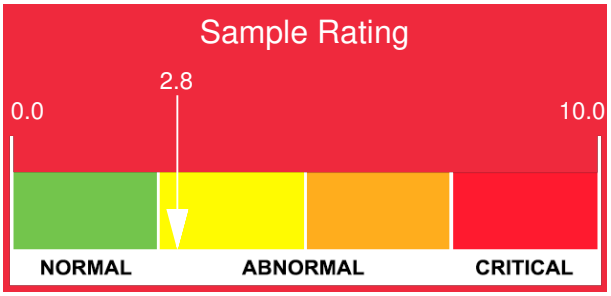
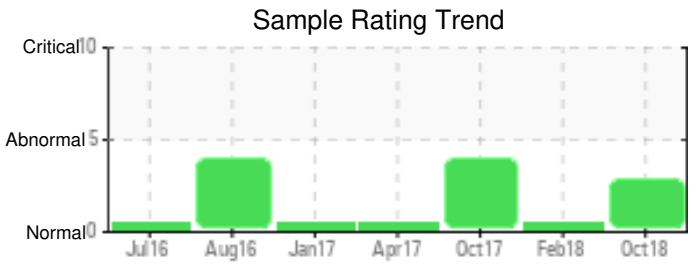
PETRO-CANADA LUBRICANTS





[STRATH RESOURCES / 6-8-62-3W6] U-5000 HEAT MEDIUM

Customer: PTRHTF20175

QUADRA CHEMICALS
7802 98 STREET
CLAIRMONT, AB T0H 0W0 Canada
Attn: Quadra Samples
Tel:
E-Mail: quadra_samples@quadra.ca

System Information

System Volume: 19300 gal
Bulk Operating Temp: 482F / 250C
Heating Source:
Blanket:
Fluid: PETRO CANADA PETRO-THERM
Make: OEL

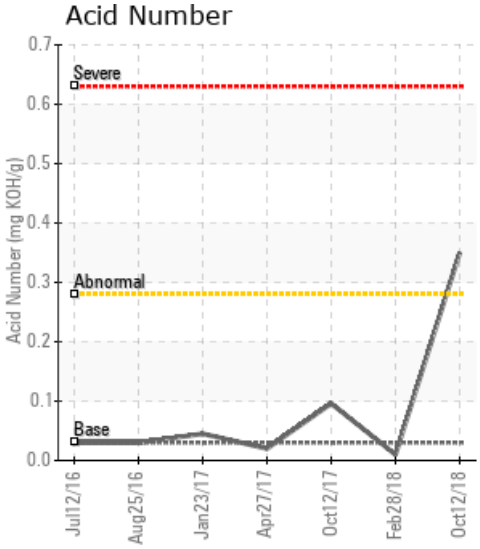
Sample Information

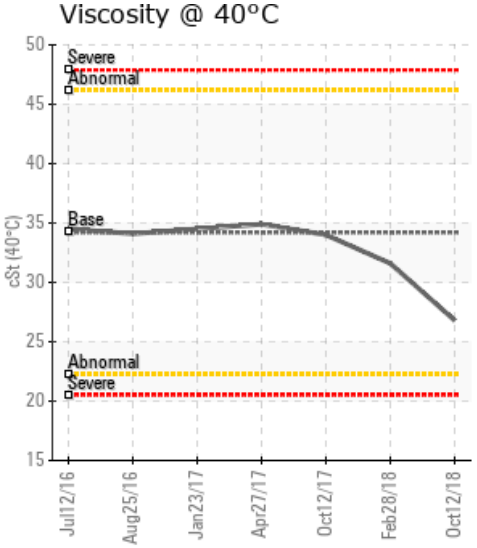
Lab No: 02246119
Analyst: Clinton Buhler
Sample Date: 10/12/18
Received Date: 10/19/18
Completed: 10/23/18
To discuss this report contact Clinton Buhler at 780-516-9920

