

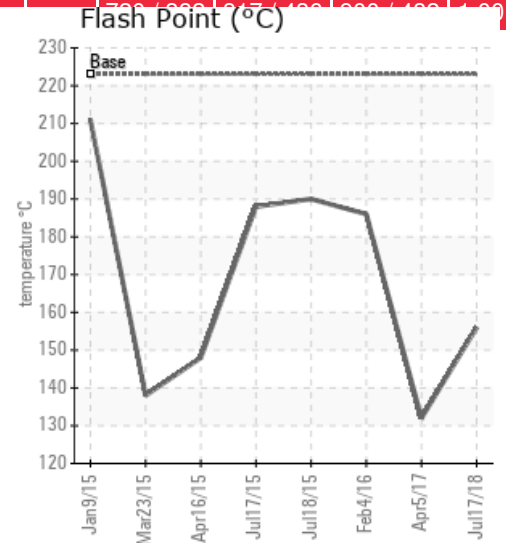
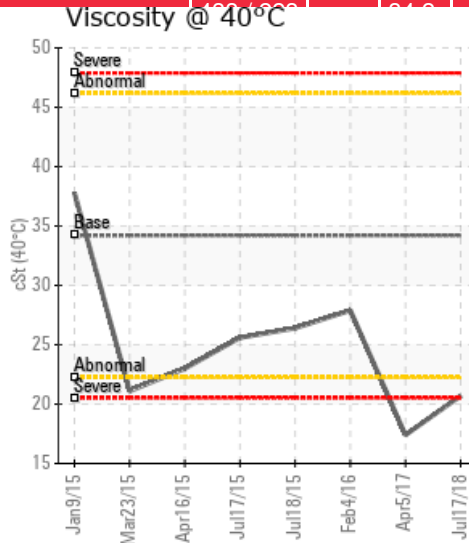
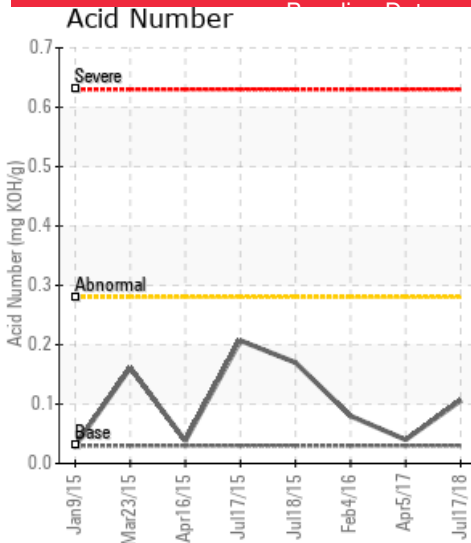
[LEUCROTTA / LSD 13-24-80-15W6] REBOILER

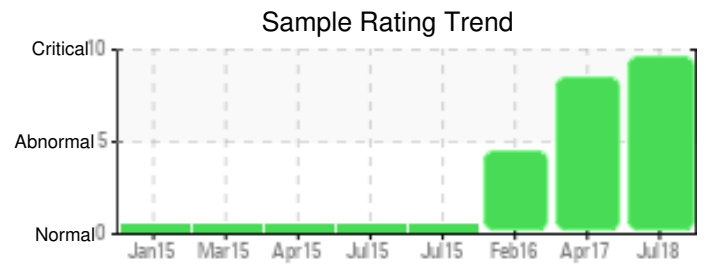
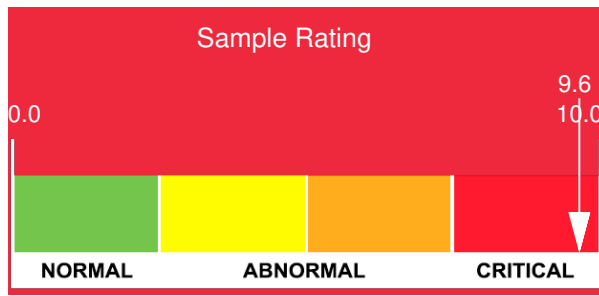
Customer: PTRHTF20151	System Information	Sample Information
LEUCROTTA EXPLORATION 13-24-80-15W6M DAWSON CREEK, BC Canada Attn: Lee Robinson Tel: (780)778-9249 E-Mail: lrobinson@leucrotta.ca	System Volume: 19000 ltr Bulk Operating Temp: 392F / 200C Heating Source: Blanket: Fluid: PETRO CANADA PETRO-THERM Make: ALCO	Lab No: 02231157 Analyst: Clinton Buhler Sample Date: 07/17/18 Received Date: 07/30/18 Completed: 08/14/18 To discuss this report contact Clinton Buhler at 780-516-9920

