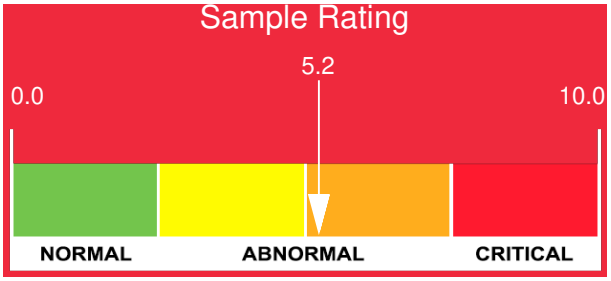
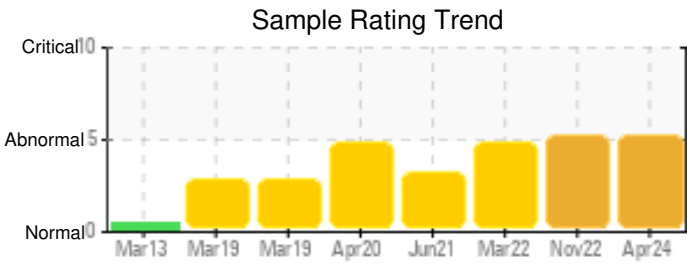
PETRO-CANADA LUBRICANTS





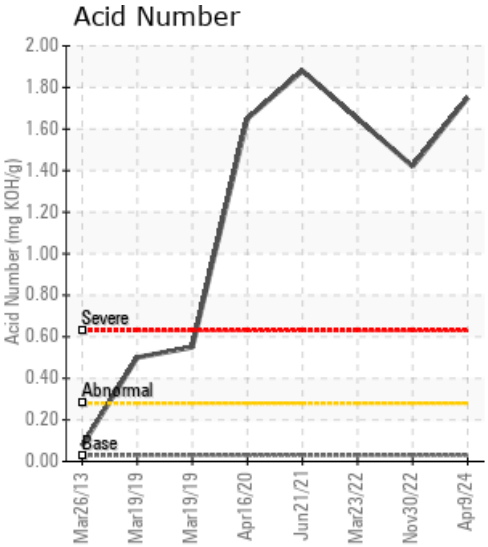
KILN THERMAL FLUID

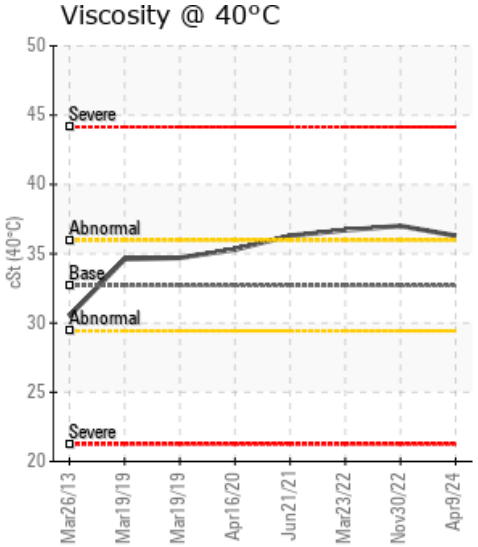
Customer: PTRHTF20101	System Information	Sample Information
CANADA MALTING 3316 BONNEYBROOK ROAD SE CALGARY, AB T2G 4M9 CA Attn: Earl Van Zeeventer Tel: (403)803-2813 E-Mail: earl.vanzeeventer@canadamalting.com	System Volume: 10000 gal Bulk Operating Temp: 446F / 230C Heating Source: Blanket: Fluid: PETRO CANADA CALFLO AF Make: VALCANNO	Lab No: 02628313 Analyst: Yutong Gao Sample Date: 04/09/24 Received Date: 04/11/24 Completed: 04/17/24 Yutong Gao yutong.gao@HFSinclair.com

