

# **PROBLEM SUMMARY**

## **Fwd Machinery Space [WO 450327061]** Machine Id **Pump - Fire Water (Stbd) - Gearbox (S/N Sample Tag PA-71001B-S2)** Component Starboard Gearbox

Starboard (

PETRO CANADA PREMIUM R&O 220 (98 LTR)

# COMPONENT CONDITION SUMMARY







## 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.

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 <u>Kevin.Marson@wearcheck.com</u>

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

## PROBLEMATIC TEST RESULTS

Sample Status				SEVERE	SEVERE	SEVERE
Particles >4µm		ASTM D7647	>20000	<u> </u>	<b>1</b> 39168	<b>1</b> 77354
Particles >6µm		ASTM D7647	>5000	<b>4</b> 4139	<b>4</b> 7007	<b>4</b> 3611
Oil Cleanliness		ISO 4406 (c)	>21/19/16	<b>4</b> 24/23/17	<b>4</b> 24/23/17	▲ 25/23/17
MPC Varnish Potential	Scale	ASTM D7843(m)*	>15	<b>4</b> 5		

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

## HISTORICAL DIAGNOSIS

#### 16 Jan 2024 Diag: Kevin Marson



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



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.

#### 13 Oct 2023 Diag: Kevin Marson



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.





# **OIL ANALYSIS REPORT**

## **Fwd Machinery Space [WO 450327061]** Machine Id **Pump - Fire Water (Stbd) - Gearbox (S/N Sample Tag PA-71001B-S2)** Component

