

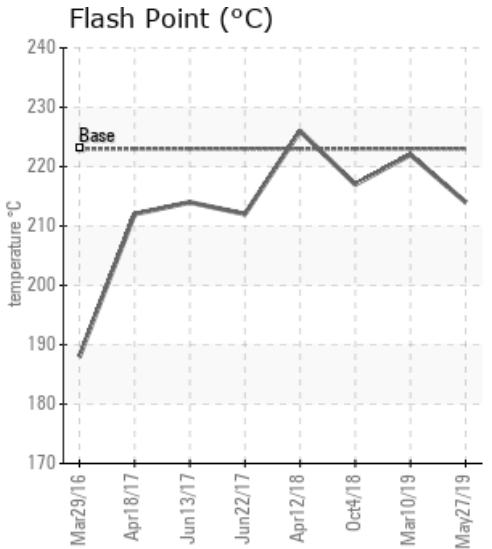
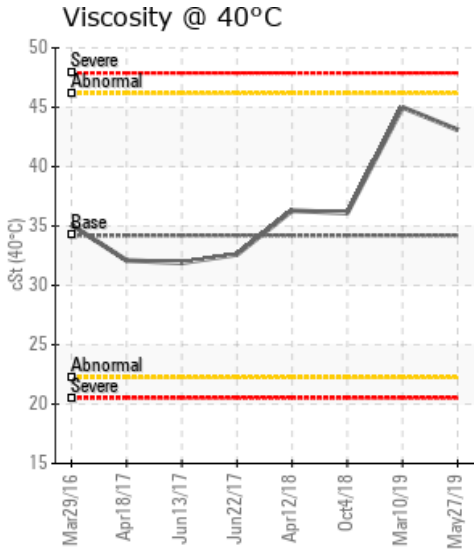
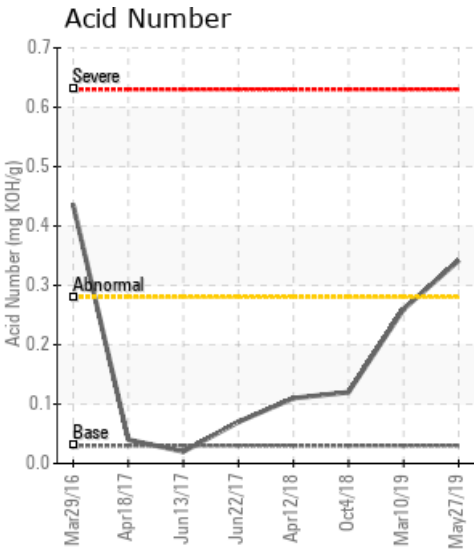
[7-36-58-03W6 SMOKEY] H5040 CONDENSATE LINE HEATER

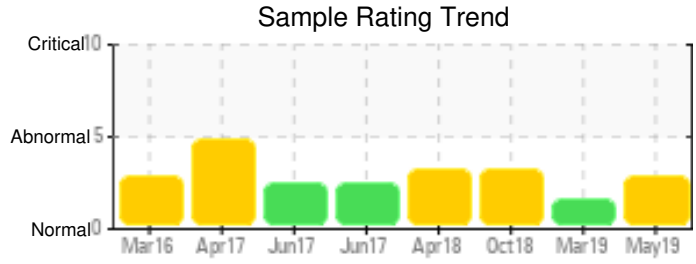
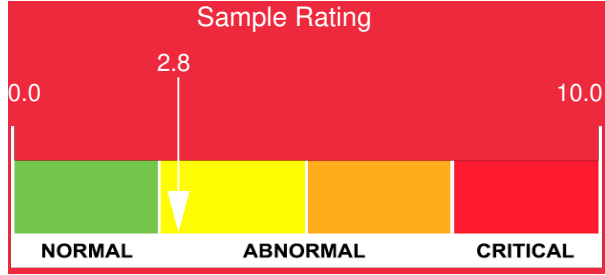
Customer: PTRHTF20103	System Information	Sample Information
CNRL P.O. BOX 6808 EDSON, AB T7E 1L5 Canada Attn: Rodney Marcichiw Tel: (780)517-3542 E-Mail: rodney.marcichiw@cnrl.com	System Volume: 16000 ltr Bulk Operating Temp: 374F / 190C Heating Source: Blanket: Fluid: PETRO CANADA PETRO-THERM Make: ALCO	Lab No: 02289704 Analyst: Clinton Buhler Sample Date: 05/27/19 Received Date: 06/07/19 Completed: 06/20/19

