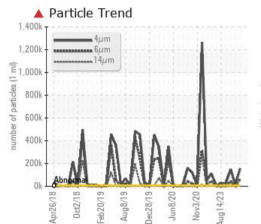


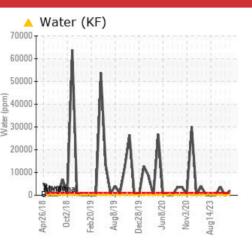
PROBLEM SUMMARY

Area **Aft Machinery Space [450270725]** Machine Id Thruster Aft Starboard - Seal Oil System (S/N Sample Tag CL-06003-S3) Component Sealing System Eluid

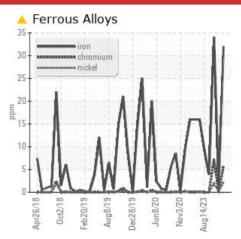
PETRO CANADA ENERGOL GR-XP ISO 150 (65 LTR)

COMPONENT CONDITION SUMMARY









RECOMMENDATION

Check seals and/or filters for points of contaminant entry. We advise that you check all areas where contaminants can enter the system. 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 advise that you use off-line filtration with water adsorbent filters to attempt to remove the water from this fluid. We advise that you follow the water drain-off procedure for this component. Resample in 30-45 days to monitor this situation.

PROBLEMATIO	C TEST	RESULT	S			
Sample Status				SEVERE	ABNORMAL	SEVERE
Chromium	ppm	ASTM D5185(m)	>3	<u> </u>	0	A 7
Water	%	ASTM D6304*		6.207		0.378
ppm Water	ppm	ASTM D6304*		<u> </u>		A 3783
Particles >4µm		ASTM D7647	>5000	🔺 154564	🔺 15578	🔺 148164
Particles >6µm		ASTM D7647	>1300	6 3227	A 2817	▲ 38031
Particles >14µm		ASTM D7647	>160	4563	148	1586
Particles >21µm		ASTM D7647	>40	466	44	A 261
Oil Cleanliness		ISO 4406 (c)	>19/17/14	4/23/19	🔺 21/19/14	4 /22/18
Appearance	scalar	Visual*	NORML	🔺 LAYRD	NORML	🔺 WGOIL
Emulsified Water	scalar	Visual*		<u> </u>	NEG	1 %
Free Water	scalar	Visual*		<u> </u>	NEG	1 %
Viscosity Index (VI)	Scale	ASTM D2270*		A 206	94	5 4

Customer Id: TERHAM Sample No.: PC0082719 Lab Number: 02622844 Test Package: MAR 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>

RECOMMENDED ACTIONS							
Action	Status	Date	Done By	Description			
Water Drain-off			?	We advise that you follow the water drain-off procedure for this component.			
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 Seals			?	Check seals and/or filters for points of contaminant entry.			
Filter Fluid			?	We advise that you use off-line filtration with water adsorbent filters to attempt to remove the water from this fluid.			

HISTORICAL DIAGNOSIS

05 Jan 2024 Diag: Kevin Marson



WEAR

We recommend you service the filters on this component. We recommend an early resample to monitor this condition.All component wear rates are normal. There is a moderate amount of silt (particulates < 14 microns in size) present in the fluid. The AN level is acceptable for this fluid. The fluid is still serviceable provided that the contaminant(s) can be reduced to acceptable levels.



04 Jan 2024 Diag: Kevin Marson

Check seals and/or filters for points of contaminant entry. We advise that you check all areas where contaminants can enter the system. 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 drain the fluid from the component if this has not already been done. Resample in 30-45 days to monitor this situation.Chromium ppm levels are severe. There is a high amount of particulates (2 to 100 microns in size) present in the fluid. There is a moderate concentration of water present in the fluid. Free water present. Abnormal water content and sodium(Na) level indicate possible sea water contamination. The AN level is acceptable for this fluid. The fluid is no longer serviceable as a result of the abnormal and/or severe wear.

