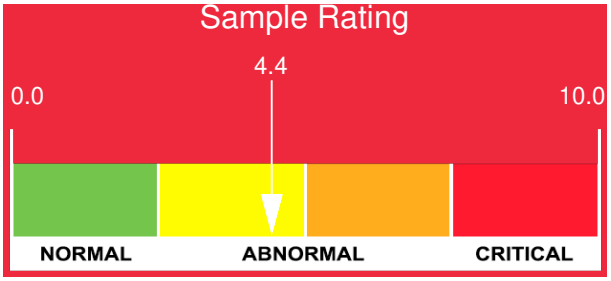
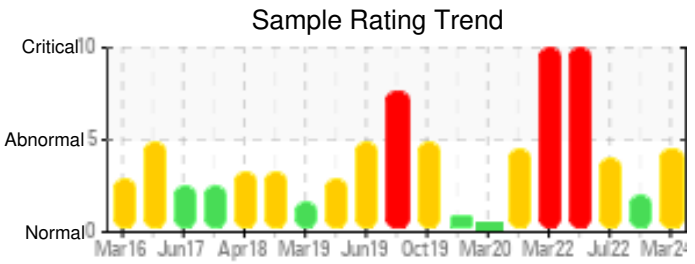
PETRO-CANADA LUBRICANTS





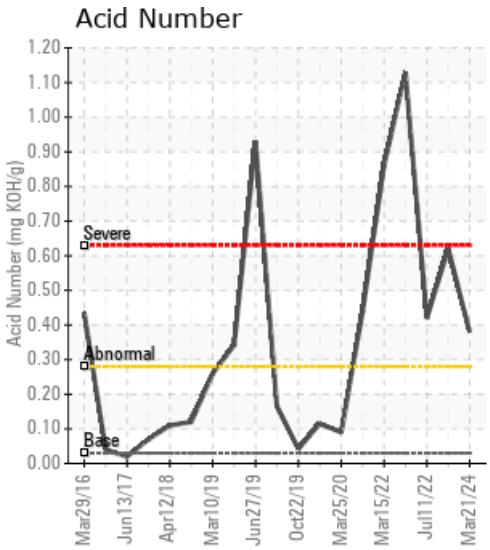
[Smoky / 7-36-58-03W6] H5040 CONDENSATE LINE HEATER

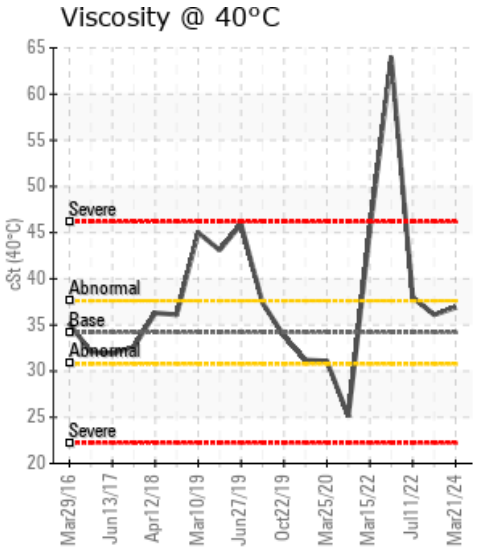
Customer: PTRHTF20273	System Information	Sample Information
CANADIAN NATURAL RESOURCES (CNRL) Smoky/Leland/Bistone EDSON, AB T7E 1L5 CA Attn: Rodney Marcichiw Tel: E-Mail: rodney.marcichiw@cnrl.com	System Volume: 15400 ltr Bulk Operating Temp: 374F / 190C Heating Source: Blanket: Fluid: PETRO CANADA PETRO-THERM Make: ALCO	Lab No: 02626256 Analyst: Clinton Buhler Sample Date: 03/21/24 Received Date: 04/02/24 Completed: 04/10/24 Clinton Buhler Clinton.Buhler@HFSinclair.com

