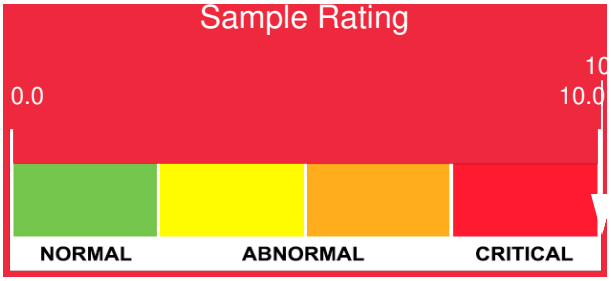
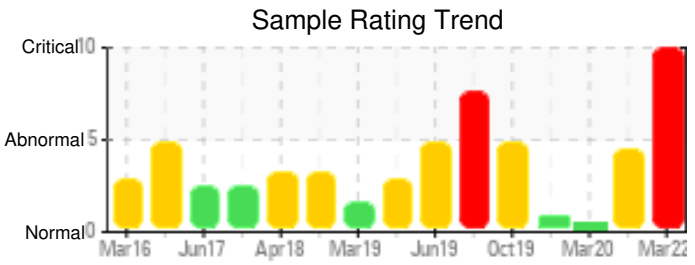




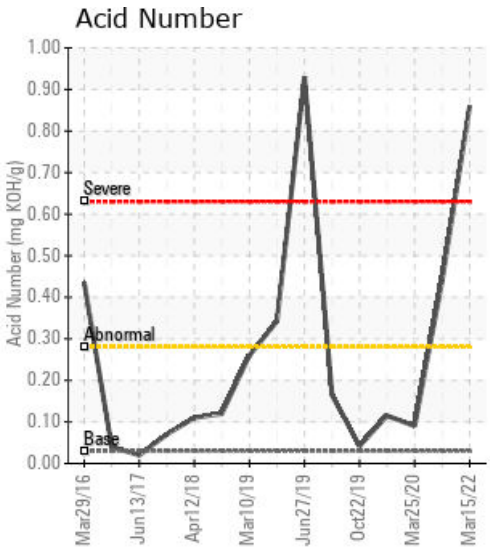
[CNRL 7-36-58-03W6] H5040 CONDENSATE LINE HEATER

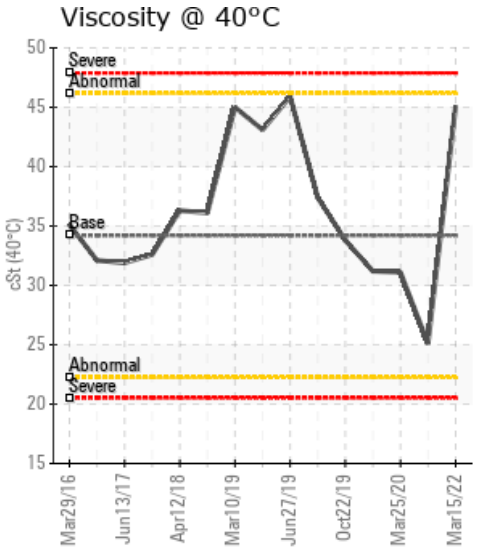
Customer: PTRHTF20103	System Information	Sample Information
CANADIAN NATURAL RESOURCES (CNRL) P.O. BOX 6808 EDSON, AB T7E 1L5 Canada Attn: Rodney Marcichiw Tel: (780)517-3542 E-Mail: rodney.marcichiw@cnrl.com	System Volume: 15400 ltr Bulk Operating Temp: 374F / 190C Heating Source: Blanket: Fluid: PETRO CANADA PETRO-THERM Make: ALCO	Lab No: 02478651 Analyst: Clinton Buhler Sample Date: 03/15/22 Received Date: 03/22/22 Completed: 03/25/22 Clinton Buhler Clinton.Buhler@hollyfrontier.com

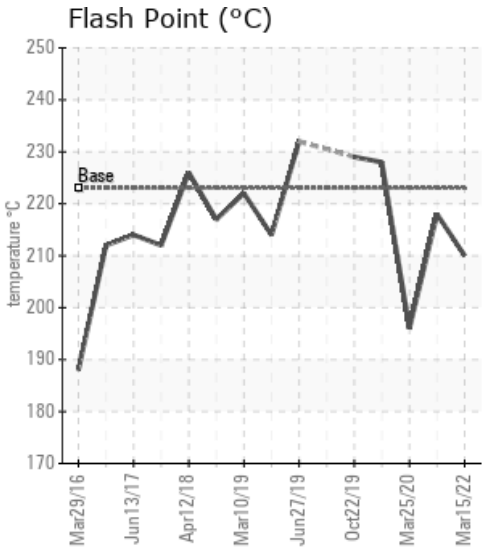
Recommendation: Potential corrosion may be ongoing as evidenced by elevated Iron level of 721 ppm and Acid Number of 0.86. This could be associated to the water contamination identified last sample and there is still ~799 ppm. The water along with fluid oxidation likely has contributed to the elevated fluid viscosity. Solids content identifies insolubles that can be associated with fluid degradation but is also very likely related to the spike in Iron. It is advised to re-sample system after further venting of water vapors. Please sample from a hot, turbulent zone. Pump discharge is ideal. Please ensure a thorough purge of the sample valve and tubing before taking a sample.Please re-sample in the next couple weeks after further venting. Fluid may require replacement pending these results.

