

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

**Customer: PTRHTF20103**  
 CNRL  
 P.O. BOX 6808  
 EDSON, AB T7E 1L5 Canada  
 Attn: Rodney Marcichiw  
 Tel: (780)517-3542  
 E-Mail: rodney.marcichiw@cnrl.com

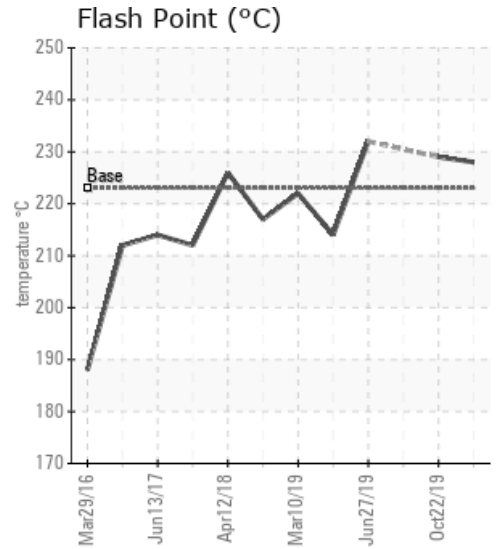
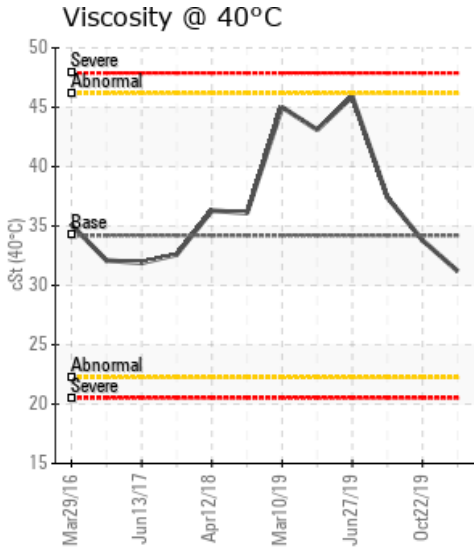
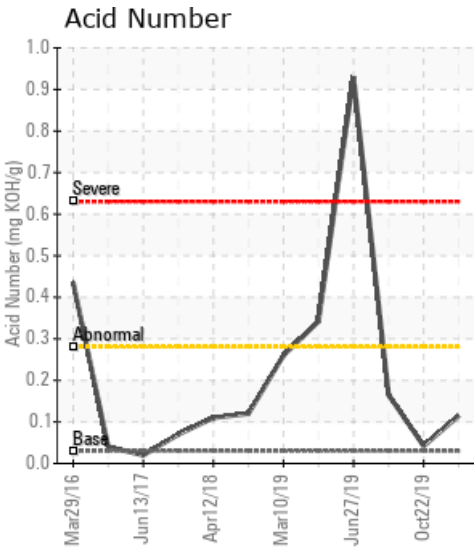
**System Information**  
 System Volume: 15400 ltr  
 Bulk Operating Temp: 374F / 190C  
 Heating Source:  
 Blanket:  
 Fluid: PETRO CANADA PETRO-THERM  
 Make: ALCO

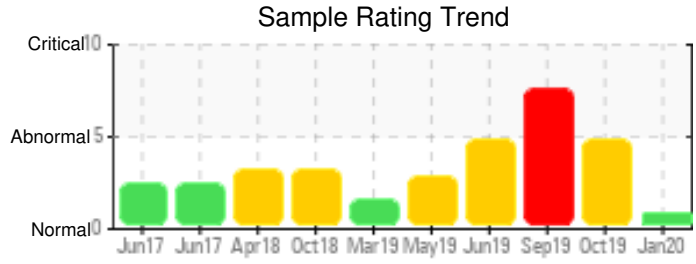
**Sample Information**  
 Lab No: 02334956  
 Analyst: Peter Harteveld  
 Sample Date: 01/23/20  
 Received Date: 01/30/20  
 Completed: 02/07/20  
 Peter Harteveld  
 peter.harteveld@petrocanadalsp.com

Recommendation: The fluid is in good condition and suitable for further use. Water content is low. AN and Fe are low which means there is no corrosion taking place as the result of earlier high water content. Boiling off the water to atmosphere has been successful. The 90% GCD temperature is slightly low and so is the viscosity. This can be an indication of a mix with a lighter fluid such as an initial leak of process fluid into the Petro-Therm. The Flash Point is normal and does not support this theory. Since it is suspicious, also because of the noted gurgling sound coming from the system, please re-sample in 3 months.

Comments: (GCD) 90% Distillation Point is marginally low.