**Starboard Gearbox** 

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 INFORI	MATION	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 METAL	S	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
ADDITIVES Boron	ppm	method ASTM D5185(m)	limit/base	current 3	history1 3	history2 4
ADDITIVES Boron Barium	ppm ppm	method ASTM D5185(m) ASTM D5185(m)	limit/base	current 3 0	history1 3 0	history2 4 0
ADDITIVES Boron Barium Molybdenum	ppm ppm ppm	method ASTM D5185(m) ASTM D5185(m) ASTM D5185(m)	limit/base	current 3 0 0	history1 3 0 0	history2 4 0 0
ADDITIVES Boron Barium Molybdenum Manganese	ppm ppm ppm ppm	method ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) ASTM D5185(m)	limit/base	current 3 0 0 0	history1 3 0 0 0	history2 4 0 0 0
ADDITIVES Boron Barium Molybdenum Manganese Magnesium	ppm ppm ppm ppm ppm	method ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) ASTM D5185(m)	limit/base	current 3 0 0 0 <1	history1 3 0 0 0 1	history2 4 0 0 0 <1
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium	ppm ppm ppm ppm ppm	method ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) ASTM D5185(m)	limit/base	Current 3 0 0 0 <1 7	history1 3 0 0 0 1 7	history2 4 0 0 0 <1 7
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus	ppm ppm ppm ppm ppm ppm ppm	method ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) ASTM D5185(m)	limit/base	Current 3 0 0 0 <1 7 31	history1 3 0 0 0 1 7 32	history2 4 0 0 0 <1 7 31
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc	ppm ppm ppm ppm ppm ppm ppm ppm	method           ASTM D5185(m)	limit/base	Current 3 0 0 0 4 7 31 4	history1 3 0 0 0 1 7 32 4	history2 4 0 0 0 <1 7 31 4
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur	ppm ppm ppm ppm ppm ppm ppm ppm	methodASTM D5185(m)ASTM D5185(m)	limit/base	Current 3 0 0 0 <1 7 31 4 3374	history1 3 0 0 0 1 7 32 4 3430	history2           4           0           0           0
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur Lithium	ppm ppm ppm ppm ppm ppm ppm ppm ppm	method           ASTM D5185(m)	limit/base 0 0 500	Current 3 0 0 0 <1 7 31 4 3374 <1	history1           3           0           0           1           7           32           4           3430           <1	history2         4         0         0         0         0         31         4         3489         <1
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur Lithium CONTAMINAN	ppm ppm ppm ppm ppm ppm ppm ppm ppm	method           ASTM D5185(m)	limit/base	Current         3         0         0         -         7         31         4         3374         <1	history1         3         0         0         1         7         32         4         3430         <1         history1	4         0         0         0         0         1         7         31         4         3489         <1         history2
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur Lithium CONTAMINAN Silicon	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	method           ASTM D5185(m)	limit/base 0 0 500 limit/base >20	Current 3 0 0 0 <1 7 31 4 3374 <1 Current 1	history1         3         0         0         1         7         32         4         3430         <1         history1         3	4         0         0         0         0         1         7         31         4         3489         <1         history2         1
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur Lithium CONTAMINAN Silicon Sodium	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	method           ASTM D5185(m)	<pre>limit/base 0 0 500 500 limit/base &gt;20</pre>	Current 3 0 0 0 - 1 7 31 4 3374 - 1 Current 1 0	history1         3         0         0         1         7         32         4         3430         <1         history1         3         0	4         0         0         0         0         0         0         1         3489         <1         history2         1            1         <1
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur Lithium CONTAMINAN Silicon Sodium Potassium	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	method           ASTM D5185(m)	<pre>limit/base 0 0 0 500 imit/base &gt;20 </pre>	Current           3           0           0           0           <1           7           31           4           3374           <1           current           1           0           1           0           1	history1         3         0         0         0         1         7         32         4         3430         <1         history1         3         0         <1	4         0         0         0         0         0         1         3489         <1         history2         1         <1         0         0         0         0         0
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur Lithium CONTAMINAN Silicon Sodium Potassium Water	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	method           ASTM D5185(m)	limit/base 0 0 500 limit/base >20 >20 >0.2	Current 3 0 0 0 4 1 7 31 4 3374 <1 Current 1 0 1 0.002	history1         3         0         0         0         1         7         32         4         3430         <1         history1         3         0         <1	4         0         0         0         0         0         1         43489         <1         history2         1         <1         0         -1         0         0         -1         0         -1         0
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur Lithium CONTAMINAN Silicon Sodium Potassium Water ppm Water	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	method           ASTM D5185(m)           ASTM D6304*	limit/base          0         0         0         500         500         limit/base         >20         >20         >20         >20         >20         >20         >20         >20         >20         >20         >20         >0.2         >2000	Current         3         0         0         -1         7         31         4         3374         <1         current         1         0         1         0         1         0         1         0         1         0         1         0.002         18	history1         3         0         0         1         7         32         4         3430         <1         history1         3         0         <1	4         0         0         0         0         -1         7         31         4         3489         <1         history2         1         <1         0
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur Lithium CONTAMINAN Silicon Sodium Potassium Water ppm Water INFRA-RED	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	method           ASTM D5185(m)           ASTM D6304*           ASTM D6304*	limit/base          0         0         0         500         junt/base         >20         >20         >20         >20         >20         >20         >20         >20         >20         >20         >20         >20         >20         >20         >20         >20         >20         >200         >200         binit/base	Current 3 0 0 0 - 1 7 31 4 3374 - 1 0 Current 1 0 1 0.002 18 Current	history1         3         0         0         1         7         32         4         3430         <1         history1         3         0         <1               history1	4         0         0         0         0         0         1         3489         <1         history2         1         <10         0            history2
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur Lithium CONTAMINAN Silicon Sodium Potassium Water ppm Water INFRA-RED Soot %	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	method           ASTM D5185(m)           ASTM D5304*           ASTM D6304*           ASTM D6304*           ASTM D7844*	limit/base 0 0 0 500 500 limit/base >20 >20 >20 >20 >20 200 limit/base	Current         3         0         0         -1         7         31         4         3374         <1         current         1         0         1         0.002         18         current         0	history1         3         0         0         1         7         32         4         3430         <1         history1         3         0         <1            history1            history1	4         0         0         0         0         0         1         3489         <1         history2         1         <1         0            history2
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur Lithium CONTAMINAN Silicon Sodium Potassium Water ppm Water INFRA-RED Soot % Nitration	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	method           ASTM D5185(m)           ASTM D5304*           ASTM D7844*           ASTM D7624*	limit/base          0         0         0         500         500         limit/base         >20         >20         >20         limit/base         >20         limit/base         >20         limit/base         limit/base         limit/base	Current         3         0         0         -1         7         31         4         3374         <1         current         1         0         1         0         1         0.002         18         current         0         2.4	Aistory1         3         0         0         1         7         32         4         3430         <1         history1         3         0         <1         history1         3         0         <1         history1         3         0         <1            history1	4         0         0         0         0         1         3489         <1         3489         <1         history2         1         <1         0         <1         history2         1         <1         history2         1         <1         0            history2



