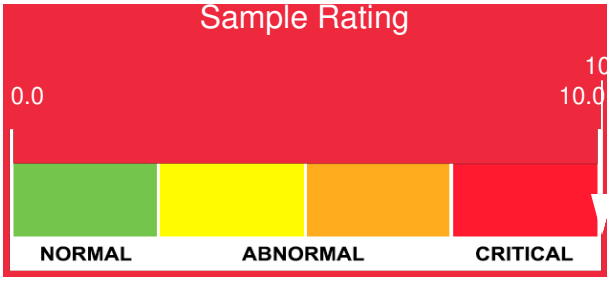
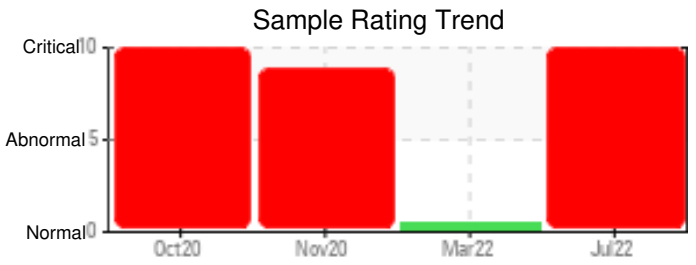




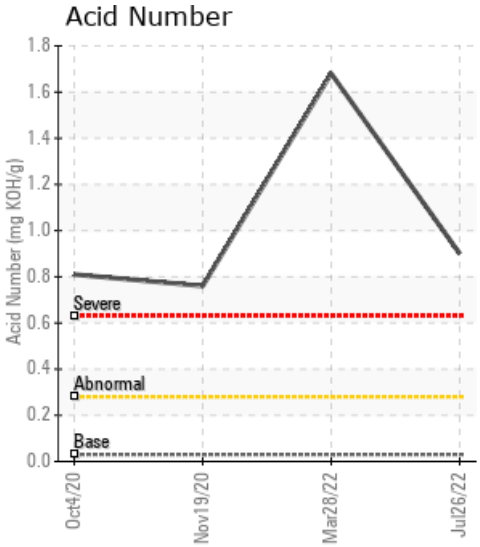
[5-11-29-4W5] ORLEN UPSTREAM

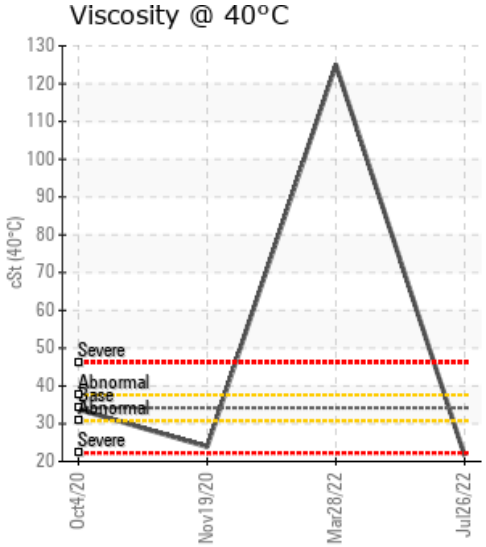
Customer: PTRHTF20243	System Information	Sample Information
CFR CHEMICALS 38451 RRZZ RED DEER, AB T4E 2N6 Canada Attn: Andrew Schacher Tel: (780)982-8478 E-Mail: aschacher@cfrchemicals.com	System Volume: 2700 ltr Bulk Operating Temp: 356F / 180C Heating Source: Blanket: Fluid: PETRO CANADA PETRO-THERM Make: PROPACK	Lab No: 02504252 Analyst: Lyle Dach Sample Date: 07/26/22 Received Date: 08/09/22 Completed: 08/15/22 Lyle Dach lyle.dach@HFSinclair.com

