![Petro-Canada Lubricants logo]

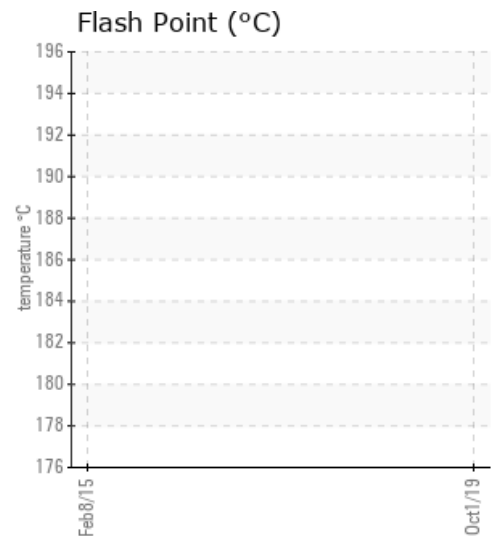## Sample Rating

0.0   6.8   10.0
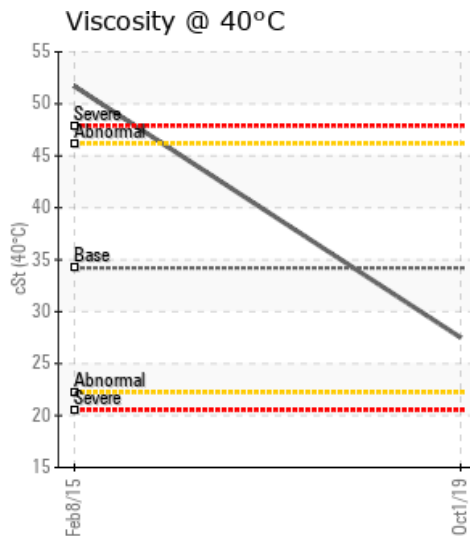
NORMAL   ABNORMAL   CRITICAL
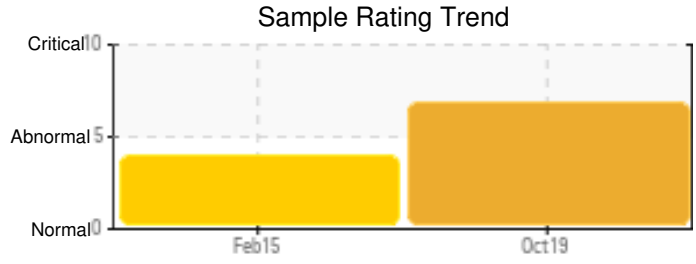
Sample Rating Trend

[10-36-65-25W5] ARC RESOURCES - SIMONETTE

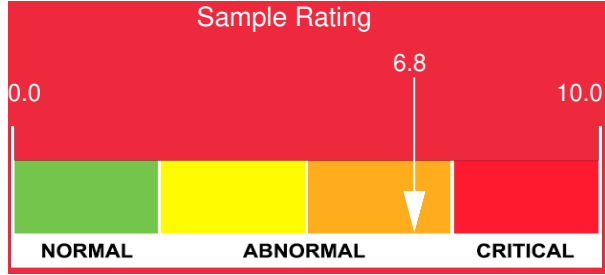| Customer: PTRHTF20046	System Information	Sample Information
QUADRA CHEMICALS 12925 146TH STREET EDMONTON, AB T5L 2H6 CANADA Attn: Quadra Samples Tel: E-Mail: quadra_samples@quadra.ca	System Volume: 1400 ltr Bulk Operating Temp: 455F / 235C Heating Source: Blanket: Fluid: PETRO CANADA PETRO-THERM Make: U/K	Lab No: 02314442 Analyst: Peter Harteveld Sample Date: 10/01/19 Received Date: 10/15/19 Completed: 10/22/19

Recommendation: *** Too much water present to do COC Flash Point ***Sample results show that excessive water has contaminated the heat transfer fluid. This excess water may also have contributed to the fluids increase in Acid Number- indicator of oxidation. % boil-off <335C can indicate thermal degradation and the 90% distillation can be indicative of oxidation, but the excess water content may also have influenced the distillation results. The high water content may be the result of taking the sample from a low drain point without flushing the sample point first. If the fluid contains this much water it is recommended to drain free water from the bottom of the system and boil-off the remaining water at a temperature of 105C. If the system volume is 1400 ltr (which was not listed on the analysis request form) it might be best to replace the fill. Please contact your Petro-Canada Tech Service Advisor for assistance.

