >6µm		ASTM D7647	>5000	▲ **44139**	▲ 47007	▲ 43611
Particles >14µm		ASTM D7647	>640	● **729**	● 1091	● 807
Particles >21µm		ASTM D7647	>160	**83**	125	79
Particles >38µm		ASTM D7647	>40	**7**	2	2
Particles >71µm		ASTM D7647	>10	**5**	1	0
Oil Cleanliness		ISO 4406 (c)	>21/19/16	▲ **24/23/17**	▲ 24/23/17	▲ 25/23/17

FLUID DEGRADATION		method	limit/base	current	history1	history2
Oxidation	Abs/.1mm	ASTM D7414*		**3.0**	---	---
Acid Number (AN)	mg KOH/g	ASTM D974*	0.20	**0.15**	0.16	0.12
MPC Varnish Potential	Scale	ASTM D7843(m)*	>15	▲ **45**	---	---

VISUAL		method	limit/base	current	history1	history2
White Metal	scalar	Visual*	NONE	**NONE**	NONE	NONE
Yellow Metal	scalar	Visual*	NONE	**NONE**	NONE	NONE
Precipitate	scalar	Visual*	NONE	**NONE**	NONE	NONE
Silt	scalar	Visual*	NONE	**NONE**	NONE	NONE
Debris	scalar	Visual*	NONE	**NONE**	NONE	NONE
Sand/Dirt	scalar	Visual*	NONE	**NONE**	NONE	NONE
Appearance	scalar	Visual*	NORML	**NORML**	NORML	NORML
Odor	scalar	Visual*	NORML	**NORML**	NORML	NORML
Emulsified Water	scalar	Visual*	>0.2	**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)	206.5	**212**	212	212
Visc @ 100°C	cSt	ASTM D7279(m)	18.6	**18.6**	18.6	18.7
Viscosity Index (VI)	Scale	ASTM D2270*	96	**97**	97	98

SAMPLE IMAGES	method	limit/base	current	history1	history2
Color					
Bottom					
MPC				*no image*	*no image*

ISO 17025:2017 Accredited Laboratory

Laboratory : WearCheck - C8-1175 Appleby Line, Burlington, ON L7L 5H9
Sample No. : PC0080294
Lab Number : 02619452
Unique Number : 5736562
Test Package : AOM 2

Received : 02 Mar 2024
Tested : 02 Mar 2024
Diagnosed : 02 Mar 2024 - Kevin Marson

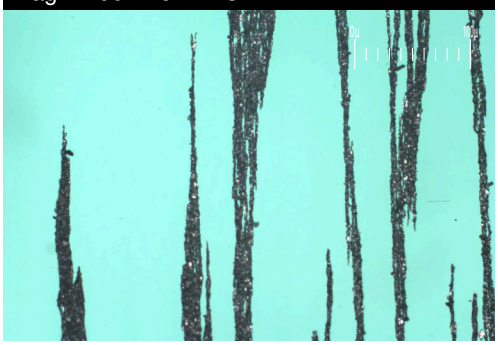
To discuss this sample report, contact Customer Service at 1-800-268-2131.
Test denoted (*) outside scope of accreditation, (m) method modified, (e) tested at external lab.
Validity of results and interpretation are based on the sample and information as supplied.

Suncor - Terra Nova Projects
Scotia Centre, 235 Water Strret
St. John`s, NL
CA A1C 1B6
Contact: Josh Hynes
joshynes@suncor.com
T: (709)778-3575
F: (709)724-2835

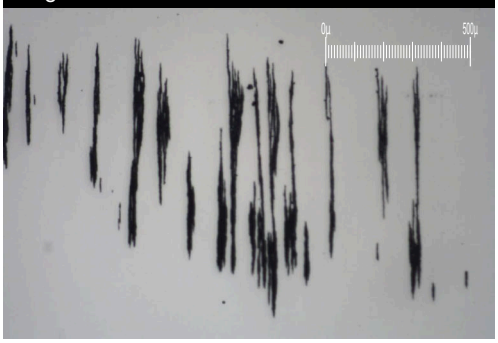
FERROGRAPHY REPORT

Area
Fwd Machinery Space [WO 450327061]
Machine Id
Pump - Fire Water (Stbd) - Gearbox (S/N Sample Tag PA-71001B-S2)
Component
Starboard Gearbox
Fluid
PETRO CANADA PREMIUM R&O 220 (98 LTR)

