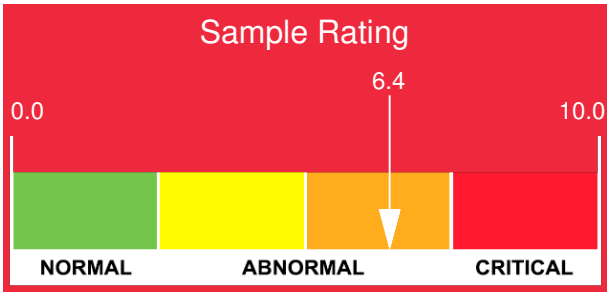
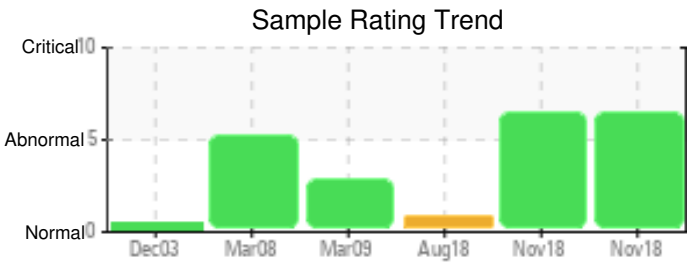
PETRO-CANADA LUBRICANTS





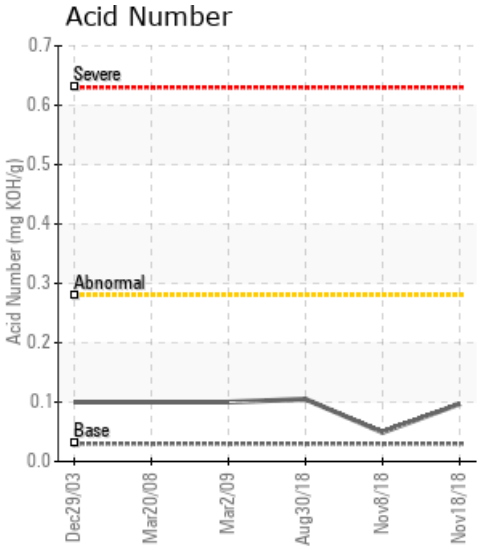
HEAT TRANSFER SYSTEM

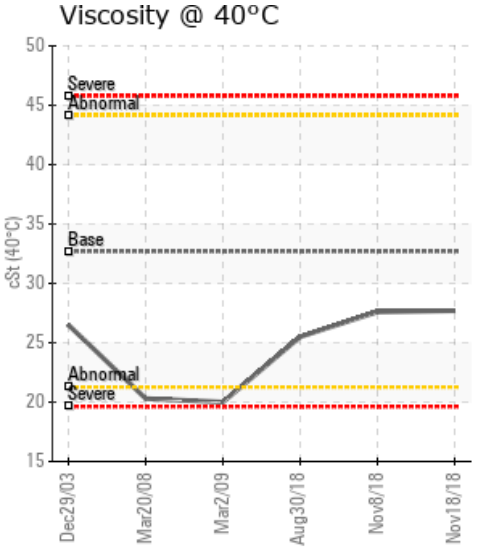
Customer: PTRHTF10008	System Information	Sample Information
ARKEMA 1415 STEELE AVENUE GRAND RAPIDS, MI 49507 USA Attn: DAVE AMBROSE Tel: (616)890-9532 E-Mail: david.ambrose@arkema.com	System Volume: 3000 gal Bulk Operating Temp: 540F / 282C Heating Source: Blanket: Fluid: PETRO CANADA CALFLO AF Make:	Lab No: 02252212 Analyst: Yvette Trzcinski Sample Date: 11/18/18 Received Date: 11/19/18 Completed: 11/21/18

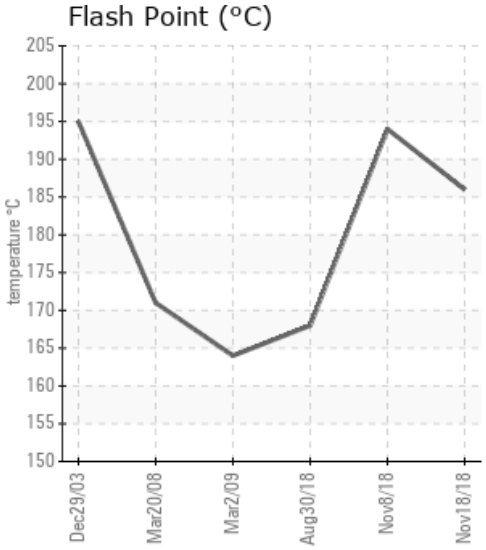
Recommendation: This sample also shows signs of thermal degradation to the system - high level of low boilers that has caused a lower flash point of the fluid and can also lead to pump cavitation overtime a well as coke material that can lead to deposits in the system and increased system fouling. Recommend replacing a portion of the fluid or draining, cleaning and system recharge based on system fouling and deposit build up

Comments: (GCD) 90% Distillation Point is severely low. (GCD) % < 335°C is abnormally high. (GCD) 10% Distillation Point is abnormally low. (GCD) 50% Distillation Point is marginally low. COC Flash Point is marginally low.