# **OIL ANALYSIS REPORT**



4000 2000

Abnorma

Jun8/1

Jan20/20

Feb25/20

articles >4µm articles >6µm articles >14µm articles >21µm articles >38µm articles >71µm il Cleanliness FLUID DEGRAD xidation xidation xid Number (AN) <sup>&gt;</sup> C Varnish Potential VISUAL	ATION Abs/.1mm mg KOH/g Scale	ASTM D7647 ASTM D7647 ASTM D7647 ASTM D7647 ASTM D7647 ISO 4406 (c) <b>method</b> ASTM D7414* ASTM D7414	>20000 >5000 >640 >160 >40 >10 >21/19/16 limit/base	<ul> <li>134235</li> <li>44139</li> <li>729</li> <li>83</li> <li>7</li> <li>5</li> <li>24/23/17</li> <li>current</li> <li>3.0</li> </ul>	<ul> <li>▲ 139168</li> <li>▲ 47007</li> <li>● 1091</li> <li>125</li> <li>2</li> <li>1</li> <li>24/23/17</li> <li>history1</li> </ul>	<ul> <li>177354</li> <li>43611</li> <li>807</li> <li>79</li> <li>2</li> <li>0</li> <li>25/23/17</li> <li>history</li> </ul>
articles >6μm articles >14μm articles >21μm articles >38μm articles >71μm il Cleanliness FLUID DEGRAD xidation xidation cid Number (AN) <sup>2</sup> C Varnish Potential	ATION Abs/.1mm mg KOH/g Scale	ASTM D7647 ASTM D7647 ASTM D7647 ASTM D7647 ISO 4406 (c) <b>method</b> ASTM D7414* ASTM D974*	>5000 >640 >160 >40 >10 >21/19/16 limit/base	<ul> <li>▲ 44139</li> <li>729</li> <li>83</li> <li>7</li> <li>5</li> <li>▲ 24/23/17</li> <li>Current</li> <li>3.0</li> </ul>	<ul> <li>▲ 47007</li> <li>● 1091</li> <li>● 125</li> <li>2</li> <li>● 1</li> <li>● 24/23/17</li> </ul>	<ul> <li>▲ 43611</li> <li>● 807</li> <li>79</li> <li>2</li> <li>0</li> <li>▲ 25/23/17</li> <li>history</li> </ul>
articles >14μm articles >21μm articles >38μm articles >71μm il Cleanliness FLUID DEGRAD xidation sid Number (AN) >C Varnish Potential VISUAL	ATION Abs/.1mm mg KOH/g Scale	ASTM D7647 ASTM D7647 ASTM D7647 ISO 4406 (c) <b>method</b> ASTM D7414* ASTM D974*	>640 >160 >40 >10 >21/19/16 limit/base	<ul> <li>729</li> <li>83</li> <li>7</li> <li>5</li> <li>24/23/17</li> <li>current</li> <li>3.0</li> </ul>	<ul> <li>1091</li> <li>125</li> <li>2</li> <li>1</li> <li>24/23/17</li> <li>history1</li> </ul>	<ul> <li>807</li> <li>79</li> <li>2</li> <li>0</li> <li>▲ 25/23/17</li> <li>history</li> </ul>
articles >21µm articles >38µm articles >71µm il Cleanliness FLUID DEGRAD xidation cid Number (AN) °C Varnish Potential	ATION Abs/.1mm mg KOH/g Scale	ASTM D7647 ASTM D7647 ASTM D7647 ISO 4406 (c) method ASTM D7414* ASTM D974*	>160 >40 >10 >21/19/16 limit/base	83 7 5 ▲ 24/23/17 Current 3.0	125 2 1 ▲ 24/23/17 history1	79 2 0 ▲ 25/23/17 history
articles >38µm articles >71µm il Cleanliness FLUID DEGRAD xidation cid Number (AN) <sup>D</sup> C Varnish Potential VISUAL	ATION Abs/.1mm mg KOH/g Scale	ASTM D7647 ASTM D7647 ISO 4406 (c) method ASTM D7414* ASTM D974*	>40 >10 >21/19/16 limit/base	7 5 ▲ 24/23/17 Current 3.0	2 1 ▲ 24/23/17 history1	2 0 ▲ 25/23/17 history
articles >71µm il Cleanliness FLUID DEGRAD xidation zid Number (AN) PC Varnish Potential VISUAL	ATION Abs/.1mm mg KOH/g Scale	ASTM D7647 ISO 4406 (c) method ASTM D7414* ASTM D974*	>10 >21/19/16 limit/base	5 24/23/17 current 3.0	1 ▲ 24/23/17 history1	0 25/23/17 history
I CleanIness FLUID DEGRAD xidation xid Number (AN) PC Varnish Potential VISUAL	ATION Abs/.1mm mg KOH/g Scale	ISO 4406 (c) method ASTM D7414* ASTM D974*	>21/19/16 limit/base	24/23/17 current 3.0	▲ 24/23/17 history1	history