14 Sep 2023 Diag: Bill Quesnel

We recommend you service the filters on this component. We recommend an early resample to monitor this condition.All component wear rates are normal. There is a moderate amount of silt (particulates < 14 microns in size) present in the fluid. The AN level is acceptable for this fluid. The fluid is still serviceable provided that the contaminant(s) can be reduced to acceptable levels.









OIL ANALYSIS REPORT

Aft Machinery Space [450270725] Thruster Aft Starboard - Seal Oil System (S/N Sample Tag CL-06003-S3) Component

Sealing System Fluid

PETRO CANADA ENERGOL GR-XP ISO 150 (65 LTR)

DIAGNOSIS

Recommendation

Check seals and/or filters for points of contaminant entry. We advise that you check all areas where contaminants can enter the system. 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 advise that you use off-line filtration with water adsorbent filters to attempt to remove the water from this fluid. We advise that you follow the water drain-off procedure for this component. Resample in 30-45 days to monitor this situation.

A Wear

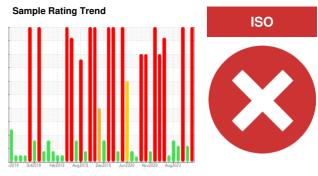
Chromium ppm levels are abnormal.

Contamination

There is a high amount of particulates (2 to 100 microns in size) present in the fluid. There is a moderate concentration of water present in the fluid. Excessive free water present.

Fluid Condition

The AN level is acceptable for this fluid. The fluid is no longer serviceable as a result of the abnormal and/or severe wear.



