

PROBLEM SUMMARY

Water Injection [450273721] Machine Id Pump - Glycol Circulation (B) (S/N Sample Tag PA-38002B) Component Pump

Pump Fluid

PETRO CANADA DURON HP 15W40 (7 LTR)

COMPONENT CONDITION SUMMARY









🔺 Non-ferrous Metals



RECOMMENDATION

We advise that you check all areas where contaminants can enter the system. We recommend that you drain the oil from the component if this has not already been done. We recommend you service the filters on this component. Resample in 30-45 days to monitor this situation.

PROBLEMATIC	C TEST	RESULT	S			
Sample Status				SEVERE	SEVERE	SEVERE
Copper	ppm	ASTM D5185(m)	>15	<mark>/</mark> 30	<1	1
Particles >4µm		ASTM D7647	>5000	4 254999	135416	▲ 255539
Particles >6µm		ASTM D7647	>1300	1 01822	6 1155	103643
Particles >14µm		ASTM D7647	>40	4 1136	5063	1 366
Particles >21µm		ASTM D7647	>10	A 229	1 494	▲ 333
Particles >38µm		ASTM D7647	>3	<u> </u>	1 70	1 2
Oil Cleanliness		ISO 4406 (c)	>19/17/12	4 25/24/17	▲ 24/23/20	▲ 25/24/18
Visc @ 40°C	cSt	ASTM D7279(m)	118.2	A 77.4	153	128
Visc @ 100°C	cSt	ASTM D7279(m)	15.6	<u> </u>	15.2	14.5

Customer Id: TERHAM Sample No.: PC Lab Number: 02626226 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 <u>gloria.gonzalez@wearcheck.com</u>

RECOMMENDE	D ACTIONS			
Action	Status	Date	Done By	Description
Change Fluid			?	We recommend that you drain the oil from the component if this has not already been done.
Change Filter			?	We recommend you service the filters on this component.
Resample			?	Resample in 30-45 days to monitor this situation.
Check Dirt Access			?	We advise that you check all areas where contaminants can enter the system.

HISTORICAL DIAGNOSIS



27 Jan 2020 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. Resample in 30-45 days to monitor this situation.All component wear rates are normal. Particles >14µm are severely high. Particles >21µm are severely high. Particles >38µm are severely high. Particles >6µm are severely high. Particles >4µm are severely high. Particles >71µm are abnormally high. The system cleanliness code is much higher than the acceptable limit for the target ISO 4406 cleanliness code. Viscosity of sample indicates oil is within SAE 40 range, advise investigate. The AN level is acceptable for this fluid. The condition of the oil is suitable for further service.



01 Jan 2020 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. Particles >14 μ m are severely high. Particles >21 μ m are severely high. Particles >38 μ m are abnormally high. The system cleanliness code is much higher than the acceptable limit for the target ISO 4406 cleanliness code. The AN level is acceptable for this fluid. The condition of the oil is suitable for further service.





03 Dec 2019 Diag: Kevin Marson

We advise that you check all areas where contaminants can enter the system. We recommend that you drain the oil from the component if this has not already been done. 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. Iron and lead ppm levels are abnormal. A sharp increase in the iron level is noted. A sharp increase in the lead level is noted. Particles >14µm are severely high. Particles >6µm are severely high. Particles >4µm are severely high. The system cleanliness code is much higher than the acceptable limit for the target ISO 4406 cleanliness code. The AN level is acceptable for this fluid. The oil is no longer serviceable as a result of the abnormal and/or severe wear. NOTE: The color of the oil is darker then previous samples.





OIL ANALYSIS REPORT

Water Injection [450273721] Machine Id Pump - Glycol Circulation (B) (S/N Sample Tag PA-38002B) Component

Pump Fluid

PETRO CANADA DURON HP 15W40 (7 LTR)

DIAGNOSIS

Recommendation

We advise that you check all areas where contaminants can enter the system. We recommend that you drain the oil from the component if this has not already been done. We recommend you service the filters on this component. Resample in 30-45 days to monitor this situation.

🔺 Wear

Copper ppm levels are abnormal.

Contamination

There is a high amount of particulates (2 to 100 microns in size) present in the oil. The system cleanliness code is much higher than the acceptable limit for the target ISO 4406 cleanliness code.

Fluid Condition

Viscosity of sample indicates oil is within SAE 10W30 range, advise investigate. The AN level is acceptable for this fluid. The oil is no longer serviceable as a result of the abnormal and/or severe wear.