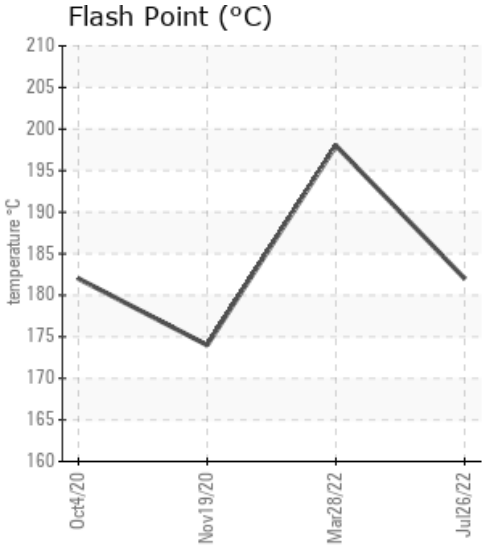
Recommendation: Fluid has continued to degrade, acid number, viscosity, flash point, GCD % <335, GCD 10% and pentane insolubles are all at alarm levels. Fluid is in poor condition due to both oxidation and thermal degradation. Fluid looks to have an ingress of lighter hydro carbons which is bringing the viscosity and flash point down and effected the GCD. The lighter ends could be vented off but the fluids acidity and pentane insolubles are still at high levels and iron is climbing slightly. Full or partial fluid change out should be considered, as well as cleaning of system internals. Consult PC Technical Services for remediation / degradation prevention strategies.

Comments: Pentane Insolubles levels are severely high. Acid Number (AN) is severely high. (GCD) 10% Distillation Point is severely low. Visc @ 40°C is severely low. (GCD) % < 335°C is marginally high. COC Flash Point is marginally low.

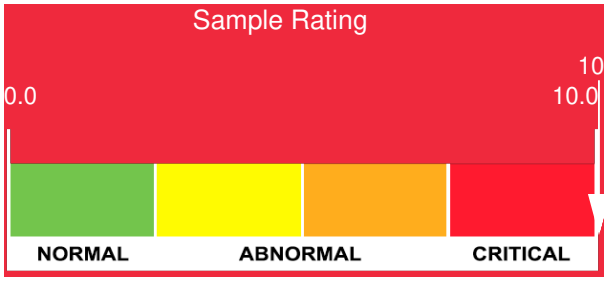
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
07/26/22	08/09/22	4.0m		360 / 182	32.0	21.6	0.90	0.617	623 / 328	798 / 426	897 / 481	10.14
03/28/22	04/13/22	10.0m	sight glass	388 / 198	233.5	125	1.68	3.65	690 / 365	808 / 431	908 / 487	5.10
11/19/20	11/25/20	5.0m	Boiler sight glass	345 / 174	49.2	23.9	0.76	0.282	607 / 320	774 / 412	881 / 471	12.02
10/04/20	10/15/20	5.0m	BOILER SITE GLASS	360 / 182	25.8	33.8	0.81	0.257	618 / 326	786 / 419	885 / 474	10.89
Baseline Data				433 / 223		34.2	0.03		720 / 382	817 / 436	900 / 482	1.00