Recommendation: Sample results indicate that there are several parameters of concern although some values appear healthy. Distillation levels are not concerning at this point although it may be that they appear healthy because of two opposing degradation modes. The fluid's Acid Number has increased to 0.342 from 0.26 with a corresponding 62 ppm of Iron which can be a result of increased corrosion. Solids content is at 1.51% which is above the 0.5% alarm threshold. Speaking with Rodney Marcichiw, it is understood that the bulk oil temperature was increased some time ago in order to maintain the target condensate temperature (from 145C to 190C). That, and it is understood that operations has been continually venting off vapors and there are noises from around the fire tubes. Water content is very low now, so it is possible that the vapors that are continually being vented may be low boiling vapors as a result of thermal degradation (cracking of the oil molecules). The fluid's viscosity of 43 cSt can be a function of both oxidation (see acid number increase) as well as thermal degradation (vapor formation, solids content and reduced heating efficiency). As discussed, please obtain another sample in 1 month to verify results, after which time further discussions should be had to make a plan to restore system operation.

Comments:

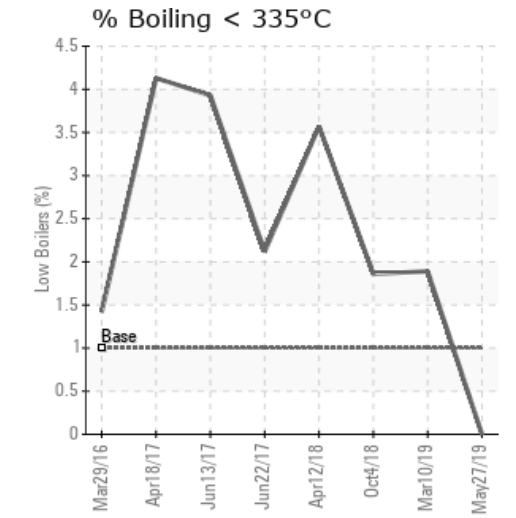
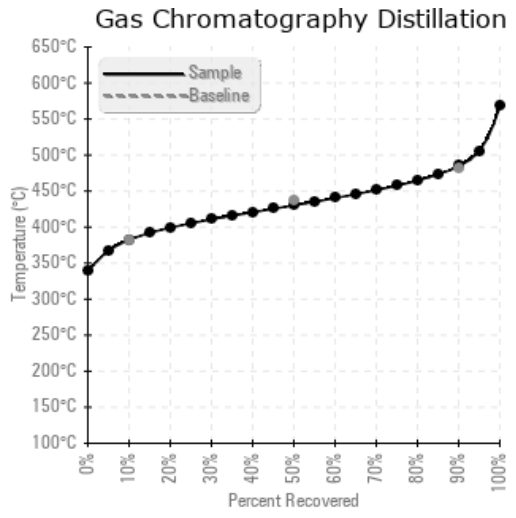
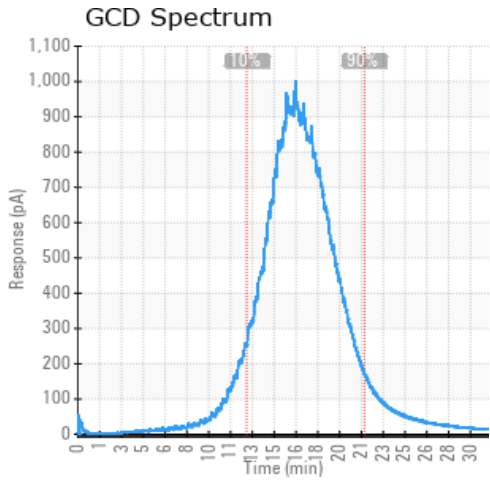
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
05/27/19	06/07/19	10y	BOTTOM OF HEATER	417 / 214	64.1	43.1	0.342	1.51	720 / 382	806 / 430	904 / 485	0.00
03/10/19	03/20/19	10y	BOTTOM OF HEATER	432 / 222	146.3	45.0	0.26	1.80	710 / 376	804 / 429	900 / 482	1.89
10/04/18	11/15/18	0y		423 / 217	577.4	36.1	0.12	0.401	690 / 366	783 / 417	877 / 470	1.86
04/12/18	04/24/18	0y		439 / 226	414.9	36.3	0.11	0.577	695 / 368	802 / 428	909 / 487	3.57
06/22/17	07/06/17	0y	BOTTOM OF HEATER	414 / 212	428.7	32.6	0.07	0.180	708 / 376	810 / 432	920 / 494	2.12
06/13/17	06/20/17	0y	BOTTOM DRAIN	417 / 214	906.0	31.9	0.02	0.526	694 / 368	805 / 429	902 / 484	3.93
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
05/27/19	64	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03/10/19	101	0	0	4	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0
10/04/18	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04/12/18	18	0	0	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
06/22/17	3	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0
06/13/17	4	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	
03/10/19	The fluid is in good condition and suitable for further use but the viscosity is slightly high and the solids content is high. Filtration of the fluid is recommended. Please re-sample in 6 months or after filtration has taken place. (whichever comes first) Pentane Insolubles levels are severely high.