SAMPLE INFORM	MATION	method	limit/base	current	history1	history2
Sample Number		Client Info		PC	PC	PC
Sample Date		Client Info		13 Mar 2024	27 Jan 2020	01 Jan 2020
Machine Age	kms	Client Info		0	0	0
Oil Age	kms	Client Info		0	0	0
Oil Changed		Client Info		N/A	N/A	N/A
Sample Status				SEVERE	SEVERE	SEVERE
CONTAMINAT	ION	method	limit/base	current	history1	history2
Water		WC Method	>.1	NEG	NEG	NEG
WEAR METAL	S	method	limit/base	current	history1	history2
Iron	ppm	ASTM D5185(m)	>75	20	2	15
Chromium	ppm	ASTM D5185(m)	>5	0	<1	<1
Nickel	ppm	ASTM D5185(m)		0	0	<1
Titanium	ppm	ASTM D5185(m)		<1	<1	<1
Silver	ppm	ASTM D5185(m)		0	0	0
Aluminum	ppm	ASTM D5185(m)	>5	2	<1	1
Lead	ppm	ASTM D5185(m)	>10	1	0	2
Copper	ppm	ASTM D5185(m)	>15	<u> </u>	<1	1
Tin	ppm	ASTM D5185(m)		<1	0	0
Antimony	ppm	ASTM D5185(m)		0	<1	<1
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 2	history1 1	history2 2
ADDITIVES Boron Barium	ppm ppm	method ASTM D5185(m) ASTM D5185(m)	limit/base 0 0	current 2 0	history1 1 <1	history2 2 <1
ADDITIVES Boron Barium Molybdenum	ppm ppm ppm	method ASTM D5185(m) ASTM D5185(m) ASTM D5185(m)	limit/base 0 0 60	current 2 0 65	history1 1 <1 60	history2 2 <1 59
ADDITIVES Boron Barium Molybdenum Manganese	ppm ppm ppm ppm	method ASTM D5185(m) ASTM D5185(m) ASTM D5185(m) ASTM D5185(m)	limit/base 0 0 60 0	2 0 65 0	history1 1 <1 60 <1	history2 2 <1 59 <1
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 0 0 60 0 1010	2 0 65 0 1002	history1 1 <1 60 <1 983	history2 2 <1 59 <1 980
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 0 0 60 0 1010 1070	Current 2 0 65 0 1002 1184	history1 1 <1 60 <1 983 991	history2 2 <1 59 <1 980 926
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus	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)	limit/base 0 0 60 0 1010 1070 1150	Current 2 0 65 0 1002 1184 1069	history1 1 <1 60 <1 983 991 1012	history2 2 <1 59 <1 980 926 946
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc	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 0 0 60 0 1010 1070 1150 1270	Current 2 0 65 0 1002 1184 1069 1214	history1 1 <1 <1 60 <1 983 991 1012 1177 	history2 2 <1 59 <1 980 926 946 1166
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur	ppm 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) ASTM D5185(m)	limit/base 0 0 60 0 1010 1070 1150 1270 2060	Current 2 0 65 0 1002 1184 1069 1214 2955	history1	history2 2 <1 59 <1 980 926 946 1166 2511
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur Lithium	ppm 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) ASTM D5185(m) ASTM D5185(m)	limit/base 0 0 60 0 1010 1070 1150 1270 2060	Current 2 0 65 0 1002 1184 1069 1214 2955 <1	history1 1 <1 60 <1 983 991 1012 1177 2704 <1	history2 2 <1 59 <1 980 926 946 1166 2511 <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) 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 0 0 60 0 1010 1070 1150 1270 2060 Limit/base	Current 2 0 65 0 1002 1184 1069 1214 2955 < 1	history1 1 <1 60 <1 983 991 1012 1177 2704 <1 history1	history2 2 <1 59 <1 980 926 946 1166 2511 <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 60 0 1010 1070 1150 1150 1270 2060 limit/base >20	current 2 0 65 0 1002 1184 1069 1214 2955 <1 current 4	history1 1 <1 60 <1 983 991 1012 1177 2704 <1 history1 5	history2 2 <1 59 <1 980 926 946 1166 2511 <1 history2 7
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 0 0 60 0 1010 1070 1150 1270 2060 limit/base >20	current 2 0 65 0 1002 1184 1069 1214 2955 <1 current 4 6	history1 1 <1 60 <1 983 991 1012 1177 2704 <1 history1 5 <1	history2 2 <1 59 <1 980 926 946 1166 2511 <1 history2 7 0
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 0 0 60 0 1010 1070 1150 1270 2060 limit/base >20	current 2 0 65 0 1002 1184 1069 1214 2955 <1 current 4 6 1	history1 1 <1 60 <1 983 991 1012 1177 2704 <1 bistory1 5 <1 <1	history2 2 <1 59 <1 980 926 946 1166 2511 <1 history2 7 0 0
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 TS ppm ppm ppm	method ASTM D5185(m)	limit/base 0 0 60 0 1010 1070 1150 1270 2060 limit/base >20 limit/base	current 2 0 65 0 1002 1184 1069 1214 2955 <1 current 4 6 1 current	history1 1 <1 60 <1 983 991 1012 1177 2704 <1 history1 5 <1 <1 +istory1 history1	history2 2 <1 59 <1 980 926 946 1166 2511 <1 history2 7 0 0 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 TS ppm ppm	method ASTM D5185(m)	limit/base 0 0 60 0 1010 1070 1150 1270 2060 2060 2060 200 200 200 200 200 200	Current 2 0 65 0 1002 1184 1069 1214 2955 <1 current 4 6 1 current 4 5 254999	history1 1 <1 60 <1 983 991 1012 1177 2704 <1 5 <1 5 <1 5 <1 1 1 135416	history2 2 <1 59 <1 980 926 946 1166 2511 <1 history2 7 0 0 0 history2 ▲ 255539