Comments: Water contamination levels are severely high. Water contamination levels are severely high.. ppm Water contamination levels are severely high. ppm Water contamination levels are severely high.. Pentane Insolubles levels are abnormally high. Acid Number (AN) is abnormally high.
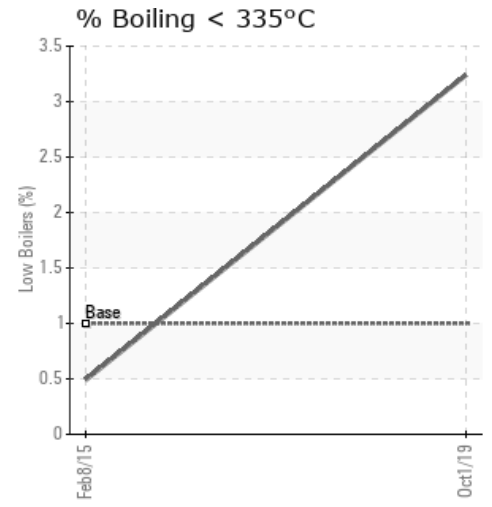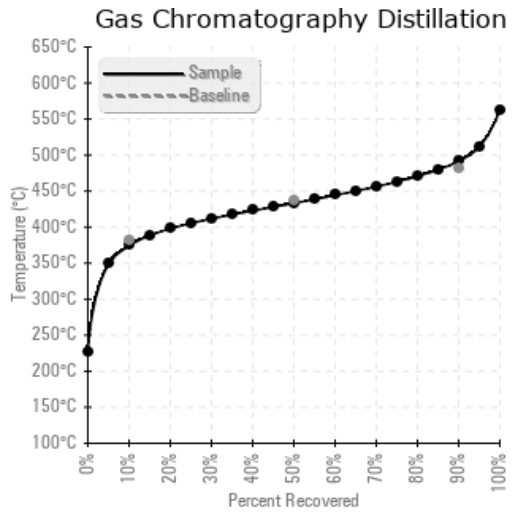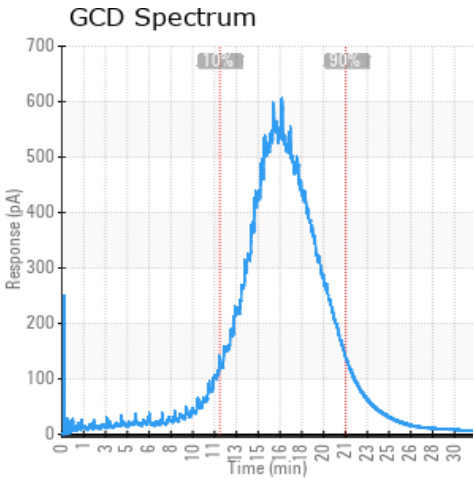
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
10/01/19	10/15/19	3y			7473.0	27.5	0.599	0.546	705 / 374	812 / 433	917 / 491	3.24
02/08/15	02/25/15	4y	BATH	367 / 186	25.4	51.7	0.03	0.028	803 / 429	866 / 464	917 / 492	0.49
Baseline Data				433 / 223		34.2	0.03		720 / 382	817 / 436	900 / 482	1.00

Acid Number

Viscosity @ 40°C

Flash Point (°C)

Sample Rating

0.0 — 6.8 — 10.0

NORMAL | ABNORMAL | CRITICAL

Sample Rating Trend

Critical 10 — Abnormal 5 — Normal 0

Feb15 — Oct19
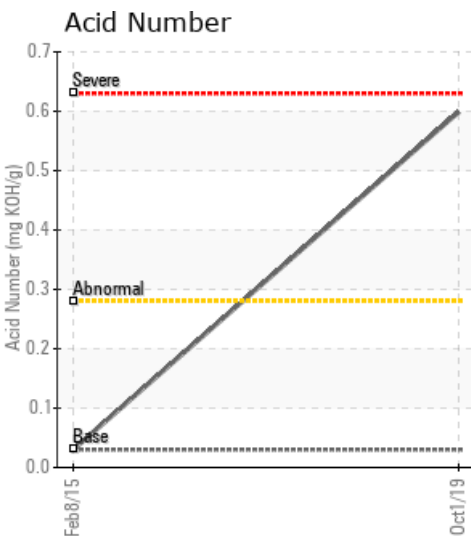
Sample Date	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorus	Zinc
10/01/19	23	0	0	2	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0
02/08/15	7	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	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%]

GCD Spectrum

Gas Chromatography Distillation

% Boiling < 335°C

Historical Comments

| 02/08/15 | The fluid is in reasonable condition and suitable for further use. The distillation curve data is not typical for Petro-Therm. There are two possibilities for the current characteristics of the fluid:1. The fluid is oxidized as a result of contact with air at high temperature. TAN and Flash Point do not support this.2. The fluid is in fact a heavier fluid than Petro-Therm or a heavier fluid mixed with Petro-Therm. The Flash Point indicates Thermal Degradation taking place.The suggested actions based on the above are:1. Check/(re) install blanket gas on the expansion tank.2. Vent off the low boiler vapors formed as a result of thermal degradation via the thief hatch on the expansion tank.For proper venting practices, contact your Petro-Canada Technical Service Advisor. Please re-sample in 6 months. (GCD) 10% Distillation Point is severely high. (GCD) 50% Distillation Point is abnormally high. Visc @ 40°C is abnormally high. COC Flash Point is marginally low. |