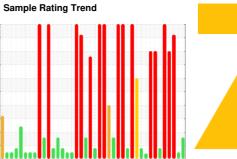


PROBLEM SUMMARY



ISO

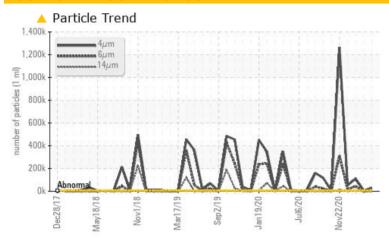
Aft Machinery Space [450188488]

Thruster Aft Starboard - Seal Oil System (S/N Sample Tag CL-06003-S3)

Sealing System

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

COMPONENT CONDITION SUMMARY



RECOMMENDATION

We recommend you service the filters on this component. We recommend an early resample to monitor this condition.

PROBLEMATIC TEST RESULTS							
Sample Status			ABNORMAL	NORMAL	SEVERE		
Particles >4µm	ASTM D7647	>5000	28148	4589	110306		
Particles >6µm	ASTM D7647	>1300	6179	756	44433		
Particles >14μm	ASTM D7647	>160	184	24	6 195		
Oil Cleanliness	ISO 4406 (c)	>19/17/14	22/20/15	19/17/12	24/23/20		

Customer Id: TERHAM Sample No.: PC

Lab Number: 02582299 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 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			?	We recommend an early resample to monitor this condition.

HISTORICAL DIAGNOSIS

19 Jul 2023 Diag: Kevin Marson

NORMAL



Resample at the next service interval to monitor. All component wear rates are normal. The system cleanliness is acceptable for your target ISO 4406 cleanliness code. The system and fluid cleanliness is acceptable. The AN level is acceptable for this fluid. The condition of the fluid is suitable for further service.



ISO



11 Jun 2023 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 advise that you use off-line filtration with water adsorbent filters to attempt to remove the water from this fluid. We advise that you perform a filter service, and use off-line filtration to improve the cleanliness of the system fluid. Resample in 30-45 days to monitor this situation.All component wear rates are normal. 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. The AN level is acceptable for this fluid.



31 Mar 2023 Diag: Kevin Marson





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.All component wear rates are normal. There is a high amount of particulates (2 to 100 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.





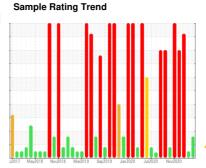
OIL ANALYSIS REPORT

Aft Machinery Space [450188488]

Thruster Aft Starboard - Seal Oil System (S/N Sample Tag CL-06003-S3)

Sealing System

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





DIAGNOSIS

Recommendation

We recommend you service the filters on this component. We recommend an early resample to monitor this condition.

All component wear rates are normal.

Contamination

There is a moderate amount of silt (particulates < 14 microns in size) present in the fluid.