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)	limit/base 0 0 60 0 1010 1070 1150 1270 2060 2060 limit/base >20 limit/base >20 limit/base >5000 >1300	Current 2 0 65 0 1002 1184 1069 1214 2955 <1 current 4 6 1 current 2 254999 101822	history1 1 <1 60 <1 983 991 1012 1177 2704 <1 5 <1 5 <1 history1 history1 ▲ 135416 ▲ 61155	history2 2 <1 59 <1 980 926 946 1166 2511 <1 history2 7 0 0 history2 ▲ 255539 ▲ 103643
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur Lithium CONTAMINAN Silicon Sodium Potassium FLUID CLEANL Particles >4µm Particles >14µm	ppm ppm ppm ppm ppm ppm ppm ppm ppm TS ppm ppm ppm	method ASTM D5185(m) ASTM D7647 ASTM D7647 ASTM D7647	limit/base 0 0 60 0 1010 1070 1150 1270 2060 2060 limit/base >20 limit/base >20 limit/base >20 >20 limit/base >20 >20 limit/base >20 limit/base	Current 2 0 65 0 1002 1184 1069 1214 2955 <1 Current 4 6 1 Current ▲ 254999 ▲ 101822 ▲ 1136	history1 1 60 <1 983 991 1012 1177 2704 <1 5 <1 5 <1 bistory1 5 <1 5 <1 60 61155 5063	history2 2 <1 59 <1 980 926 946 1166 2511 <1 history2 7 0 0 history2 ▲ 255539 ▲ 103643 ▲ 1366
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur Lithium CONTAMINAN Silicon Sodium Potassium FLUID CLEANL Particles >4µm Particles >14µm Particles >21µm	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	method ASTM D5185(m) ASTM D7647 ASTM D7647 ASTM D7647 ASTM D7647	limit/base 0 0 60 0 1010 1070 1150 1270 2060 2060 limit/base >20 limit/base >20 limit/base >5000 >1300 >40 >10	Current 2 0 65 0 1002 1184 1069 1214 2955 <1 Current 4 6 1 Current 4 6 1 Current 1 Current 1 254999 101822 1136 229	history1 1 <1 60 <1 983 991 1012 1177 2704 <1 bistory1 5 <1 bistory1 1 135416 61155 5063 1494	history2 2 <1 59 <1 980 926 946 1166 2511 <1 history2 7 0 0 bistory2 ▲ 255539 ▲ 103643 ▲ 1366
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur Lithium CONTAMINAN Silicon Sodium Potassium FLUID CLEANL Particles >4µm Particles >14µm Particles >38µm	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	method ASTM D5185(m) ASTM D7647 ASTM D7647 ASTM D7647 ASTM D7647	limit/base 0 0 60 0 1010 1070 1150 1270 2060 2060 limit/base >20 limit/base >20 limit/base >20 limit/base >20 limit/base >20 limit/base >20 limit/base >20 limit/base >20 limit/base >20 limit/base >20 limit/base >20 limit/base >20 limit/base >20 limit/base >20 limit/base	Current 2 0 65 0 1002 1184 1069 1214 2955 <1 Current 4 6 1 Current 4 6 1 Current 1 Current 1 Current 1 254999 101822 1136 229 12	history1 1 60 <1 983 991 1012 1177 2704 <1 5 <1 5 <1 bistory1 1 135416 61155 5063 1494 70	history2 2 <1 59 <1 980 926 946 1166 2511 <1 history2 7 0 0 history2 ▲ 255539 ▲ 103643 ▲ 1366 ▲ 333 ▲ 12
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur Lithium CONTAMINAN Silicon Sodium Potassium FLUID CLEANL Particles >4µm Particles >4µm Particles >21µm Particles >38µm Particles >71µm	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	method ASTM D5185(m) ASTM D7647 ASTM D7647 ASTM D7647 ASTM D7647	limit/base 0 0 60 0 1010 1070 1150 1270 2060 limit/base >20 limit/base >20 limit/base >20 limit/base >20 limit/base >20 limit/base >20 limit/base >20 limit/base >3 >3 >3	Current 2 0 65 0 1002 1184 1069 1214 2955 <1 Current 4 6 1 Current 4 6 1 Current 1 254999 101822 1136 229 12 12	history1 1 60 <1 983 991 1012 1177 2704 <1 5 <1 5 <1 bistory1 135416 61155 5063 1494 70 12	history2 2 <1 59 <1 980 926 946 1166 2511 <1 history2 7 0 0 history2 ▲ 255539 ▲ 103643 ▲ 1366 ▲ 333 ▲ 12 2
ADDITIVES Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur Lithium CONTAMINAN Silicon Sodium Potassium FLUID CLEANL Particles >4µm Particles >4µm Particles >4µm Particles >14µm Particles >71µm Oil Cleanliness	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	method ASTM D5185(m) ASTM D7647 ASTM D7647 ASTM D7647 ASTM D7647 ASTM D7647 ASTM D7647	limit/base 0 0 60 0 1010 1070 1150 1270 2060 20 0 2060 20 20 20 20 20 20 20 20 20 20 20 20 20	Current 2 0 65 0 1002 1184 1069 1214 2955 <1 current 4 6 1 current 4 6 1 current 4 6 1 current 4 1 254999 101822 1136 229 12 12 12 1 25/24/17	history1 1 60 <1	history2 2 <1 59 <1 980 926 946 1166 2511 <1 Kistory2 7 0 0 Kistory2 ↓ 25539 ↓ 103643 ↓ 1366 ▲ 333 ↓ 12 2 ↓ 25/24/18



