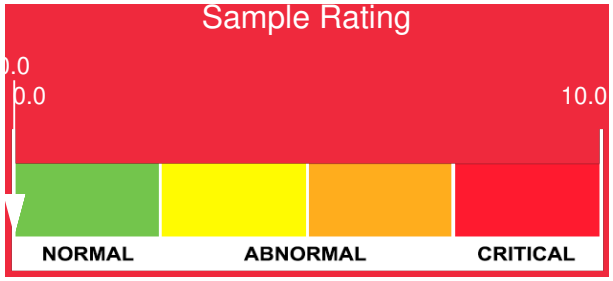
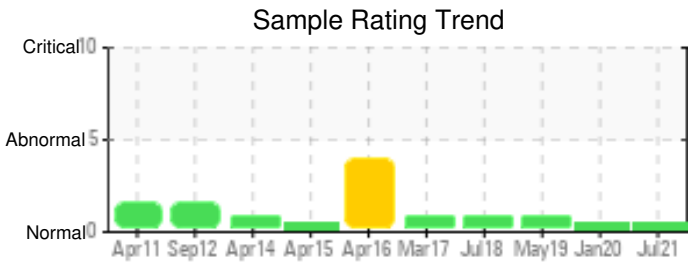




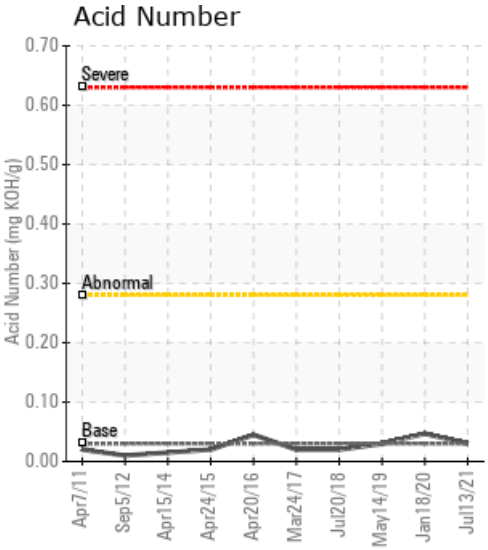
[CNRL KNOPCIK / LSD 09-10-74-1146] CNRL KNOPCIK

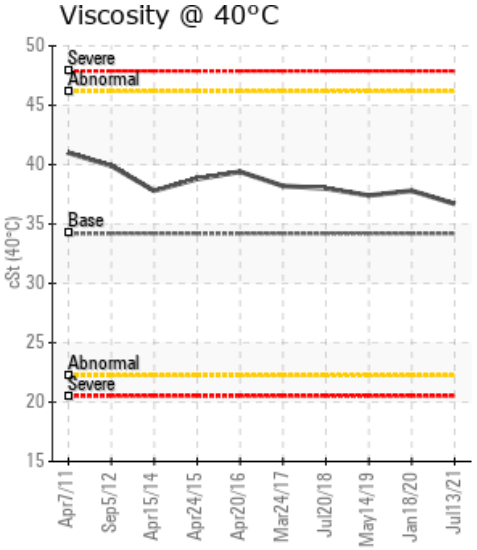
Customer: PTRHTF20048	System Information	Sample Information
CANADIAN NATURAL RESOURCES BOX 125 HYTHE, AB T0H 0C0 CANADA Attn: Ken Moon Tel: (280)831-0623 E-Mail: ken.moon@cnrl.com	System Volume: 30000 ltr Bulk Operating Temp: 437F / 225C Heating Source: Blanket: Fluid: PETRO CANADA PETRO-THERM Make: BORN/HEATEC	Lab No: 02444484 Analyst: Clinton Buhler Sample Date: 07/13/21 Received Date: 09/16/21 Completed: 10/04/21 Clinton Buhler Clinton.Buhler@hollyfrontier.com

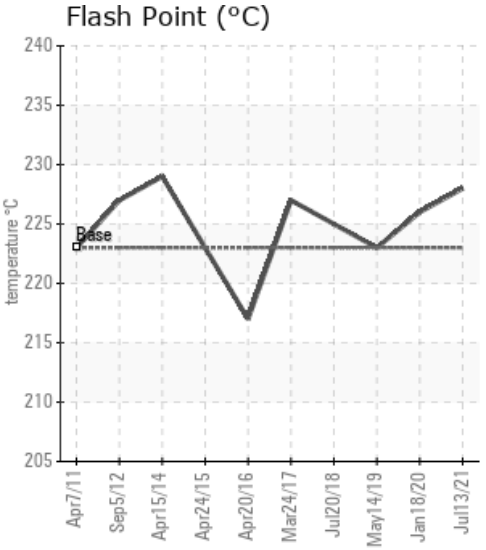
Recommendation: Analysis results indicate that the fluid is in suitable condition for continued service.Please re-sample in 12 months