SAMPLE INFOR	MATION	method	limit/base	current	history1	history2
Sample Number		Client Info		PC0082719	PC	PC
Sample Date		Client Info		26 Feb 2024	05 Jan 2024	04 Jan 2024
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	ABNORMAL	SEVERE
WEAR METAL	S	method	limit/base	current	history1	history2
PQ		ASTM D8184*		0	0	0
Iron	ppm	ASTM D5185(m)	>100	32	2	34
Chromium	ppm	ASTM D5185(m)	>3	<u> </u>	0	A 7
Nickel	ppm	ASTM D5185(m)	>8	2	<1	2
Titanium	ppm	ASTM D5185(m)		0	0	0
Silver	ppm	ASTM D5185(m)		0	0	0
Aluminum	ppm	ASTM D5185(m)	>3	<1	<1	<1
Lead	ppm	ASTM D5185(m)		0	0	<1
Copper	ppm	ASTM D5185(m)	>3	1	<1	1
Tin	ppm	ASTM D5185(m)		0	0	0
Antimony	ppm	ASTM D5185(m)		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)		<1	12	<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)		3	<1	4
Calcium	ppm	ASTM D5185(m)		5	5	6
Phosphorus	ppm	ASTM D5185(m)		134	170	138
Zinc	ppm	ASTM D5185(m)		8	4	10
Sulfur	ppm					8796
		ASTM D5185(m)		9073	10729	0/90
Lithium	ppm	ASTM D5185(m) ASTM D5185(m)		9073 <1	10729 <1	<1
Lithium CONTAMINAN	ppm		limit/base			
	ppm	ASTM D5185(m) method		<1	<1	<1
CONTAMINAN	ppm ITS ppm	ASTM D5185(m)		<1 current	<1 history1	<1 history2
CONTAMINAN Silicon	ppm	ASTM D5185(m) method ASTM D5185(m)		<1 current 4	<1 history1 4	<1 history2 9
CONTAMINAN Silicon Sodium	ppm ITS ppm ppm	ASTM D5185(m) method ASTM D5185(m) ASTM D5185(m)	>25	<1 current 4 17	<1 history1 4 2	<1 history2 9 20
CONTAMINAN Silicon Sodium Potassium Water	ppm ITS ppm ppm ppm	ASTM D5185(m) method ASTM D5185(m) ASTM D5185(m) ASTM D5185(m)	>25	<1 current 4 17 1	<1 history1 4 2 <1	<1 history2 9 20 2
CONTAMINAN Silicon Sodium Potassium Water	ppm ITS ppm ppm ppm % ppm	ASTM D5185(m) method ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) ASTM D6304* ASTM D6304*	>25	<1 current 4 17 1 0.207	<1 history1 4 2 <1 	<1 history2 9 20 2 0.378
CONTAMINAN Silicon Sodium Potassium Water ppm Water FLUID CLEAN	ppm ITS ppm ppm ppm % ppm	ASTM D5185(m) method ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) ASTM D6304* ASTM D6304*	>25 >20	<1 <u>current</u> 4 17 1 ▲ 0.207 ▲ 2075	<1 history1 4 2 <1 	<1 history2 9 20 2 4 0.378 3783
CONTAMINAN Silicon Sodium Potassium Water ppm Water FLUID CLEAN Particles >4µm	ppm ITS ppm ppm ppm % ppm	ASTM D5185(m) method ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) ASTM D6304* ASTM D6304* Comparison ASTM D6304*	>25 >20 limit/base >5000	<1 <u>current</u> 4 17 1 ▲ 0.207 ▲ 2075 <u>current</u> ▲ 154564	<1 history1 4 2 <1 history1 15578	<1 history2 9 20 2 0.378 0.378 3783 history2 148164
CONTAMINAN Silicon Sodium Potassium Water ppm Water FLUID CLEAN Particles >4µm Particles >6µm	ppm ITS ppm ppm ppm % ppm	ASTM D5185(m) method ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) ASTM D6304* ASTM D6304* Comparison ASTM D6304* ASTM D7647 ASTM D7647	>25 >20 limit/base >5000 >1300	<1 current 4 17 1 0.207 2075 current 154564 63227	<1 history1 4 2 <1 history1 15578 2817	<1 history2 9 20 2 0.378 3783 history2 148164 38031
CONTAMINAN Silicon Sodium Potassium Water ppm Water FLUID CLEAN Particles >4µm Particles >6µm Particles >14µm	ppm ITS ppm ppm ppm % ppm	ASTM D5185(m) method ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) ASTM D6304* ASTM D6304* Comparison ASTM D7647 ASTM D7647 ASTM D7647	>25 >20 limit/base >5000 >1300 >160	<1 Current 4 17 1 ▲ 0.207 ▲ 2075 Current ▲ 154564 ▲ 63227 ▲ 4563	<1 history1 4 2 <1 history1 15578 2817 148	<1 history2 9 20 2 0.378 3783 history2 148164 38031 1586
CONTAMINAN Silicon Sodium Potassium Water ppm Water FLUID CLEAN Particles >4µm Particles >6µm Particles >14µm Particles >21µm	ppm ITS ppm ppm ppm % ppm	ASTM D5185(m) method ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) ASTM D6304* ASTM D6304* ASTM D6304* ASTM D7647 ASTM D7647 ASTM D7647 ASTM D7647	>25 >20 limit/base >5000 >1300 >160 >40	<1 Current 4 17 1 0.207 2075 Current ▲ 154564 ▲ 63227 ▲ 4563 ▲ 466	<1 history1 4 2 <1 history1 15578 2817 148 44	<1 history2 9 20 2 0.378 3783 history2 148164 38031 1586 261
CONTAMINAN Silicon Sodium Potassium Water ppm Water FLUID CLEAN Particles >4µm Particles >6µm Particles >14µm	ppm ITS ppm ppm ppm % ppm	ASTM D5185(m) method ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) ASTM D6304* ASTM D6304* Comparison ASTM D7647 ASTM D7647 ASTM D7647	>25 >20 limit/base >5000 >1300 >160 >40 >10	<1 Current 4 17 1 ▲ 0.207 ▲ 2075 Current ▲ 154564 ▲ 63227 ▲ 4563	<1 history1 4 2 <1 history1 15578 2817 148	<1 history2 9 20 2 0.378 3783 history2 148164 38031 1586