Fluid Condition

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

0 (65 LTR)						
SAMPLE INFORM	MATION	method	limit/base	current	history1	history2
Sample Number		Client Info		PC	PC	PC0040122
Sample Date		Client Info		14 Aug 2023	19 Jul 2023	11 Jun 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				ABNORMAL	NORMAL	SEVERE
WEAR METALS	S	method	limit/base	current	history1	history2
PQ		ASTM D8184*		0	8	0
Iron	ppm	ASTM D5185(m)	>100	9	16	16
Chromium	ppm	ASTM D5185(m)	>3	0	<1	0
Nickel	ppm	ASTM D5185(m)	>8	0	<1	<1
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	0
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						
Caumum	ppm	ASTM D5185(m)		0	0	0
ADDITIVES	ррш	method	limit/base	current	0 history1	0 history2
	ppm	. ,	limit/base			
ADDITIVES		method	limit/base	current	history1	history2
ADDITIVES Boron	ppm	method ASTM D5185(m)	limit/base	current 11	history1 <1	history2
ADDITIVES Boron Barium	ppm ppm	method ASTM D5185(m) ASTM D5185(m)	limit/base	current 11 0	history1 <1 0	history2 2 0
ADDITIVES Boron Barium Molybdenum	ppm ppm	method ASTM D5185(m) ASTM D5185(m) ASTM D5185(m)	limit/base	current 11 0 <1 <1 <1 <1	history1 <1 0 <1 <1 <1 <1 <2	history2 2 0 <1 <1 2
ADDITIVES Boron Barium Molybdenum Manganese	ppm ppm ppm	method ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) ASTM D5185(m)	limit/base	current 11 0 <1 <1 <1 <1 <4	history1 <1 0 <1 <1 <1 2 3	history2 2 0 <1 <1 2 2 2
ADDITIVES Boron Barium Molybdenum Manganese Magnesium	ppm ppm ppm ppm	method ASTM D5185(m)	limit/base	current 11 0 <1 <1 <1 <1 4 268	history1 <1 0 <1 <1 2 3 278	history2 2 0 <1 <1 2 2 2 294
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium	ppm ppm ppm ppm ppm	method ASTM D5185(m)	limit/base	current 11 0 <1 <1 <1 <1 <4	history1 <1 0 <1 <1 <1 2 3	history2 2 0 <1 <1 2 2 2
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur	ppm ppm ppm ppm ppm ppm	method ASTM D5185(m)	limit/base	current 11 0 <1 <1 <1 <4 268 8 13115	history1 <1 0 <1 <1 2 3 278 11 8850	history2 2 0 <1 <1 2 2 2 94 11 8920
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur Lithium	ppm ppm ppm ppm ppm ppm ppm ppm	method ASTM D5185(m)	limit/base	current 11 0 <1 <1 <1 <1 4 268 8	history1 <1 0 <1 <1 2 3 278 11	history2 2 0 <1 <1 2 2 2 94 11
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur	ppm ppm ppm ppm ppm ppm ppm ppm	method ASTM D5185(m)	limit/base	current 11 0 <1 <1 <1 <4 268 8 13115	history1 <1 0 <1 <1 2 3 278 11 8850	history2 2 0 <1 <1 2 2 2 94 11 8920
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur Lithium	ppm ppm ppm ppm ppm ppm ppm ppm	method ASTM D5185(m)		current 11 0 <1 <1 <1 <4 268 8 13115 <1	history1 <1 0 <1 <1 2 3 278 11 8850 <1	history2 2 0 <1 <1 2 2 294 11 8920 <1
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur Lithium CONTAMINAN	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	method ASTM D5185(m)	limit/base	current 11 0 <1 <1 <1 4 268 8 13115 <1 current	history1 <1 0 <1 <1 2 3 278 11 8850 <1 history1	history2 2 0 <1 <1 2 2 294 11 8920 <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	current 11 0 <1 <1 <1 <4 268 8 13115 <1 current 1	history1 <1 0 <1 <1 2 3 278 11 8850 <1 history1 5	history2 2 0 <1 <1 2 2 294 11 8920 <1 history2 8
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)	limit/base >25	current 11 0 <1 <1 <1 <4 268 8 13115 <1 current 1 <1	history1 <1 0 <1 <1 2 3 278 11 8850 <1 history1 5 2	history2 2 0 <1 <1 2 2 294 11 8920 <1 history2 8 8
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)	limit/base >25 >20	current 11 0 <1 <1 <1 4 268 8 13115 <1 current 1 <1 <1	history1 <1 0 <1 1 2 3 278 11 8850 <1 history1 5 2 <1	history2 2 0 <1 <1 2 2 294 11 8920 <1 history2 8 8 8 <1
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur Lithium CONTAMINAN Silicon Sodium Potassium FLUID CLEANL	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	method ASTM D5185(m)	limit/base >25 >20 limit/base	current 11 0 <1 <1 <1 <4 268 8 13115 <1 current 1 <1 <ur> <ur> <ur> <ur> <ur> <ur> <ur> <ur></ur></ur></ur></ur></ur></ur></ur></ur>	history1 <1 0 <1 2 3 278 11 8850 <1 history1 5 2 <1 history1	history2 2 0 <1 <1 2 2 294 11 8920 <1 history2 8 8 <1 history2
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur Lithium CONTAMINAN Silicon Sodium Potassium FLUID CLEANL Particles >4µm	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	method ASTM D5185(m) method ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) ASTM D5185(m)	limit/base >25 >20 limit/base >5000	current 11 0 <1 <1 <1 <1 4 268 8 13115 <1 current 1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <	history1 <1 0 <1 2 3 278 11 8850 <1 history1 5 2 <1 history1 4589	history2 2 0 <1 <1 2 2 294 11 8920 <1 history2 8 8 <1 history2
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur Lithium CONTAMINAN Silicon Sodium Potassium FLUID CLEANL Particles >4µm Particles >6µm	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	method ASTM D5185(m) method ASTM D5185(m) ASTM D7647	limit/base >25 >20 limit/base >5000 >1300 >160	current 11 0 <1 <1 <1 4 268 8 13115 <1 current 1 <1 <1 21 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1	history1 <1 0 <1 2 3 278 11 8850 <1 history1 5 2 <1 history1 4589 756	history2 2 0 <1 <1 2 2 294 11 8920 <1 history2 8 8 <1 history2 110306 44433
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur Lithium CONTAMINAN Silicon Sodium Potassium FLUID CLEANL Particles >4µm Particles >6µm Particles >14µm	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	method ASTM D5185(m) method ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) ASTM D7647 ASTM D7647	limit/base >25 >20 limit/base >5000 >1300 >160	current 11 0 <1 <1 <1 <1 4 268 8 13115 <1 current 1 <1 <1 current ▲ 28148 ▲ 6179 ▲ 184	history1 <1 0 <1 2 3 278 11 8850 <1 history1 5 2 <1 history1 4589 756 24	history2 2 0 <1 <1 2 2 294 11 8920 <1 history2 8 8 <1 history2 110306 44433 6195