A Particle Count

Particle Trend

11Cue

Viscosity @ 100°C

491,520 122,88

(TE 1000) 120 30 8

> 800 700 600 \$ 500 16 400 300 Ê 200 100 Abnor 0k Sep 15/1

OIL ANALYSIS REPORT

FLUID DEGRAD	DATION	method	limit/base	current	history1	history
Acid Number (AN)	mg KOH/g	ASTM D974*	3.2	1.69	1.91	1.93
VISUAL		method	limit/base	current	history1	history
White Metal	scalar	Visual*	NONE	NONE	NONE	VLITE
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	VLITE	NONE	NONE
Appearance	scalar	Visual*	NORML	NORML	HAZY	NORML
Odor	scalar	Visual*	NORML	NORML	NORML	NORML
Emulsified Water	scalar	Visual*	>.1	NEG	NEG	NEG
Free Water	scalar	Visual*		NEG	NEG	NEG
FLUID PROPE	RTIES	method	limit/base	current	history1	history
Visc @ 40°C	cSt	ASTM D7279(m)	118.2	A 77.4	153	128
Visc @ 100°C	cSt	ASTM D7279(m)	15.6	<u> </u>	15.2	14.5
Viscosity Index (VI)	Scale	ASTM D2270*	139	122	9 9	1 13
SAMPLE IMAG	iES	method	limit/base	current	history1	history
Color						
Bottom						6



214

144

Inc76/1

38/

lct7/19 el/Ling

: WearCheck - C8-1175 Appleby Line, Burlington, ON L7L 5H9 : PC Received : 02 Apr 2024 Lab Number : 02626226 Tested : 03 Apr 2024 ISO 17025:2017 Accredited Laboratory Unique Number : 5759358 Diagnosed : 03 Apr 2024 - Kevin Marson Test Package : MAR 2 (Additional Tests: KV100, 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

Contact/Location: Josh Hynes - TERHAM