Contact/Location: Josh Hynes - TERHAM



A Particle Count

Particle Trend

214

38

144

eh20/1

Feb20/19

Feb20/1

Acid Number

Inr78/1

Apr26/1 0ct2/1

🔺 Ferrous Alloys

491,520 122,880

(m 30,720 7,680 1,920 1,920 480 120 30 30 30 8

1,400

200k 0k

> pr26/1 0ct2/1

Water (KF)

10

1.00 B

Apr26/1

OIL ANALYSIS REPORT

VISUAL method limit/base current history1 White Metal scalar Visual* NONE NORML NORML NORML NORML NORML NORML NEG 1 NOR NEG </th <th>Acid Number (AN)</th> <th>ma KOH/a</th> <th>ASTM D974*</th> <th>0.9</th> <th>0.29</th> <th>0.45</th> <th>0.2</th>	Acid Number (AN)	ma KOH/a	ASTM D974*	0.9	0.29	0.45	0.2
White Metal scalar Visual* NONE NORML NORML NOR NORML N	. ,						h
Yellow MetalscalarVisual*NONENONENONENONEPrecipitatescalarVisual*NONENONENONENONENONENONESiltscalarVisual*NONENONENONENONENONENONEDebrisscalarVisual*NONENONENONENONENONENONENONESand/DirtscalarVisual*NONENONENONENONENONENOAppearancescalarVisual*NORMLLAYRDNORMLNOOdorscalarVisual*NORMLNORMLNORMLNOEmulsified WaterscalarVisual*NORMLNORMLNOFree WaterscalarVisual*NORMLNORMLNEG1FLUID PROPERTIESmethodlimit/basecurrenthistory1Visc @ 40°CcStASTM D7279(m)14.524.814.21Viscosity Index (VI)ScaleASTM D2270*206945SAMPLE IMAGESmethodlimit/basecurrenthistory1ColorImat/Dasecurrenthistory1		scalar					NC
Precipitate scalar Visual* NONE NORML NORML NORML NORML NORMUC NORMUC NORMUC NORMUC NORMUC NORMUC NORMUC NORMUC NOR			Visual*	NONE	-	NONE	NC
Silt scalar Visual* NONE NORML NORML NORML NORML NORML NORMUNATIONS NORMUNATIONS NORMUNATIONS NORMUNATIONS NOSOUTO NOSOUTO SASTM D	Precipitate	scalar	Visual*			NONE	NC
Sand/Dirt scalar Visual* NONE NONE NONE NOR NOR Appearance scalar Visual* NORML LAYRD NORML W Odor scalar Visual* NORML NORML NORML W Odor scalar Visual* NORML NORML NORML NORML W Emulsified Water scalar Visual* 1% NORML NORML N Free Water scalar Visual* 1% NEG 1 FLUID PROPERTIES method limit/base current history1 Visc @ 40°C cSt ASTM D7279(m) 14.9 144 145 1 Visc @ 100°C cSt ASTM D7279(m) 14.5 24.8 14.2 1 Viscosity Index (VI) Scale ASTM D2270* 206 94 5 SAMPLE IMAGES method limit/base current history1 Color Color Imathematical and	•	scalar	Visual*	NONE	NONE	NONE	NC
Appearance scalar Visual* NORML LAYRD NORML W Odor scalar Visual* NORML NORML NORML N Emulsified Water scalar Visual* NORML NORML NORML N Emulsified Water scalar Visual* A 1% NEG 1 Free Water scalar Visual* >10% NEG 1 Fluid PROPERTIES method limit/base current history1 Visc @ 40°C cSt ASTM D7279(m) 149 144 145 1 Visc @ 100°C cSt ASTM D7279(m) 14.5 24.8 14.2 1 Visc @ 100°C cSt ASTM D2270* 206 94 5 SAMPLE IMAGES method limit/base current history1 Color	Debris	scalar	Visual*	NONE	NONE	NONE	NC