Comments:

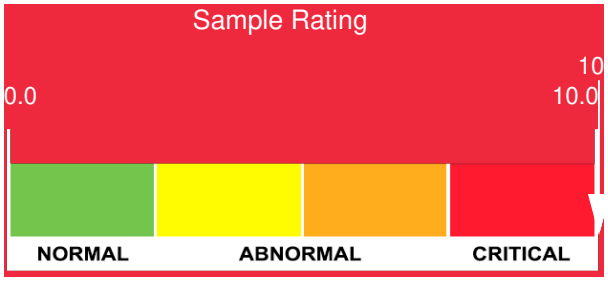
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
03/15/22	03/22/22	36.0m	Bottom of heater	410 / 210	799.5	45.1	0.86	1.05	722 / 383	815 / 435	913 / 489	1.72
10/13/20	10/20/20	24.0m	Bottom of heater	424 / 218	2536.7	25.1	0.44	0.189	715 / 379	813 / 434	912 / 489	2.73
03/25/20	04/03/20	17.0m	BOTTOM OF HEATER	385 / 196	55.3	31.1	0.09	0.093	723 / 384	815 / 435	911 / 488	1.33
01/23/20	01/30/20	4.0m	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	3.0m	BOTTOM OF VESSEL	444 / 229	3002.6	33.8	0.042	0.090	711 / 377	806 / 430	904 / 485	1.36
Baseline Data				433 / 223		34.2	0.03		720 / 382	817 / 436	900 / 482	1.00

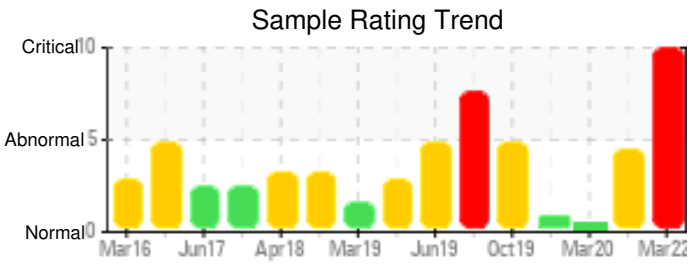






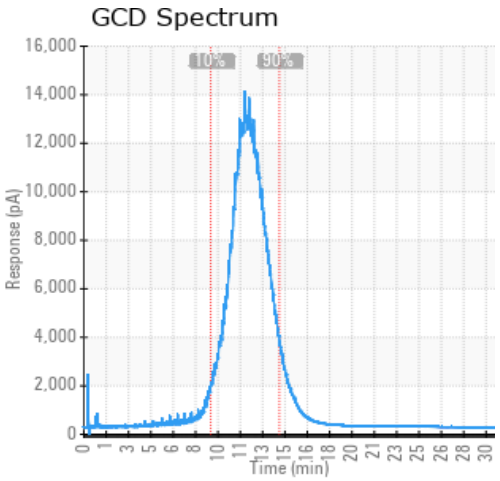
PETRO-CANADA LUBRICANTS

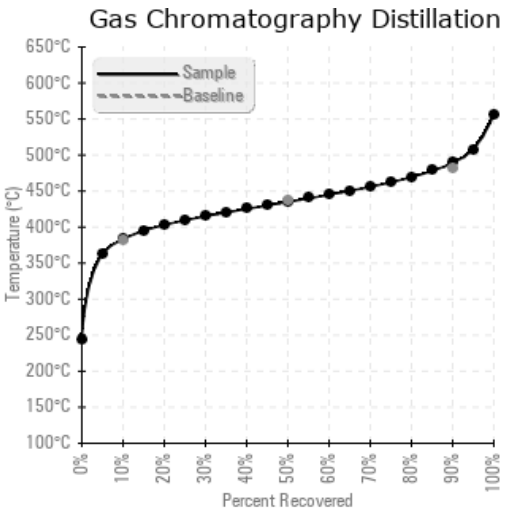


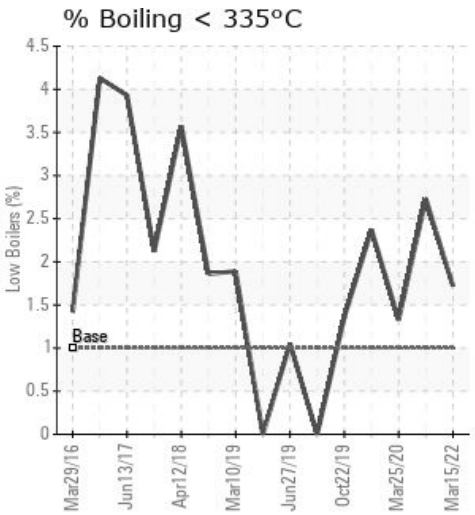


Sample Date	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorus	Zinc
03/15/22	721	0	0	3	0	0	0	0	0	0	1	0	0	0	0	0	14	0	1	0	0	0	0	0
10/13/20	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03/25/20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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
Baseline Data			0	0						0			0	0					0				0	

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







Historical Comments

10/13/20	The fluid is in a good condition and suitable for further use but the water content is high. 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. ppm Water contamination levels are severely high. Acid Number (AN) is abnormally high.
03/25/20	This is the re-run of the sample taken on March 25th when a low boiler vapor content of 6.48% was reported due to a GC fault. After GC repair the low boiler vapor content is 1.33%. The other parameters remain the same. The fluid is in a good condition and suitable for further use. There are indications of initial thermal degradation of the fluid. (Minor decreases in viscosity and Flash Point) At the moment this is not a problem and the initiative to install a pump to circulate the fluid will have a positive effect on the service life of the fluid.
01/23/20	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. (GCD) 90% Distillation Point is marginally low.
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.