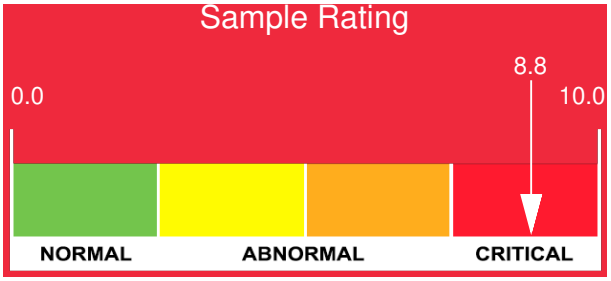
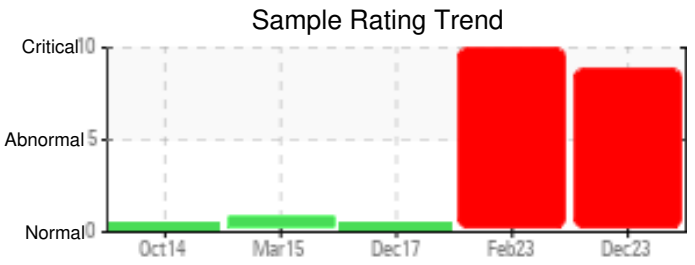




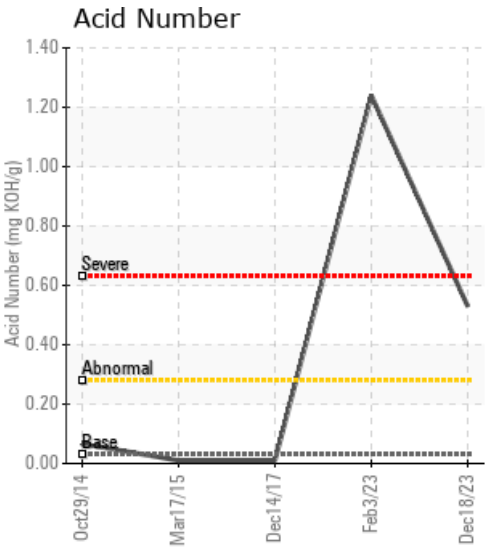
[LSD#B-88-I/94-B-1] 049 HEAT MEDIUM

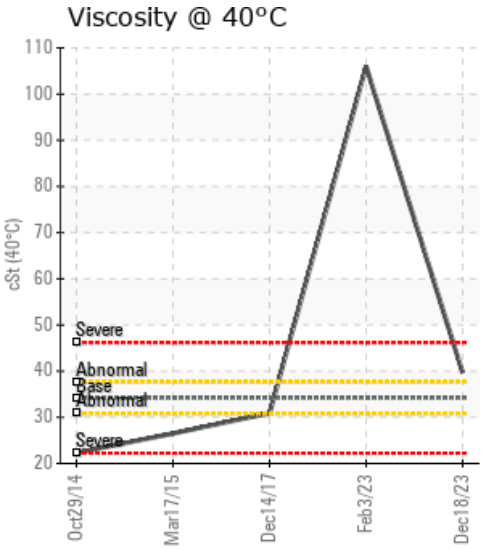
Customer: PTRHTF60051	System Information	Sample Information
Canadian National Resources - CNRL Fort St John, BC V1J 1B2 CA Attn: Austin Furgiuele Tel: (250)263-3445 E-Mail: austin.furgiuele@cnrl.com	System Volume: 2000 ltr Bulk Operating Temp: 392F / 200C Heating Source: Blanket: Fluid: PETRO CANADA PETRO-THERM Make: ZIRCO	Lab No: 02606858 Analyst: Clinton Buhler Sample Date: 12/18/23 Received Date: 01/05/24 Completed: 01/08/24 Clinton Buhler Clinton.Buhler@HFSinclair.com

