

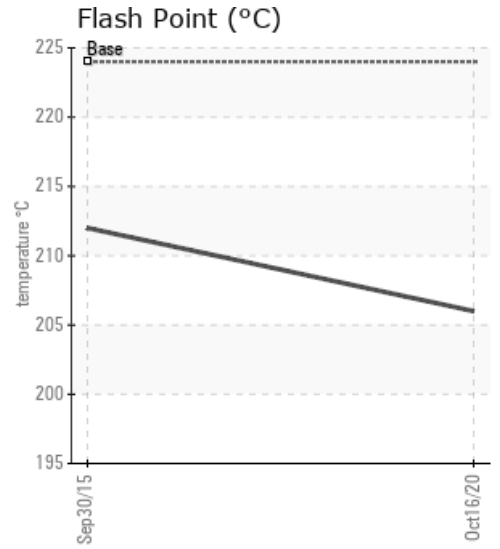
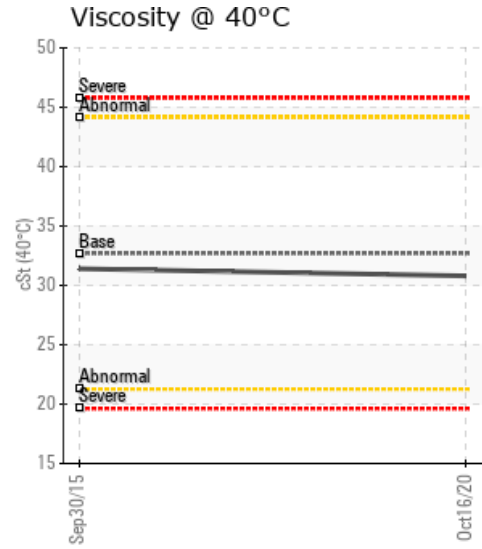
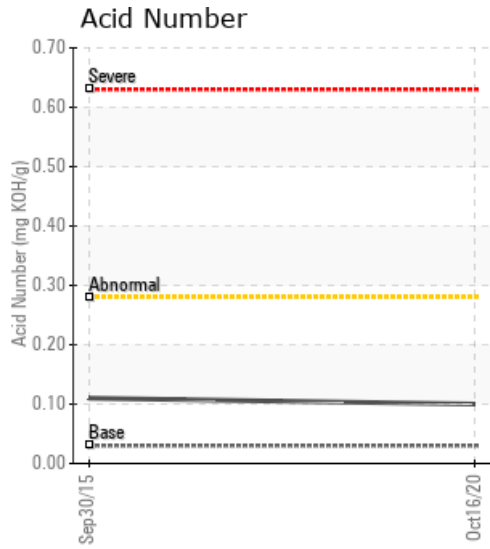
# HOT OIL SYSTEM

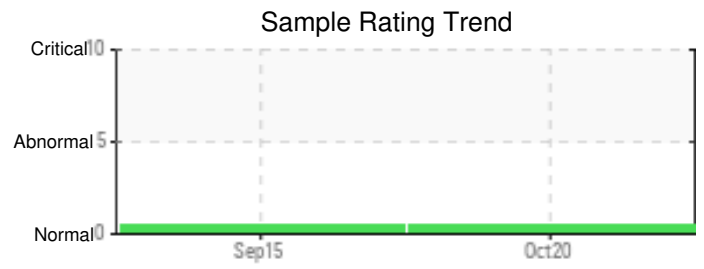
Customer: PTRHTF20165	System Information	Sample Information
Alberta Innovates Technology Future... 250 Karl Clark Rd Edmonton, AB T6N 1E4 Canada Attn: Jeff Maunder Tel: (780)450-5219 E-Mail: jeff.maunder@innotechalberta.ca	System Volume: 600 ltr Bulk Operating Temp: 446F / 230C Heating Source: Blanket: Fluid: PETRO CANADA CALFLO AF Make: THERMAL FLUID SYSTEM	Lab No: 02386373 Analyst: Yutong Gao Sample Date: 10/16/20 Received Date: 11/10/20 Completed: 11/12/20 Yutong Gao yutong.gao@petrocanadalsp.com

Recommendation: The current fluid properties are very similar to the sample on Sept 30th, 2015. The oil viscosity and flash point are normal. There is minimum water contamination. The solid content is low. The oil oxidation is minimum as well. Please continue to run the fluid and take one sample in 3~5 years to monitor the conditions.