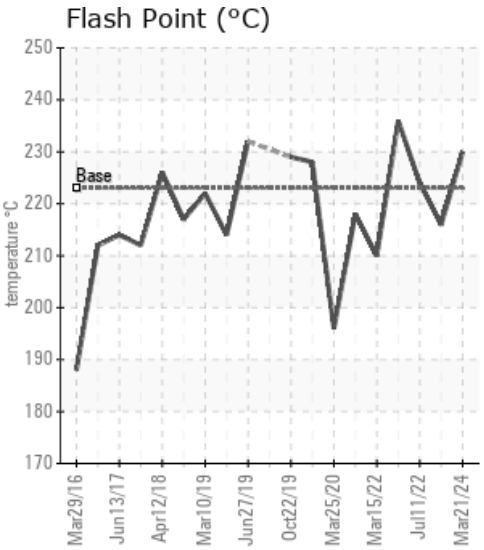
Recommendation: Sample results indicate increased water content (814 ppm), up from 69 ppm in 2023. Solids content has gone up to 0.810%, from 0.457%. It is understood this sample was drawn from the bottom of the vessel. For the most representative sample, please re-sample from the circulation pump discharge. Sampling from the bottom of the vessel can potentially yield more negative results due to it collecting most of the system's solids and water. Please re-sample system in the next 1-2 months, but please sample from the circulation line, preceded by a through purge of the sample valve.

Comments: Pentane Insolubles levels are severely high. ppm Water contamination levels are abnormally high. Water contamination levels are abnormally high. Acid Number (AN) is abnormally high.

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	%
03/21/24	04/02/24	0.0m	bottom of vessel	446 / 230	814	36.9	0.38	0.810	724 / 385	812 / 433	910 / 488	0.64
04/05/23	04/21/23	36.0m		421 / 216	69.1	36.1	0.62	0.457	703 / 373	787 / 419	910 / 488	2.42
07/11/22	07/18/22	1.0m	New sample	435 / 224	416.5	38.0	0.42	0.083	721 / 383	808 / 431	907 / 486	1.16
04/06/22	04/25/22	36.0m	sight glass	457 / 236	2577.3	64.0	1.13	1.07	722 / 383	816 / 435	915 / 491	1.80
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
Baseline Data				433 / 223		34.2	0.03		720 / 382	817 / 436	900 / 482	1.00







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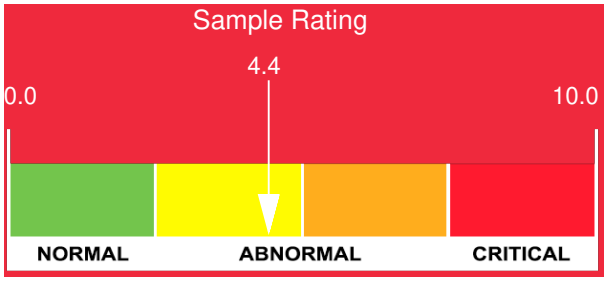
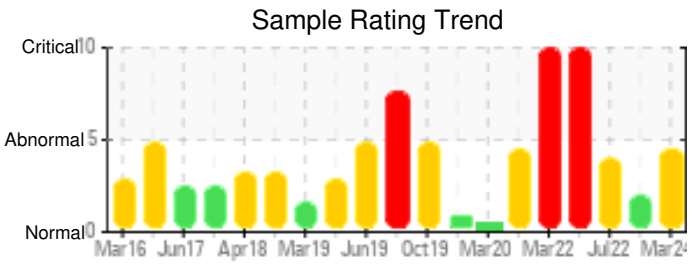
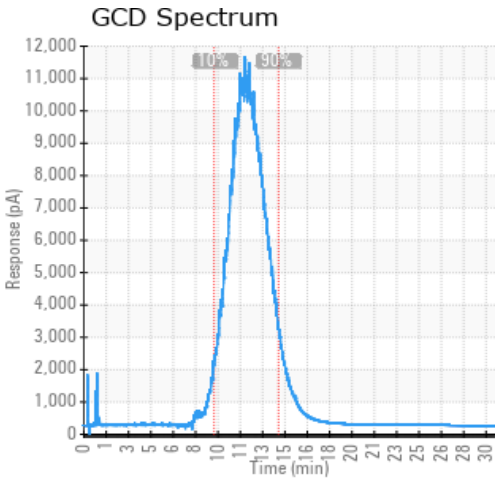
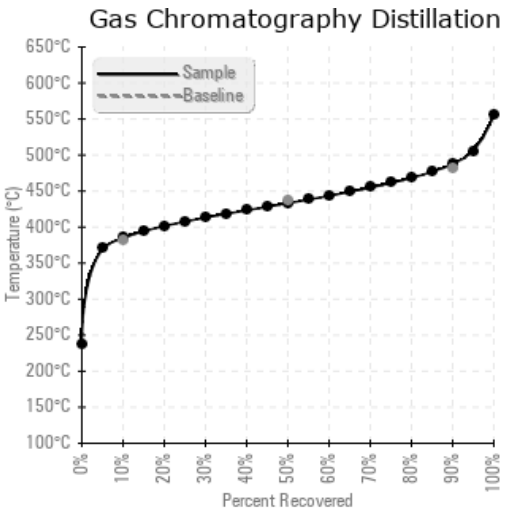