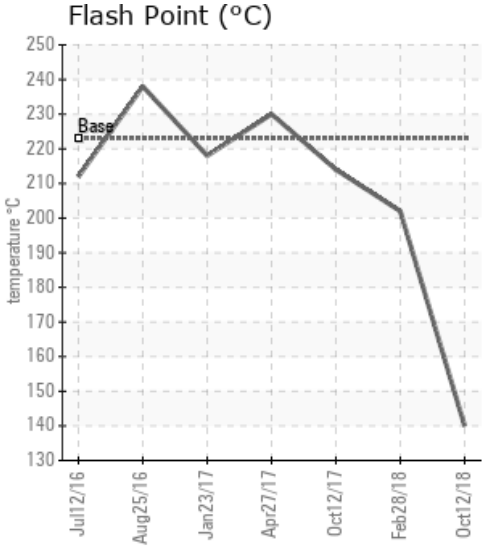
Recommendation: It is understood that there was recently a condensate leak into the HTF system. This may explain the reduced flash point. A reduced flash point can be a safety concern. Following all safety protocol, venting of the low boiling vapors will help restore the flashpoint level to acceptable levels. Blanket gas cannot be in service during venting. Investigate if blanket gas pressure of 210 kpa is required for circulating pump suction head. If so, further investigation into venting is needed. Increased Acid Number generally is associated to oxidation of the fluid. Acid Number is at 0.35 yet iron remains at 0, so corrosion doesn't seem to be ongoing. Generally, sweetening is recommended around an Acid Number of 0.4. In this case, please plan to re-sample system in 6 months once all condensate has been safely removed and the Acid Number can be re-evaluated.

Comments: COC Flash Point is severely low. Acid Number (AN) is abnormally high.

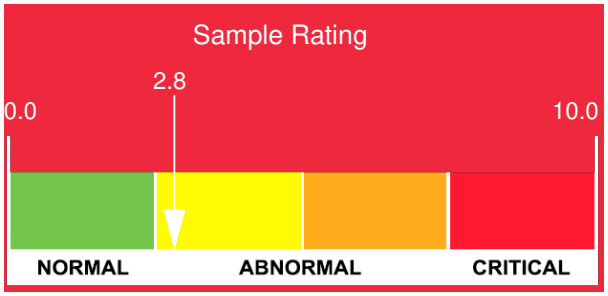
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
10/12/18	10/19/18	37m		284 / 140	2.5	26.8	0.35	0.035	714 / 379	801 / 427	899 / 482	1.48
02/28/18	03/12/18	28m		396 / 202	45.8	31.6	0.01	0.042	724 / 385	820 / 438	911 / 489	1.46
10/12/17	10/18/17	25m		417 / 214	1774.0	34.0	0.096	0.044	723 / 384	813 / 434	910 / 488	0.75
04/27/17	04/28/17	20m	PUMP DISCHARGE	446 / 230	115.9	34.9	0.02	0.035	724 / 385	813 / 434	909 / 487	0.42
01/23/17	02/10/17	16m	PUMP INLET	424 / 218	58.9	34.5	0.045	0.027	723 / 384	811 / 433	913 / 490	0.45
08/25/16	08/29/16	11m	PUMP DISCHARGE	460 / 238	1029.9	34.1	0.03	0.052	725 / 385	812 / 434	915 / 490	0.44
Baseline Data				433 / 223		34.2	0.03		720 / 382	817 / 436	900 / 482	1.00