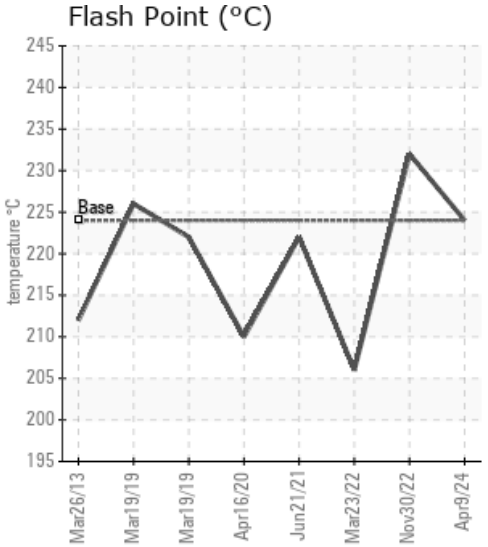
Recommendation: The current fluid is oxidized. The solid content has been increasing over the years, which all reduce the heat transfer efficiency. Considering the fluid age, it is time to plan a system cleaning, flushing and fluid changes. As communicated early this year, the fluid orders need to be in place 8 weeks ahead of the work.

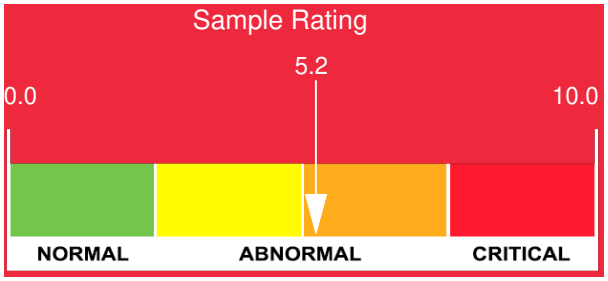
Comments: Solid levels are severely high. Acid Number (AN) is severely high. Visc @ 40°C is abnormally high.

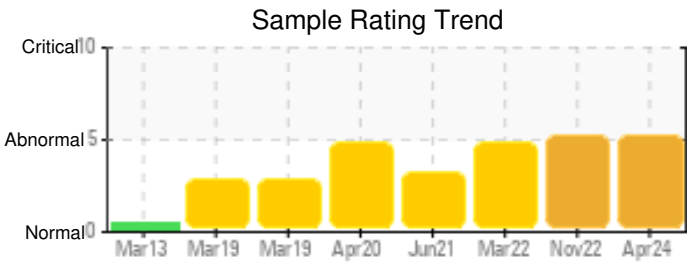
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
04/09/24	04/11/24	30.0y		435 / 224	15	36.3	1.75	1.16	695 / 368	796 / 425	904 / 485	2.23
11/30/22	12/02/22	0.0y	heater room	450 / 232	26.8	37.0	1.42	0.969	692 / 367	793 / 423	901 / 483	2.74
03/23/22	03/24/22	30.0y		403 / 206	40.3	36.7	1.65	0.713	676 / 358	767 / 408	904 / 484	3.61
06/21/21	06/23/21	20.0y	Fluid Heater	432 / 222	39.2	36.3	1.88	0.054	687 / 364	777 / 414	884 / 473	2.58
04/16/20	04/27/20	30.0y	BESIDE THERMAL HEAT	410 / 210	13.7	35.3	1.65	0.563	701 / 371	793 / 423	895 / 479	1.48
Baseline Data				435 / 224		32.7	0.03		693 / 367	790 / 421	887 / 475	2.5