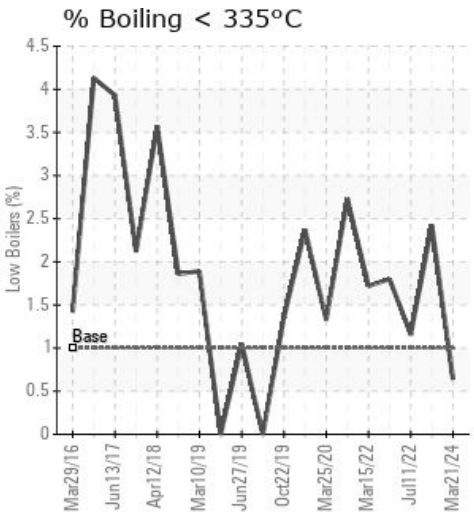


Sample Date	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorus	Zinc
03/21/24	63	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
04/05/23	50	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2	0	0	0	0	1
07/11/22	182	0	0	2	0	0	0	0	0	0	23	0	1	0	0	0	3	0	1	1	3	0	11	12
04/06/22	780	0	0	2	0	0	2	0	0	0	1	0	0	0	0	0	16	0	1	0	0	0	0	0
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
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

04/05/23	Sample results indicate that water is much lower than previous analysis'. Acid number remains elevated and solids (0.457 %) is also elevated and may be related to contaminants or degradation materials. Please ensure blanket gas is operational in the expansion tank head space. Filtration would be beneficial in keeping solids low. Please re-sample in 6 months and please ensure that the sample valve is thoroughly purged before drawing sample. Sample from pump discharge.
07/11/22	This sample reflects the fresh fluid after the system was manually cleaned and a circulation pump was installed. with 182 ppm of Fe, Acid Number of 0.42 and fluid viscosity of 38, it would appear that there are remnants of the previous degraded fluid. This has led to some degradation of the fresh fluid. Water at 416 ppm can be vented off as steam. Please ensure that the blanket gas is dry and sweet, and that it is between 2-3 psi at all times, except for venting periods. Note that the lab ran a filter patch and identified rust and scale, likely associated with the previous corrosion of the expansion tank. Please re-sample in 3 months Water contamination levels are marginally high. ppm Water contamination levels are marginally high. Acid Number (AN) is abnormally high.
04/06/22	Sample results indicates water contaminated fluid. Water content has increased, upping fluid viscosity from 45.1 to 64 cSt. Acid Number is also up. The source of the water needs to be eliminated. Based on these recent results, and trusting that the sample is representative of system condition, fluid replacement is advised. Please contact Technical Services to discuss further
03/15/22	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.