Comments:

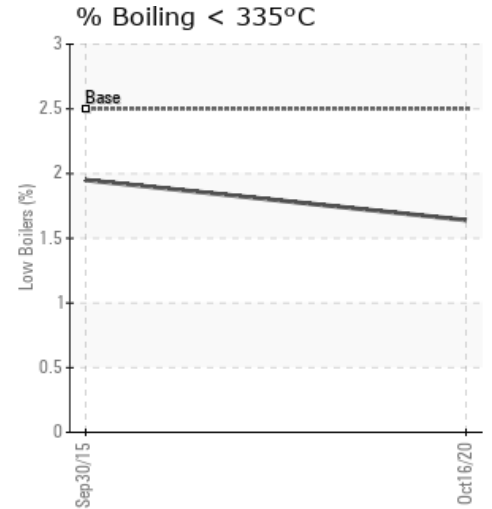
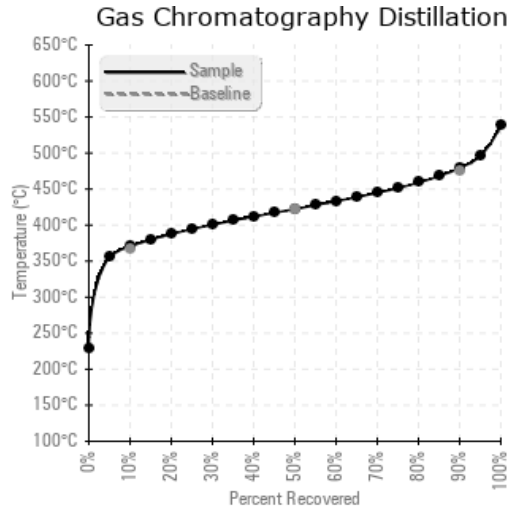
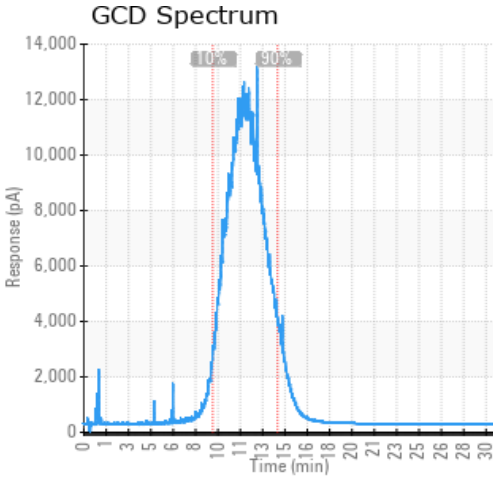
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
10/16/20	11/10/20	17y	Above Heater pump	403 / 206	12.6	30.8	0.10	0.076	699 / 370	792 / 422	895 / 479	1.64
09/30/15	10/06/15	0y		414 / 212	13.1	31.4	0.11	0.040	689 / 365	784 / 418	887 / 475	1.95
Baseline Data				435 / 224		32.7	0.03		693 / 367	790 / 421	887 / 475	2.5





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
10/16/20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	82	0
09/30/15	2	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	75	1
<b>Baseline Data</b>			0	0						0		0	0					0					270	

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



### Historical Comments

09/30/15	Note the sample colour is darker than new oil values (indicative of the oils age) however all results appear to be within normal ranges. This darker colour could be an indicator of carboning up of the heat transfer surfaces. This can cause the syetem to require more energy to produce the same amount of heat and make the system inefficient. Also note the intial boiling point is decreasing from new oil values indicating that thermal cracking may be occurring (also aligns with the dark colour of the oil). Also note the decreasing flash point.