Odor scalar Visual* NORML NORML NORML NORML N Emulsified Water scalar Visual* 1% 1% NEG 1 Free Water scalar Visual* >10% NEG 1 Free Water scalar Visual* >10% NEG 1 FLUID PROPERTIES method limit/base current history1 Visc @ 40°C cSt ASTM D7279(m) 149 144 145 1 Visc @ 100°C cSt ASTM D7279(m) 14.5 24.8 14.2 1 Viscosity Index (VI) Scale ASTM D2270* 206 94 5 SAMPLE IMAGES method limit/base current history1 Color Imit/base current history1	Sand/Dirt	scalar	Visual*	NONE	NONE	NONE	NC
Emulsified Water scalar Visual* 1% NEG 1 Free Water scalar Visual* >10% NEG 1 FLUID PROPERTIES method limit/base current history1 Visc @ 40°C cSt ASTM D7279(m) 149 144 145 1 Visc @ 100°C cSt ASTM D7279(m) 14.5 24.8 14.2 1 Visc @ 100°C cSt ASTM D2270* 206 94 5 SAMPLE IMAGES method limit/base current history1 Color I I I I I I	Appearance	scalar	Visual*	NORML	🔺 LAYRD	NORML	🔺 W(
Free Water scalar Visual* >10% NEG 1 FLUID PROPERTIES method limit/base current history1 Visc @ 40°C cSt ASTM D7279(m) 149 144 145 1 Visc @ 100°C cSt ASTM D7279(m) 14.5 24.8 14.2 1 Viscosity Index (VI) Scale ASTM D2270* 206 94 5 SAMPLE IMAGES method limit/base current history1 Color Imit/base current history1	Odor	scalar	Visual*	NORML	NORML	NORML	NC
FLUID PROPERTIES method limit/base current history1 Visc @ 40°C cSt ASTM D7279(m) 149 144 145 14 Visc @ 100°C cSt ASTM D7279(m) 14.5 24.8 14.2 1 Visc @ 100°C cSt ASTM D7279(m) 14.5 24.8 14.2 1 Viscosity Index (VI) Scale ASTM D2270* 206 94 5 SAMPLE IMAGES method limit/base current history1 Color	Emulsified Water	scalar	Visual*		1 %	NEG	<u> </u>
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Visc @ 100°C cSt ASTM D7279(m) 14.5 24.8 14.2 1 Viscosity Index (VI) Scale ASTM D2270* A 206 94 5 SAMPLE IMAGES method limit/base current history1 Color	FLUID PROPE	RTIES	method	limit/base	current	history1	ł
Viscosity Index (VI) Scale ASTM D2270* 206 94 5 SAMPLE IMAGES method limit/base current history1 Color Imit/base current page 1000000000000000000000000000000000000	Visc @ 40°C	cSt	ASTM D7279(m)	149	144	145	14
SAMPLE IMAGES method limit/base current history1	Visc @ 100°C	cSt	ASTM D7279(m)	14.5	24.8	14.2	11
Color	Viscosity Index (VI)	Scale	ASTM D2270*		A 206	94	4 54
	SAMPLE IMAG	ES	method	limit/base	current	history1	ł
Bottom	Color						
	Color						

(B/HO) B/HO) ag E 0.4 Pio 0.20 0.0 Aug 14/23 eh20/1 : WearCheck - C8-1175 Appleby Line, Burlington, ON L7L 5H9 Suncor - Terra Nova Projects Laboratory CALA Sample No. : PC0082719 Received : 18 Mar 2024 Scotia Centre, 235 Water Strret Lab Number : 02622844 Tested : 20 Mar 2024 St. John`s, NL ISO 17025:2017 Accredited Laboratory Unique Number : 5747963 Diagnosed : 20 Mar 2024 - Kevin Marson CA A1C 1B6 Test Package : MAR 2 (Additional Tests: KF, KV100, PQ, PrtCount, TAN Man, VI) Contact: Josh Hynes To discuss this sample report, contact Customer Service at 1-800-268-2131. joshynes@suncor.com T: (709)778-3575 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. F: (709)724-2835

14/2

Contact/Location: Josh Hynes - TERHAM