10/04/18	The fluid is in good condition and suitable for further use. The water content of the fluid is slightly high. Please boil-off and vent to atmosphere. Pentane Insoluble (solids) content has decreased compared with the previous sample. It is still close to the reportable limit (0.5%) and therefore it would be good to start filtration of the fluid. The 90% GCD temperature is low and so is the distillation curve as a whole. This is no concern at this time. Please re-sample in 6 months. Pentane Insolubles levels are abnormally high. Water contamination levels are marginally high. ppm Water contamination levels are marginally high. (GCD) 90% Distillation Point is marginally low.
04/12/18	Water content is marginally high, however has improved since last sample. Pentane insoluble is also high. Flash point has improved. Consider venting system from high point to eliminate water. Continue to operate and resample in 6 - 8 months Pentane Insolubles levels are severely high. Water contamination levels are marginally high. Water contamination levels are marginally high.. ppm Water contamination levels are marginally high.
06/22/17	The water content of the fluid has decreased significantly but is still elevated. Venting to atmosphere on a weekly basis will lower this further. The solids content of the fluid has decreased significantly and is now at an acceptable level. The 90% GCD temperature is slightly high indicating some fluid oxidation has taken place. Aside from removing blanket gas during periods of venting, please ensure blanket gas is in place during operation. The fluid is suitable for further use. Please re-sample in 6 months. Water contamination levels are marginally high. Water contamination levels are marginally high.. ppm Water contamination levels are marginally high.
06/13/17	The water content of the fluid is high. The combination of slightly elevated boil-off below 335 degrees C and the low 10% GCD temperature indicates thermal degradation of the fluid. This is normal and of no concern at this time but venting/boil-off to atmosphere is recommended to reduce the water- and low boiler vapor content. Pentane Insoluble (solids) content is at the warning limit. Again no concern at this time but as the solids content increases over time filtration of the fluid has to be considered. The fluid is suitable for further use. Please re-sample in 6 months. When sending in the next sample please list fluid service life on the sample label. Water contamination levels are abnormally high. ppm Water contamination levels are abnormally high. Pentane Insolubles levels are abnormally high.

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