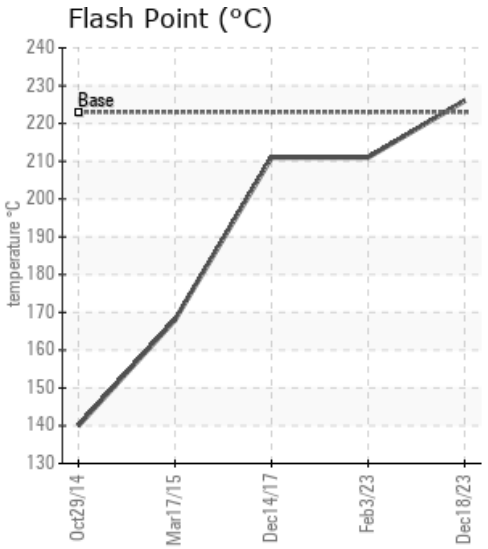
Recommendation: Sample results indicate the fluid quality has improved since the last sample in 2023, yet there are still indications of residual degraded fluid and solids in the system. Iron content remains high at 204 ppm; Acid Number is still moderately high at 0.53 (limit is 1); fluid viscosity is still above fresh at 39.7 cSt @40C. Solids content is elevated at 0.872 (limit is 0.5%) and likely consists of both iron particles and fluid degradation particulate. At the next available system outage/turnaround, system should be cleaned and filled with fresh fluid.

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	%
12/18/23	01/05/24	0.0m		439 / 226	50	39.7	0.53	0.872	727 / 386	817 / 436	921 / 494	1.16
02/03/23	03/17/23	84.0m	sight glass	412 / 211	68.8	106	1.24	2.55	734 / 390	819 / 437	916 / 491	2.69
12/14/17	01/02/18	1.5m		412 / 211	9.5	30.9	0.01	0.085	731 / 388	796 / 424	892 / 478	0.00
03/17/15	04/15/15	34.0m	SIGHT GLASS DRAIN	334 / 168	95.1	26.5	0.01	0.008	659 / 349	782 / 417	885 / 474	7.86
10/29/14	11/11/14	0.0m	LOW LEVEL BLEED	284 / 140	7.4	22.3	0.066	0.064	575 / 302	788 / 420	904 / 484	12.03
Baseline Data				433 / 223		34.2	0.03		720 / 382	817 / 436	900 / 482	1.00







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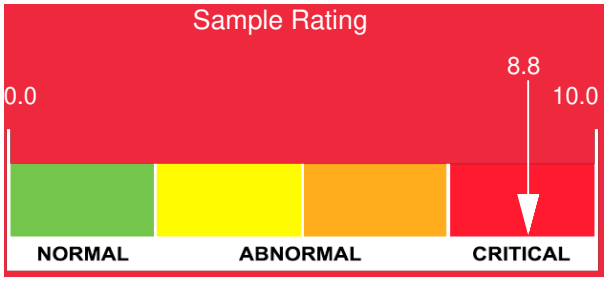
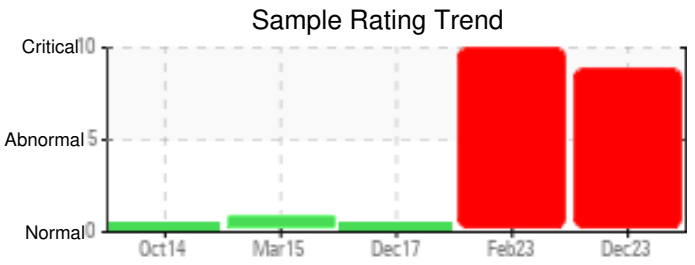
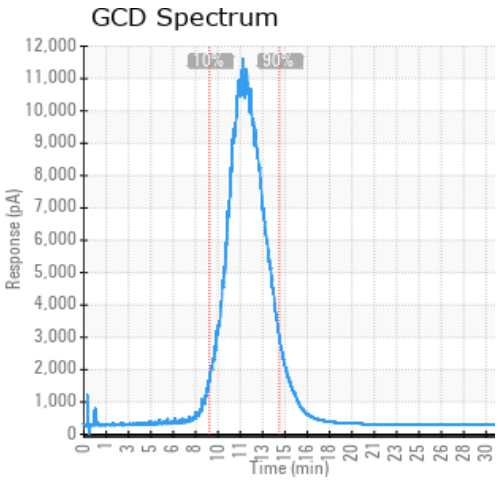
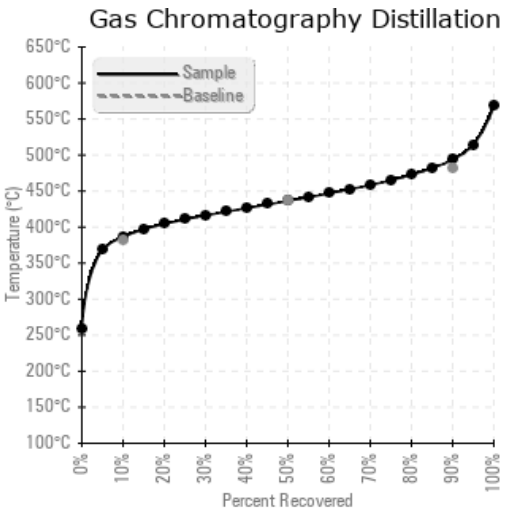