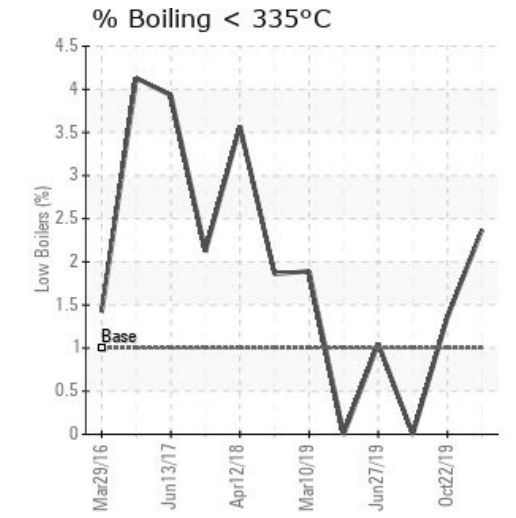
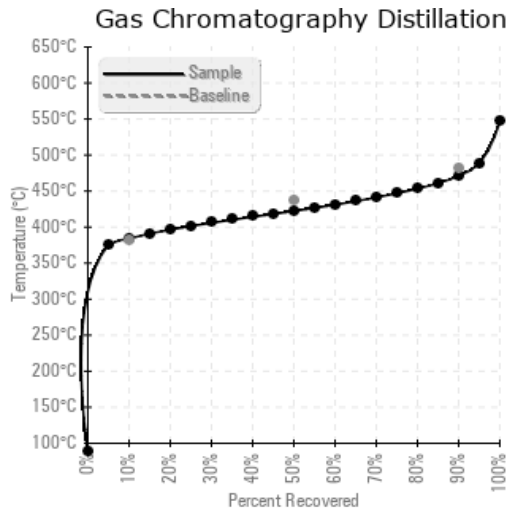
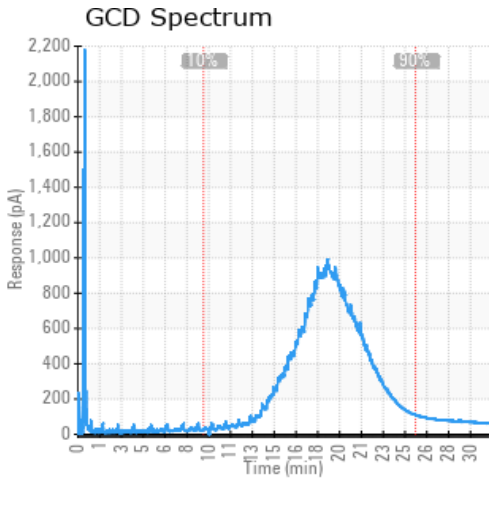
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
01/23/20	01/30/20	4m	BOTTOM OF HEATER	442 / 228	172.5	31.2	0.115	0.066	723 / 384	792 / 422	880 / 471	2.37
10/22/19	10/25/19	3m	BOTTOM OF VESSEL	444 / 229	3002.6	33.8	0.042	0.090	711 / 377	806 / 430	904 / 485	1.36
09/30/19	10/07/19	2m			3580	37.4	0.165	0.275	744 / 396	835 / 446	936 / 502	0.00
06/27/19	07/05/19	10m	BOTTOM OF HEATER	450 / 232	114.8	45.9	0.930	1.86	710 / 377	802 / 428	901 / 483	1.05
05/27/19	06/07/19	10m	BOTTOM OF HEATER	417 / 214	64.1	43.1	0.342	1.51	720 / 382	806 / 430	904 / 485	0.00
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	
01/23/20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	
10/22/19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09/30/19	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	6	8	
06/27/19	87	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
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	
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	
10/22/19	The fluid is in a good condition and suitable for further use but the water content is high. This sample was taken to verify the water content of the previous sample. The current sample confirms that the water content is indeed too high. Water should be boiled off to atmosphere. This amount of water in the fluid should be audible by knocking sounds within the heater. Please contact your Petro-Canada Tech Service Advisor to discuss further steps. Water contamination levels are severely high. Water contamination levels are severely high.. ppm Water contamination levels are severely high.
09/30/19	*** NOTE: Could not do flash point as a result of the high water level in sample *** In July a recommendation was made to clean the system and replace the fluid based on poor, non-reversible condition of the fluid. Given 2 weeks fluid service life reported, the cleaning must have taken place recently. The analysis shows that a lot of water (high pressure washing ?) was left behind. This water needs to be boiled off at appr. 105 degrees C to avoid a boil-over. It can also be drained off from a bottom drain valve as free water after letting it settle. Aside from the high water content, the fluid is in good condition and suitable for use. The 90% GCD temperature is high but can be influenced by the high water content. Please re-sample after boiling-off/draining the water. Water contamination levels are severely high. Water contamination levels are severely high.. ppm Water contamination levels are severely high. (GCD) 90% Distillation Point is severely high.
06/27/19	It was reported verbally that the system operated without blanket gas. The results of that can be seen in this analysis. TAN is high at 0.93 which is close the condemning limit of 1. Fe content is elevated. This can be corrosion due to the high acidity of the fluid. These parameters in combination with a somewhat high viscosity indicate degradation of the fluid by oxidation. This happens when the hot fluid comes into contact with oxygen which can occur when the blanket gas is removed. The Pentane Insoluble (solids) content of the fluid is high (1.86%). This is more than 3x the reportable limit of 0.5%. A high solids content like this will cause depositing of carbonaceous material on system internals and reduce efficiency of heat transfer. The condition of the fluid is poor and because of the increasing TAN no longer suitable for further service. It is therefore recommended to clean the system and replace the fluid. For support with cleaning, filling and start-up of the system please contact your Petro-Canada Technical Service Advisor. Pentane Insolubles levels are severely high. Acid Number (AN) is severely high.
05/27/19	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 0.25 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 Marcichew, 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.

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