ISO 4406 (c) >19/17/14 **22/20/15**

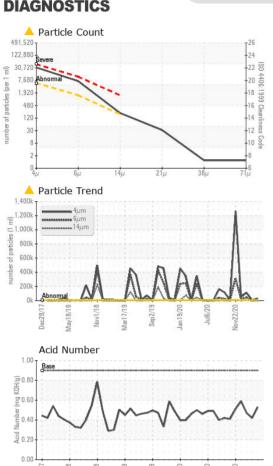
Oil Cleanliness

19/17/12

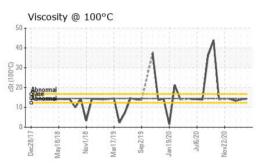
24/23/20

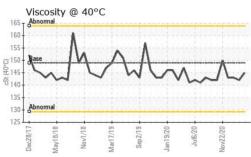


OIL ANALYSIS REPORT



FLUID DEGRAD	ATION	method	limit/base	current	history1	history2
Acid Number (AN)	mg KOH/g	ASTM D974*	0.9	0.53	0.42	0.47
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	VLITE	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*		NEG	NEG	<u>.5%</u>
Free Water	scalar	Visual*		NEG	NEG	NEG
FLUID PROPE	RTIES	method	limit/base	current	history1	history2
Visc @ 40°C	cSt	ASTM D7279(m)	149	145	142	143
Visc @ 100°C	cSt	ASTM D7279(m)	14.5	14.3	14.0	13.3
Viscosity Index (VI)	Scale	ASTM D2270*		95	94	84
SAMPLE IMAG	ES	method	limit/base	current	history1	history2
Color					7 12/23	







CALA ISO 17025:2017 Accredited Laboratory

Laboratory Sample No. Lab Number **Unique Number**

: WearCheck - C8-1175 Appleby Line, Burlington, ON L7L 5H9 : PC

Bottom

: 02582299

Received : 5643364

: 13 Sep 2023 Diagnosed : 15 Sep 2023

Diagnostician : Kevin Marson Test Package : MAR 2 (Additional Tests: KV100, PQ, PrtCount, TAN Man, VI)

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