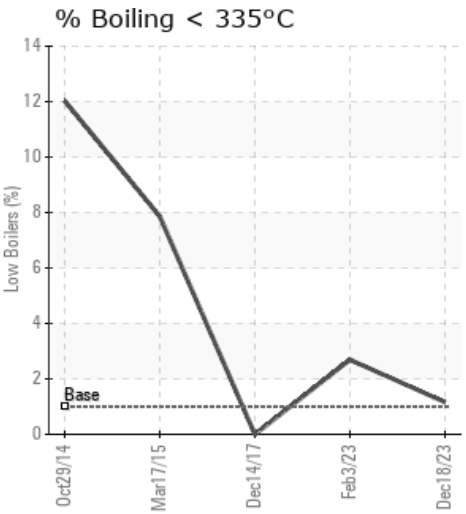


Sample Date	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorus	Zinc
12/18/23	204	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	1	0	0	11
02/03/23	582	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	9	0	0	0	0	0	0	0
12/14/17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03/17/15	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
10/29/14	0	0	0	0	0	0	2	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

02/03/23	If this fluid sample is representative of system condition, the system requires a cleaning, flush and re-fill with fresh heat transfer fluid due to severe oxidative degradation: Acid Number is at 1.24 and fluid viscosity has increased from 30.9 to 106 cSt. Solids content has increased to 2.55%, indicating system fouling. Please contact Petro-Canada Lubricants Tech Services for further details.Iron ppm levels are severe. PQ levels are severe. Pentane Insolubles levels are severely high. Acid Number (AN) is severely high. Visc @ 40°C is severely high.
12/14/17	Please ensure complete sample registration card is filled out including unit ID, heater manufacture and model.Sample results indicate that the heat transfer fluid is suitable for continued service. Continue to monitor system operation. Re-sample in 12 months.
03/17/15	Oil Flash Point is moderately low however this sample is much better then the previous sample.GCD @ 10% has also improved from last sample. Resample in 6 months. COC Flash Point is abnormally low. (GCD) % < 335°C is marginally high. (GCD) 10% Distillation Point is marginally low.
10/29/14	Viscosity has come up from 18.8 cSt to 22.3 cSt and Flash has come up from 122 deg C to 140 deg C however is still very low. Resample in 3 months and if the opportunity comes up, top up system with fresh oil. (GCD) 10% Distillation Point is severely low. COC Flash Point is severely low. (GCD) % < 335°C is abnormally high.