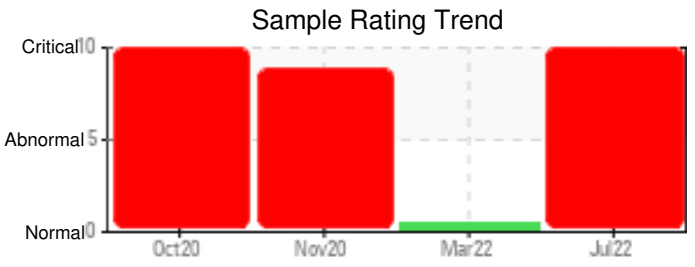






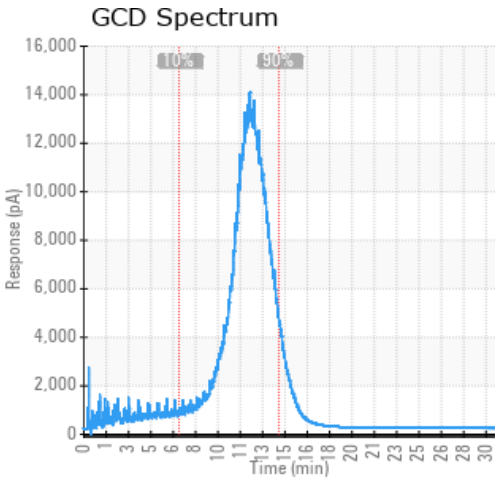
PETRO-CANADA LUBRICANTS

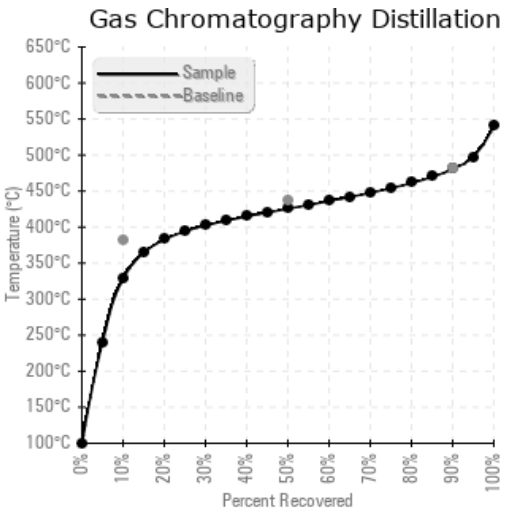


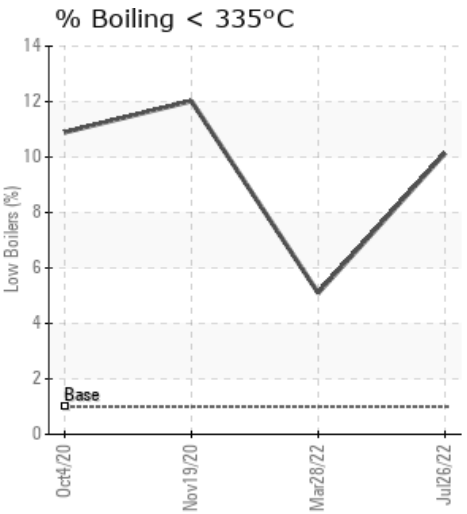


Sample Date	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorus	Zinc
07/26/22	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03/28/22	538	0	0	8	0	0	1	0	0	0	0	0	0	0	0	0	5	0	1	0	0	0	0	0
11/19/20	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/04/20	0	0	0	3	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

03/28/22	The fluid is showing significant degradation, the fluid should be resampled to confirm the condition as it has deteriorated from the last sample. The viscosity is very high and not proportional to the rest of the sample. Please investigate the system for other sample locations that could give a better representative of the whole system. Site glasses are not ideal but bottom drains are generally worse. With systems that do not have pumps it is best to purge the fluid until hot oil has been flowing for several seconds to try and get a good representative sample.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.
11/19/20	Fluid is in poor condition, very little change from previous sample in October. In the near term, venting the fluid will reduce some of the low boiler content. Eventually the fluid will need to be changed out and system cleaned.The solids content is still quite low which indicates the system internals may not be severely fouled. As degradation progresses, carbonaceous deposits will accumulate in the system. Acid number is severely high which is from oxidation. Viscosity & flash point severely low which is either from thermal cracking or process exchanger leaking hydrocarbon liquids into the fluid.
10/04/20	Fluid is in poor condition due to both oxidation and thermal degradation. Full or partial fluid changeout should be considered, as well as cleaning of system internals. Consult PC Technical Services for remediation / degradation prevention strategies. Acid Number (AN) is severely high caused by oxidation. Increase in low-boiler content and reduction in flash point is caused by thermal cracking.