Magn: 200x Illum: BC



Magn: 50x Illum: RW



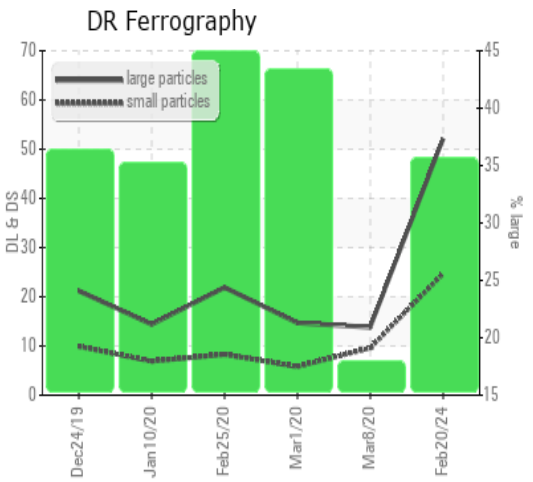
Magn: 100x Illum: RW

DR-FERROGRAPHY		method	limit/base	current	history1	history2
Large Particles		DR-Ferr*		**52.1**	---	---
Small Particles		DR-Ferr*		**24.7**	---	---
Total Particles		DR-Ferr*	>---	**76.8**	---	---
Large Particles Percentage	%	DR-Ferr*		**35.7**	---	---
Severity Index		DR-Ferr*		**1428**	---	---

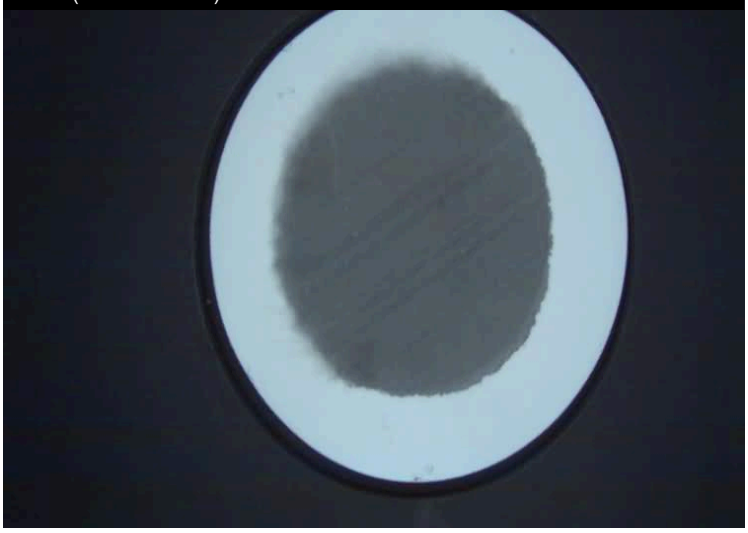
FERROGRAPHY		method	limit/base	current	history1	history2
Ferrous Rubbing	Scale 0-10	ASTM D7684*		**4**		
Ferrous Sliding	Scale 0-10	ASTM D7684*				
Ferrous Cutting	Scale 0-10	ASTM D7684*				
Ferrous Rolling	Scale 0-10	ASTM D7684*		**2**		
Ferrous Break-in	Scale 0-10	ASTM D7684*				
Ferrous Spheres	Scale 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*				
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**		
Fibres	Scale 0-10	ASTM D7684*				
Spheres	Scale 0-10	ASTM D7684*				
Other	Scale 0-10	ASTM D7684*		**1**		

WEAR

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



MPC (Varnish Test)



Sample Color & Clarity