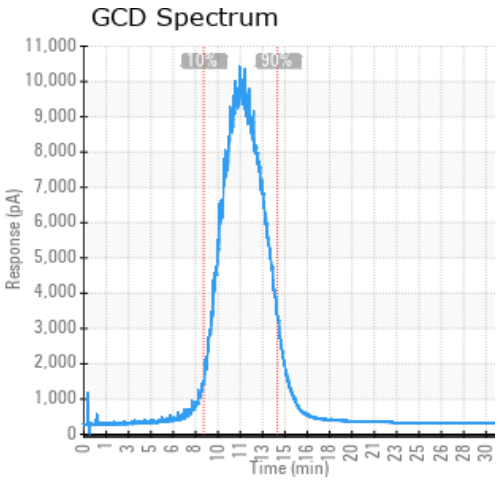


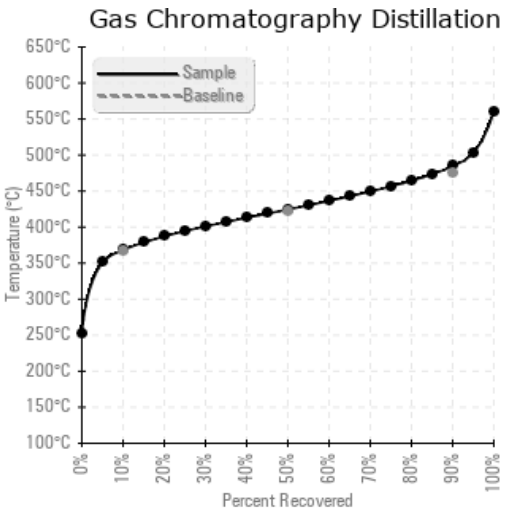


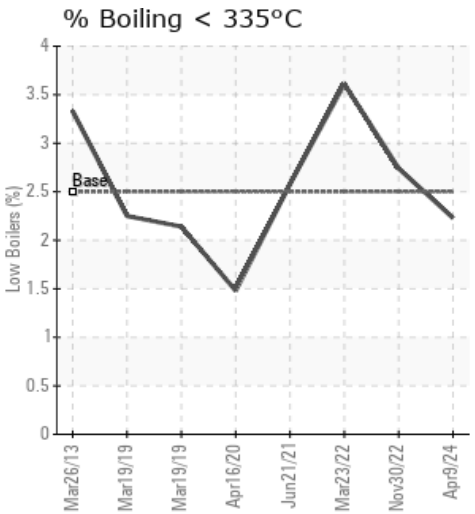


Sample Date	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorus	Zinc
04/09/24	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	0
11/30/22	3	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26	0
03/23/22	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	0
06/21/21	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0
04/16/20	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	0
Baseline Data			0	0						0			0	0					0				270	

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







Historical Comments

11/30/22	The current fluid has elevated viscosity at 40C due to the fluid oxidation over the years. The high viscosity typically reduces the heat transfer system efficiency. The solids or particles contents continue to increase, and the carbon particles and oxidation by-products may plate inside of the pipe at the lower velocity areas, which will further reduce the efficiency or cause partial blockage. The effective system filtration and 1/3 of fluid change is recommended right away. Due to the historical piping blockage concerns, the system cleaning/flushing is an ideal approach. Solid Insolubles levels are severely high. Acid Number (AN) is severely high. Visc @ 40°C is abnormally high.
03/23/22	The current fluid has elevated oxidation over the 30 year operation. The high solid content will continue to deposit inside of the system, which will reduce the heat transfer efficiency. It is better to find a way to filter out the particles. Considering the extremely long working hours, it is important to inspect the system and monitor the system deposit severity. The decision on system cleaning and flushing need to be made or planned based on the inspection results. Solid levels are severely high. Acid Number (AN) is severely high.
06/21/21	The current fluid has adequate viscosity, distillation points and the flash point. The solid content had been reduced substantially, and not sure if fluid has been filtered recently? The Acid Number continues to increase all time high, indicating the moderate and severe fluid oxidation. There is a confusion on the fluid life, if the fluid has not been changed, then the fluid life shall be 31 years old instead of the reported 20 years. Fluid oxidation typical promotes the system deposit and sludge. Considering the age of the fluid, it is better to replace 20~30% and reduce the acid number. Please take one sample after the sweetening process, and monitor the effectiveness. Acid Number (AN) is severely high.
04/16/20	The current fluid has decent viscosity, flash point and the distillation point. The solid content stays at the same level of the samples in 2019. However, the TAN (Acid Number) is much higher, meaning the oil oxidation rate has been accelerated in the past 12 months. Considering the 30 years fluid life without any system cleaning and flushing, it may be the right time to make a plan and budget the future maintance cost. The alternative option is to drain 20% of the current fluid and sweeten the system by the fresh oil in the near future before the severe carbon deposit forms. Please take one sample in 7 days after the 20% system sweetening to verify the effectiveness. Solid level is high. Acid Number (AN) is severely high.