

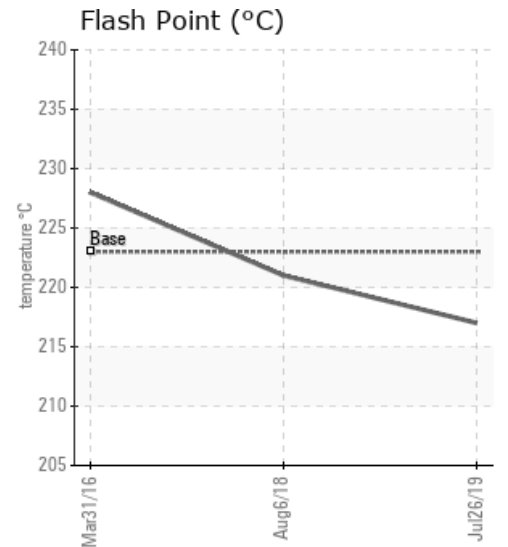
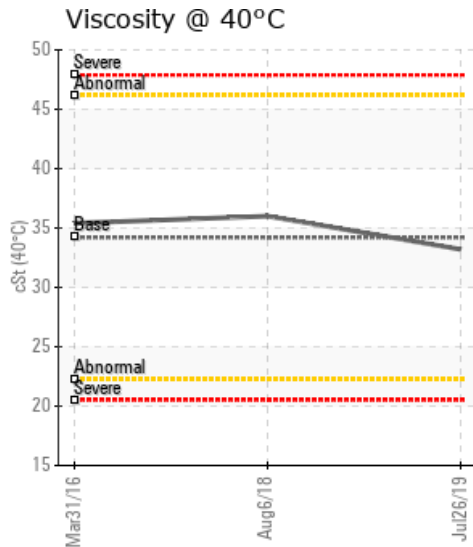
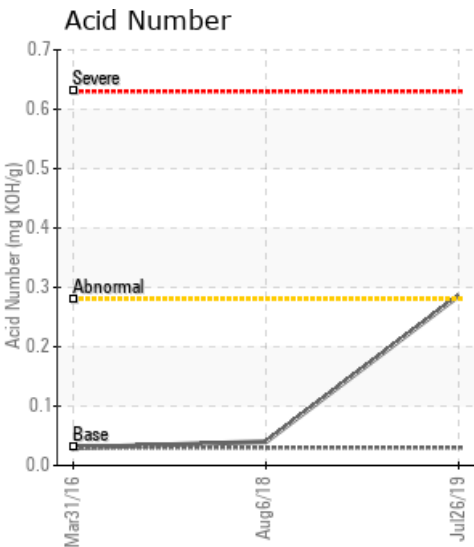
Cold Springs LSP Heat Medium

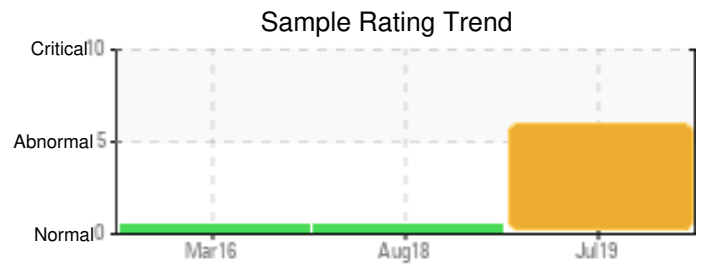
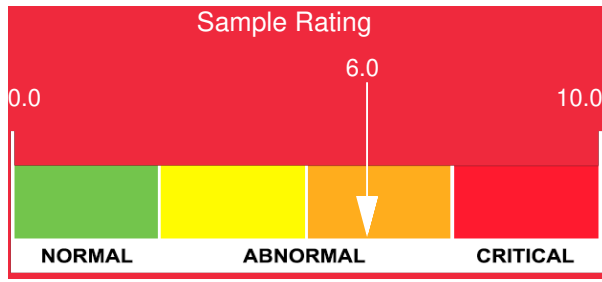
Customer: PTRHTF10200	System Information	Sample Information
TransCanada 8616 ANR Storage Rd Mancelona, MI 49659 USA Attn: Caleb Hershberger Tel: E-Mail: caleb_hershberger@transcanada.com	System Volume: 6200 gal Bulk Operating Temp: 500F / 260C Heating Source: Blanket: Fluid: PETRO CANADA PETRO-THERM Make: ALCO	Lab No: 02301671 Analyst: Yvette Trzcinski Sample Date: 07/26/19 Received Date: 08/08/19 Completed: 08/14/19

Recommendation: Customer mentioned have a ruptured tube in the reboiler, system has been shut down and not running - sample from the bottom of the heater. acid number is starting to increase due to oxidation the water will accelerate oxidation it is important to remove it. Recommend draining off water as much as possible from low points in the system. Start system slowly until all the water is driven out of the system. resample in 2-3 months.

