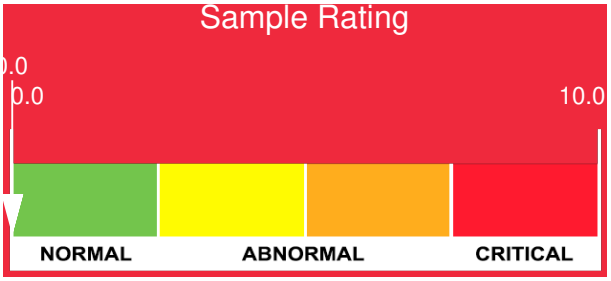
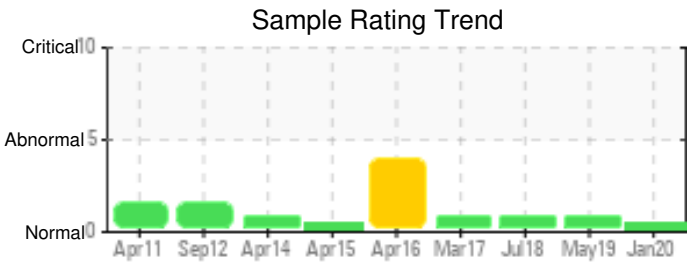




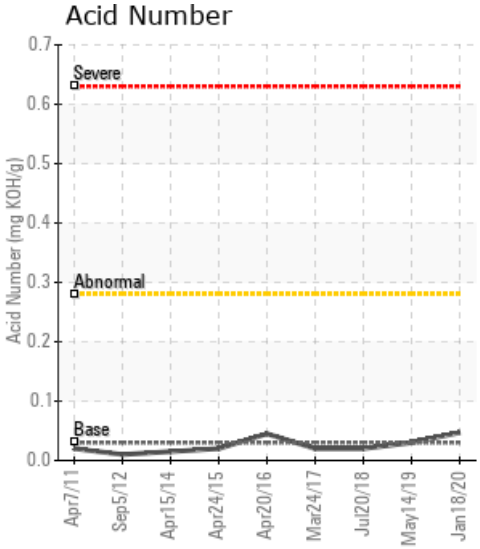
[CNRL KNOPCIK / LSD 09-10-74-1146] CNRL KNOPCIK

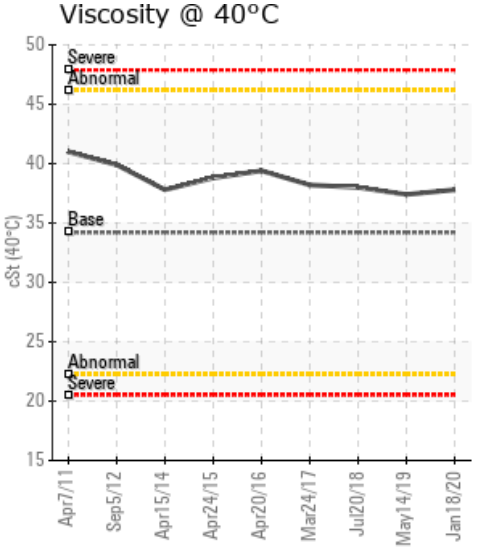
Customer: PTRHTF20048	System Information	Sample Information
CANADIAN NATURAL RESOURCES BOX 125 HYTHE, AB T0H 0C0 CANADA Attn: Ken Moon Tel: (280)831-0623 E-Mail: ken.moon@cnrl.com	System Volume: 30000 ltr Bulk Operating Temp: 437F / 225C Heating Source: Blanket: Fluid: PETRO CANADA PETRO-THERM Make: BORN/HEATEC	Lab No: 02334024 Analyst: Clinton Buhler Sample Date: 01/18/20 Received Date: 01/27/20 Completed: 02/04/20 Clinton Buhler Clinton.Buhler@PetroCanadaLSP.com

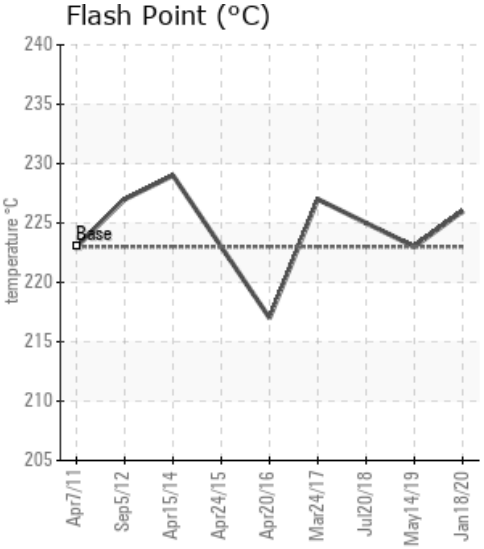
Recommendation: Sample results indicate that the heat transfer fluid is suitable for continued service. Please re-sample in 12 months

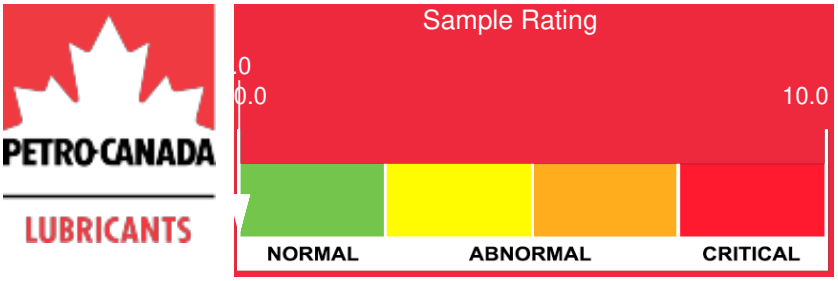
Comments:

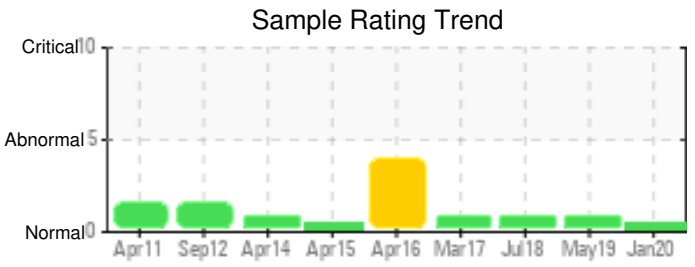
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
01/18/20	01/27/20	5y	9-10-74-11W6 KNOPCIK	439 / 226	8.3	37.8	0.047	0.053	733 / 390	813 / 434	890 / 477	0.00
05/14/19	07/30/19	11y	PUMP	433 / 223	325.0	37.4	0.030	0.054	722 / 384	823 / 439	915 / 491	0.85
07/20/18	08/22/18	10y	PUMP	437 / 225	10.8	38.0	0.02	0.027	721 / 383	793 / 423	872 / 467	0.00
03/24/17	04/27/17	0y		441 / 227	11.6	38.2	0.02	0.030	727 / 386	832 / 444	927 / 497	0.90
04/20/16	05/09/16	5y	PURGE LINE OFF TOP	423 / 217	9.2	39.4	0.045	0.086	760 / 404	845 / 452	976 / 525	0.00
Baseline Data				433 / 223		34.2	0.03		720 / 382	817 / 436	900 / 482	1.00





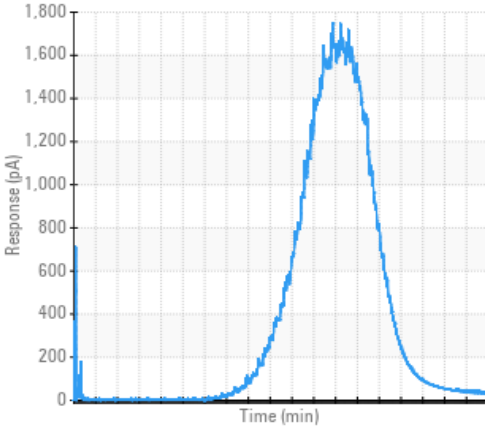


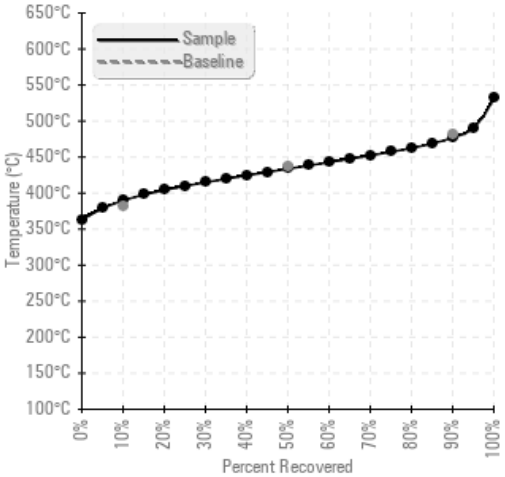


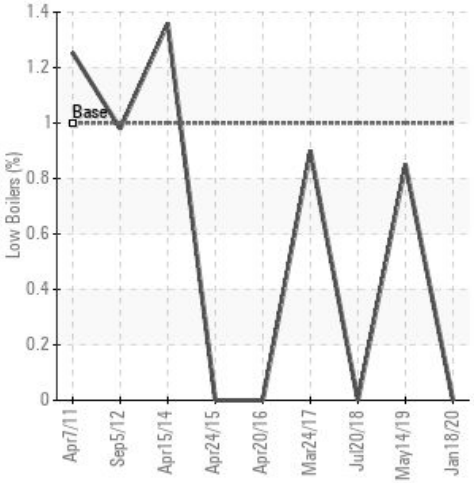


Sample Date	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorus	Zinc
01/18/20	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05/14/19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07/20/18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03/24/17	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
04/20/16	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

05/14/19	The fluid is in a good condition and suitable for further use. The sample contained some free water. This can occur when sample is taken from a low point. If not taken from a low point, boil-off water to atmosphere and/or drain free water from a low drain point. Please re-sample in 12 months.
07/20/18	Sample results indicate that the fluid is suitable for continued service. 90% GCD value is lower than previous samples; continue to monitor.Please pull another sample in 12 months.
03/24/17	sample results indicates that the fluid is suitable for continued service. 90% GCD is high. This can indicate heavier ends in the fluid which can be caused by mixing with a different fluid which is also related to the higher viscosity. Oxidation of the fluid can also cause increased 90% GCD and viscosity levels, but the low AN of the fluid doesn't suggest oxidation. Ensuring a functioning blanket gas system on the expansion tank helps to minimize oxidation.Continue to operate and re-sample in 12 months. (GCD) 90% Distillation Point is abnormally high.
04/20/16	GCD@ 90% has increased to 524.4 DEG C indicating some heavier ends in the fluid. This can be caused by contamination or by thermal cracking of fluid. Flash Point has dropped slightly but is still OK. Continue to operate and resample in 6 months. (GCD) 90% Distillation Point is severely high. Visc @ 40°C is abnormally high. (GCD) 10% Distillation Point is marginally high. (GCD) 50% Distillation Point is marginally high.