Comments:

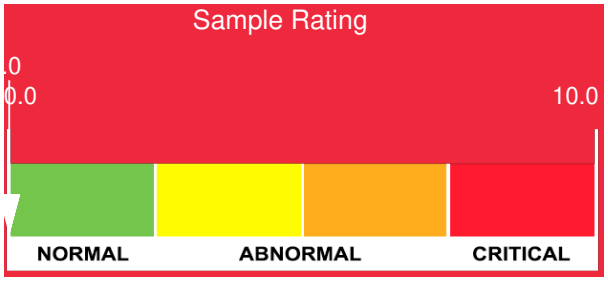
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
07/13/21	09/16/21	0.0y	hot oil pump	442 / 228	8.2	36.7	0.03	0.006	728 / 387	822 / 439	912 / 489	1.29
01/18/20	01/27/20	5.0y	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	11.0y	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	10.0y	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	0.0y		441 / 227	11.6	38.2	0.02	0.030	727 / 386	832 / 444	927 / 497	0.90
Baseline Data				433 / 223		34.2	0.03		720 / 382	817 / 436	900 / 482	1.00

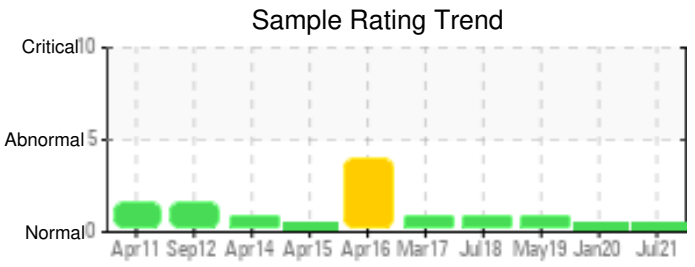






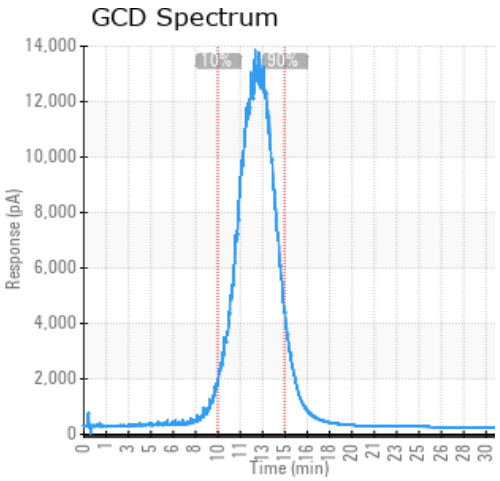
PETRO-CANADA LUBRICANTS

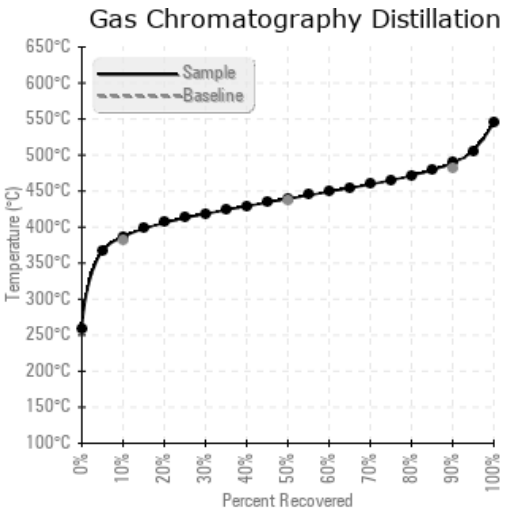


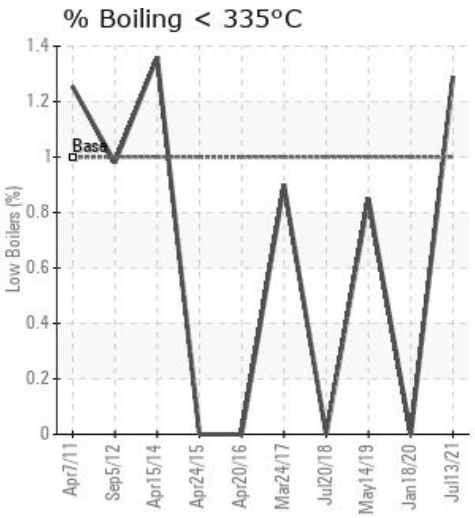


Sample Date	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorus	Zinc
07/13/21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01/18/20	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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
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

01/18/20	Sample results indicate that the heat transfer fluid is suitable for continued service. Please re-sample in 12 months
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.