FLUID DEGRAD xidation sid Number (AN) PC Varnish Potential VISUAL	ATION Abs/.1mm mg KOH/g Scale	method ASTM D7414* ASTM D974*	limit/base	current 3.0	history1	history
xidation cid Number (AN) PC Varnish Potential VISUAL	Abs/.1mm mg KOH/g Scale	ASTM D7414* ASTM D974*		3.0		
cid Number (AN) PC Varnish Potential VISUAL	mg KOH/g Scale	ASTM D974*				
VISUAL	Scale		0.20	0.15	0.16	0.12
VISUAL		ASTM D7843(m)*	>15	<b>4</b> 5		
		method	limit/base	current	history1	history
hite Metal	scalar	Visual*	NONE	NONE	NONE	NONE
ellow Metal	scalar	Visual*	NONE	NONE	NONE	NONE
ecipitate	scalar	Visual*	NONE	NONE	NONE	NONE
lt	scalar	Visual*	NONE	NONE	NONE	NONE
əbris	scalar	Visual*	NONE	NONE	NONE	NONE
and/Dirt	scalar	Visual*	NONE	NONE	NONE	NONE
opearance	scalar	Visual*	NORML	NORML	NORML	NORML
dor	scalar	Visual*	NORML	NORML	NORML	NORML
nulsified Water	scalar	Visual*	>0.2	NEG	NEG	NEG
ee Water	scalar	Visual*		NEG	NEG	NEG
FLUID PROPER	RTIES	method	limit/base	current	history1	history
sc @ 40°C	cSt	ASTM D7279(m)	206.5	212	212	212
sc @ 100°C	cSt	ASTM D7279(m)	18.6	18.6	18.6	18.7
scosity Index (VI)	Scale	ASTM D2270*	96	97	97	98
SAMPLE IMAG	ES	method	limit/base	current	history1	history
olor						
ottom						122 0 a
PC					no image	no image
	It ebris and/Dirt opearance dor nulsified Water ee Water FLUID PROPEF sc @ 40°C sc @ 100°C scosity Index (VI) SAMPLE IMAG	It scalar bebris scalar and/Dirt scalar opearance scalar dor scalar dor scalar ee Water scalar ee Water scalar ee Water scalar FLUID PROPERTIES sc @ 40°C cSt sc @ 100°C cSt scosity Index (VI) Scale SAMPLE IMAGES	It scalar Visual* ebris scalar Visual* and/Dirt scalar Visual* opearance scalar Visual* dor scalar Visual* ee Water scalar Visual* ee Water scalar Visual* FLUID PROPERTIES method sc @ 40°C cSt ASTM D7279(m) sc @ 100°C cSt ASTM D7279(m) scosity Index (VI) Scale ASTM D2270* SAMPLE IMAGES method	It scalar Visual* NONE ebris scalar Visual* NONE and/Dirt scalar Visual* NONE opearance scalar Visual* NORML opearance scalar Visual* NORML dor scalar Visual* NORML mulsified Water scalar Visual* >0.2 ee Water scalar Visual* >0.2 ee Water scalar Visual* >0.2 FLUID PROPERTIES method limit/base sc @ 40°C cSt ASTM D7279(m) 206.5 sc @ 100°C cSt ASTM D7279(m) 18.6 scosity Index (VI) Scale ASTM D2270* 96 SAMPLE IMAGES method limit/base olor pttom	It scalar Visual* NONE NONE NONE scalar Visual* NONE NONE NONE and/Dirt scalar Visual* NONE NONE NONE scalar Visual* NORML NORML NORML dor scalar Visual* NORML NORML NORML mulsified Water scalar Visual* >0.2 NEG ee Water scalar Visual* >0.2 NEG <b>FLUID PROPERTIES method limit/base current</b> sc @ 40°C cSt ASTM D7279(m) 206.5 212 sc @ 100°C cSt ASTM D7279(m) 18.6 18.6 scosity Index (VI) Scale ASTM D2270* 96 97 SAMPLE IMAGES method limit/base current floor	It scalar Visual* NONE NONE NONE NONE NONE ADDRESS and/Dirit scalar Visual* NONE NONE NONE NONE ADDRESS and/Dirit scalar Visual* NONE NONE NONE NONE ADDRESS acalar Visual* NORML NORML NORML NORML NORML ADDR scalar Visual* NORML

To discuss this samp 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.

Mav5/20 Aug22/20

CALA

ISO 17025:2017 Accredited Laboratory

F: (709)724-2835



# FERROGRAPHY REPORT

### Find 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)



DR-FERROGR	APHY	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		
FERROGRAPH	IY	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.









Contact/Location: Josh Hynes - TERHAM Page 6 of 6