Comments: Water contamination levels are severely high. Water contamination levels are severely high.. ppm Water contamination levels are severely high. Acid Number (AN) is abnormally high.

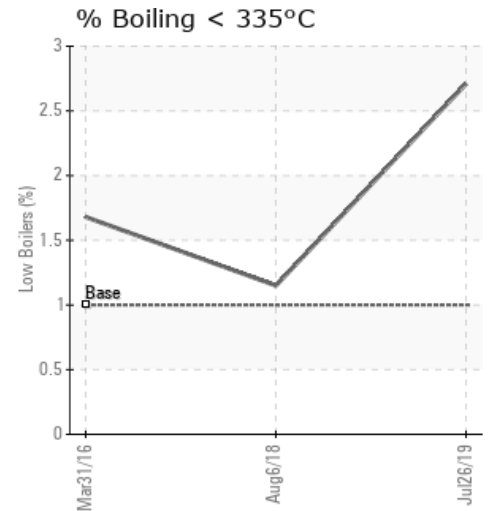
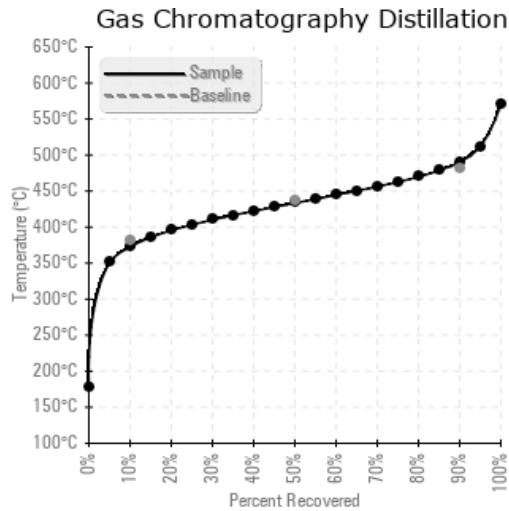
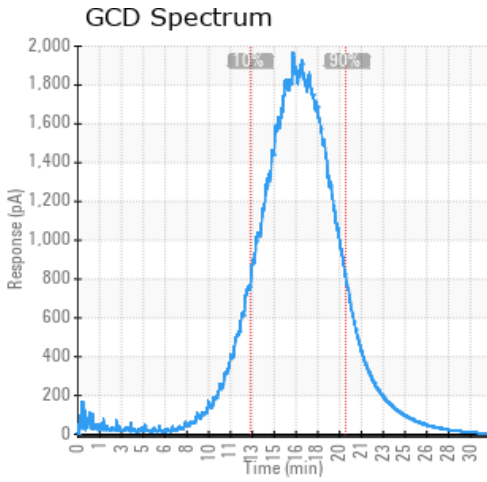
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
07/26/19	08/08/19	8h	BOTTOM OF HMO HEATER	423 / 217	2030.1	33.2	0.286	0.389	703 / 373	812 / 433	914 / 490	2.71
08/06/18	08/13/18	5h	PUMP FEED LINE	430 / 221	6.6	36.0	0.04	0.097	704 / 374	801 / 427	903 / 484	1.15
03/31/16	04/08/16	15000h	LSP SAMPLE PORT	442 / 228	132.0	35.4	0.03	0.049	708 / 376	810 / 432	914 / 490	1.68
Baseline Data				433 / 223		34.2	0.03		720 / 382	817 / 436	900 / 482	1.00





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
07/26/19	23	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	2	0	0	0
08/06/18	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03/31/16	2	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Baseline Data			0	0						0			0	0					0				0	

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



Historical Comments	
08/06/18	Oil is in good condition slight increase in viscosity and changes in boiling points that suggest seeing some degradation but insolubles and total acid number are low as well as contaminates and water. Resample at normal interval
03/31/16	Oil is in excellent condition. Please resample again in one years time.

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