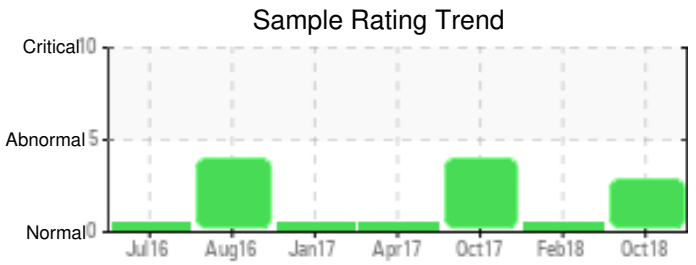






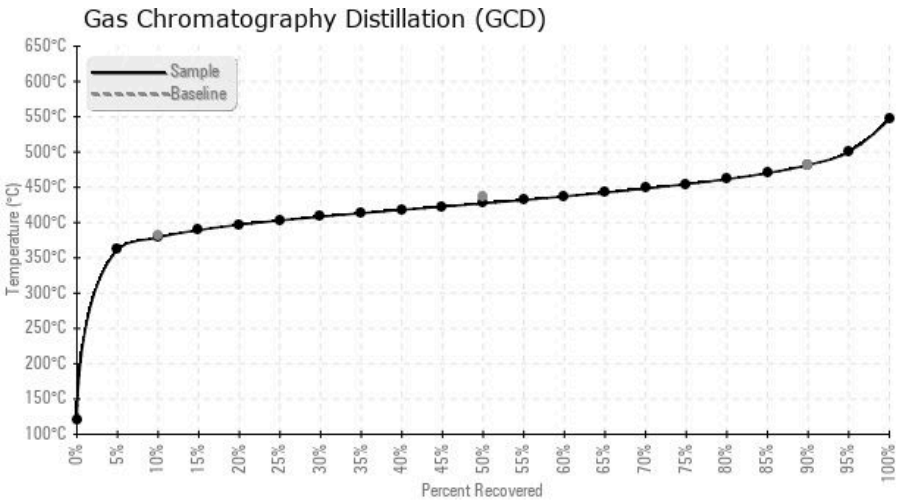
PETRO-CANADA LUBRICANTS

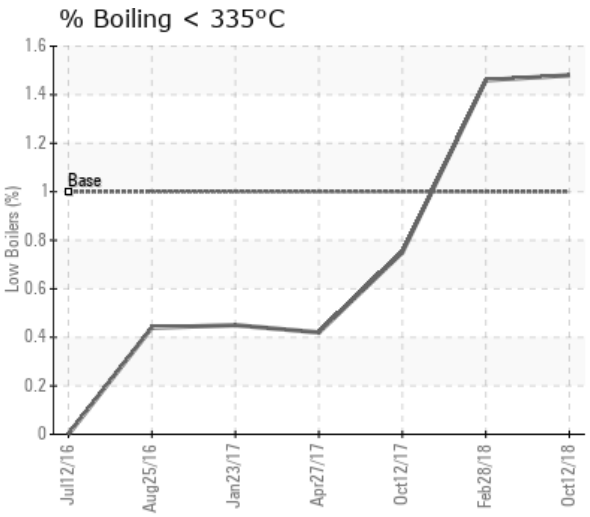




Sample Date	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorus	Zinc
10/12/18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02/28/18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/12/17	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
04/27/17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01/23/17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08/25/16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Baseline Data			0	0						0			0	0					0				0	

Elemental anaysis results (above) in parts per million (ppm). [10,000 ppm = 1.0%]





Historical Comments

02/28/18	Sample results indicate that the fluid is suitable for continued service and has improved since last sample as both water and total Acid Number have reduced significantly. The percentage boil off <335C has increased from 0.75 to 1.46 and there has been a slight reduction in flash point. This can indicate possible thermal degradation or contamination.Consider regular venting of the expansion tank after which time the blanket gas is turned back on.Re-sample in 6-12 months.
10/12/17	Water contamination can be a result of the expansion tank being exposed to precipitation. Slight increase in silicon (dirt/dust) may support this. Ensure points of ingression are sealed. Also confirm that sample was not drawn from a dead leg. Please always ensure a thorough purge before drawing sample. Allow water to boil off from expansion tank before putting blanket gas back into use. Aside from the water level in the oil, sample results indicate that the fluid is fit for continued service. Once water contamination has been vented and resolved, re-sample system in 6 months. Water contamination levels are severely high.
04/27/17	results indicate fluid is suitable for further use. GCD results, although consistent from previous results, can indicate the onset of oxidation. Re-sample within 12 months.
01/23/17	This sample indicates that the oil is in good condition and suitable for continued use. Resample in 6 months.
08/25/16	Besides the high water content the fluid is in a good condition. Water has since this sample was taken been removed by filtration and boil-off. It is recommended to continue to boil-off the water in order to reduce it to a more acceptable level (<500 ppm.) Please re-sample in one month. Water contamination levels are severely high. Water contamination levels are severely high.. ppm Water contamination levels are severely high.