Recommendation: Sample results indicate that the heat transfer fluid is not suitable for continued service. Fluid requires replacement and the system requires cleaning due to severe thermal degradation as evidenced by low viscosity, 18.16% boil off, flash point and 1.2 % insoluble (solids). Severe thermal degradation can be caused by too high of heat flux and lack of turbulent flow around the burner tubes. Once system is cleaned and filled with fresh fluid, please obtain an initial fluid sample before start-up followed by a second sample after approx. 24 hours of service to establish a baseline. It is of utmost importance to ensure all water is thoroughly cleaned from system before initial fill. A slow, gradual start-up procedure will be very beneficial to fluid life. Please contact Petro-Canada Lubricants Technical Services for further assistance

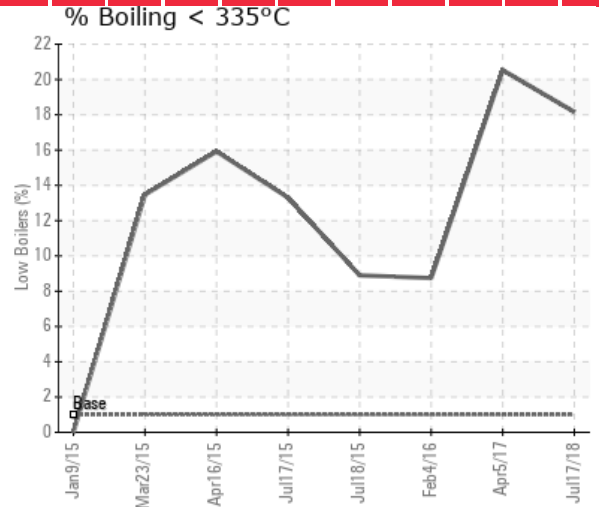
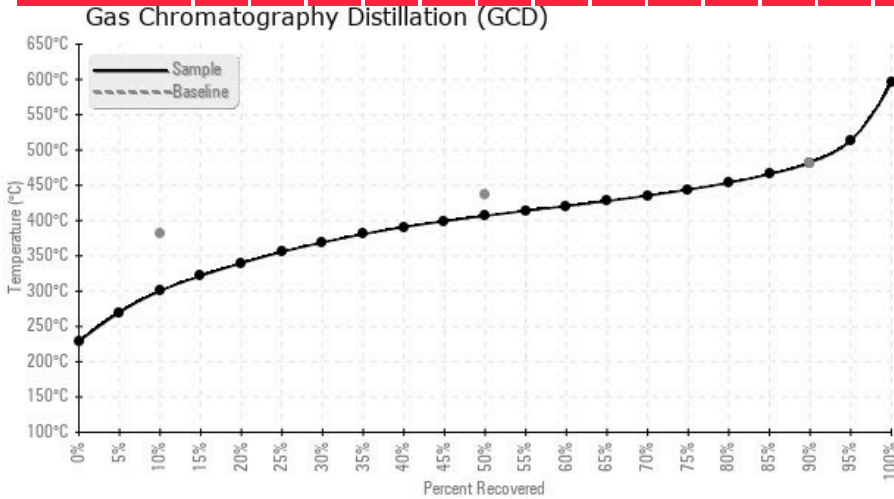
Comments: (GCD) % < 335°C is severely high. (GCD) 10% Distillation Point is severely low. COC Flash Point is severely low. Visc @ 40°C is abnormally low.

Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
07/17/18	07/30/18	0y		313 / 156	34.6	20.7	0.106	1.20	572 / 300	764 / 407	900 / 482	18.16
04/05/17	04/17/17	0y	SITE GLASS	270 / 132	39.0	17.4	0.04	0.351	525 / 274	772 / 411	918 / 492	20.53
02/04/16	02/16/16	0y	SITE GLASS	367 / 186	327.5	27.9	0.08	0.521	645 / 341	796 / 424	911 / 488	8.74
07/18/15	07/22/15	2y	HEATER BOTTOMS	374 / 190	3.1	26.4	0.170	0.142	644 / 340	803 / 428	920 / 493	8.90
07/17/15	07/22/15	2y	MID POINT HEATER	370 / 188	112.4	25.6	0.207	0.115	584 / 307	783 / 417	931 / 500	13.30
04/16/15	04/22/15	0y	REBOILER DRAIN	298 / 148	18.9	23.0	0.038	0.437	566 / 297	770 / 410	868 / 465	15.92
03/23/15	04/01/15	2y	REBOILER DRAIN	280 / 138	14.5	21.1	0.161	0.248	597 / 314	779 / 415	928 / 498	13.47





Sample Date	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorus	Zinc
07/17/18	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04/05/17	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
02/04/16	76	0	0	1	0	0	0	0	0	0	3	0	0	0	0	0	1	0	2	0	0	0	0	1
07/18/15	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
07/17/15	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
04/16/15	2	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	3	0	1	1
03/23/15	2	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	1	0	0	0	0	0
Elemental analysis results (above) in parts per million (ppm). [10,000 ppm = 1.0%]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



Historical Comments

04/05/17	Please note comments below: a high GCD %<335C, a low 10% GCD and low flash point are indications of severe thermal degradation. Please note that the flash point of 132C can be a safety concern. Aside from thermal degradation, the reduced viscosity of 17.4 cSt can also indicate contamination with a different process fluid. Check for possible process leaks (exchangers, etc). Please also ensure that blanket gas pressure is between 2-3 psi as excess pressure can dilute the HTF. Please perform a thorough venting regimen of the expansion tank to release the low boiling vapors. Re-sample within the next 2-3 months after thorough venting has been completed. Please contact your technical services advisor with any questions. Please include oil service life and type of blanket gas on the sample registration card for all future samples. (GCD) % < 335°C is severely high. (GCD) 10% Distillation Point is severely low. COC Flash Point is severely low. Visc @ 40°C is severely low.
02/04/16	Pentane insolubles are marginally high as is the GCC @10% indicating possible some contamination. continue to operate and resample in 9 - 12 months. Pentane Insolubles levels are abnormally high. (GCD) 10% Distillation Point is abnormally low. (GCD) % < 335°C is marginally high. COC Flash Point is marginally low.
07/18/15	As the comments below state the GCD at 10% and 90% are marginally high but this oil has greatly improved. Resample in 6 months. (GCD) 10% Distillation Point is abnormally low. (GCD) % < 335°C is marginally high. (GCD) 90% Distillation Point is marginally high. COC Flash Point is marginally low.
07/17/15	As comments below state, the GCD at 10% is low nut has greatly improved since last tested. Continue to operate and resample in 6 months. (GCD) 10% Distillation Point is severely low. (GCD) % < 335°C is abnormally high. (GCD) 90% Distillation Point is abnormally high. COC Flash Point is marginally low.
04/16/15	This sample Flash point is still quite low however it is still better then previous sample. GCD@10% indicates some lighter ends in the sample which could be caused by thermal cracking or contamination. Increase in Pentane Insoluble also indicate solid carbon particles in the oil as well. Pentane Insolubles levels are abnormally high. (GCD) 10% Distillation Point is severely low. COC Flash Point is severely low. (GCD) % < 335°C is abnormally high. (GCD) 90% Distillation Point is abnormally low.
03/23/15	Flash point is very low. Oil may be contaminated with condensate or lighter hydrocarbons or could be thermally cracked. If thermally cranked, it will cause viscosity to drop and explain the 10% GCD being lw and the 90% Distillation being abnormally high. (GCD) 10% Distillation Point is severely low. COC Flash Point is severely low. (GCD) % < 335°C is abnormally high. (GCD) 90% Distillation Point is abnormally high. Visc @ 40°C is abnormally low.

Petro-Canada makes no representation or warranty of any kind, either express or implied, as to the accuracy or completeness of the analysis and assumes no responsibility and shall have no liability whatsoever with respect to such analysis, or a party's use of it. Petro-Canada is a division of HollyFrontier Corporation.