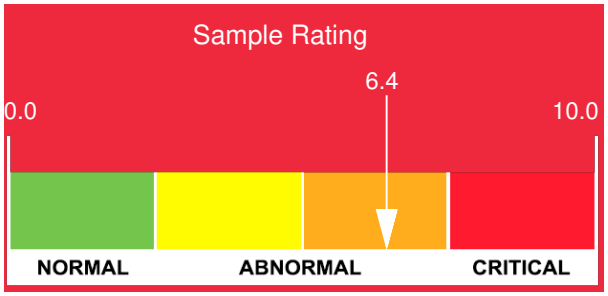
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
11/18/18	11/19/18	6y		367 / 186	18.9	27.7	0.097	0.293	620 / 326	731 / 388	834 / 446	12.83
11/08/18	11/19/18	6y		381 / 194	18.9	27.6	0.049	0.134	620 / 326	731 / 389	838 / 448	12.79
08/30/18	09/10/18	0y		334 / 168	14.0	25.5	0.105	0.137	653 / 345	778 / 415	888 / 476	7.49
03/02/09	03/02/09			327 / 164	20	20	0.1	0.05	673 / 356		909 / 487	6.9
03/20/08	03/20/08			340 / 171	17	20.3	0.1	0.16	583 / 306		889 / 476	14.5
12/29/03	01/12/04			383 / 195	38	26.5	0.1		676 / 358		905 / 485	5.7
Baseline Data				435 / 224		32.7	0.03		693 / 367	790 / 421	887 / 475	2.5

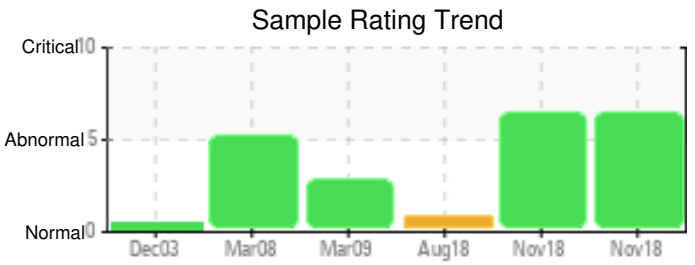






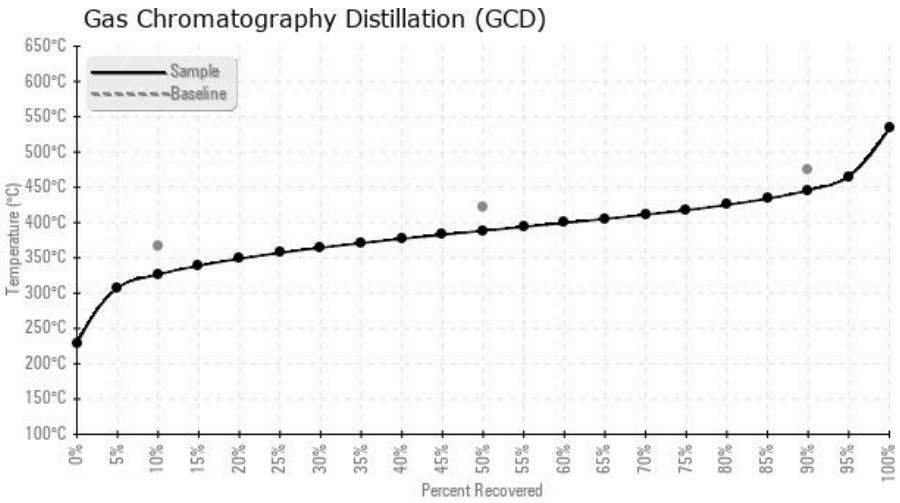
PETRO-CANADA LUBRICANTS

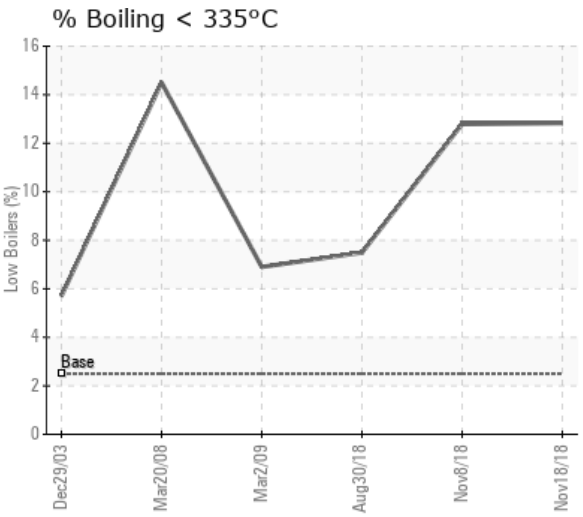




Sample Date	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorus	Zinc
11/18/18	98	1	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	1	0	97	1
11/08/18	47	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	58	0
08/30/18	20	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	38	0
03/02/09	10	0	0	2	0	0	2	0	0	0	0	0		0	0		0			0	0	0	39	0
03/20/08	8	0	0	0	0	0	0	0	0	0	0	0		0	0		0			0	0	0	33	0
12/29/03	10	0	0	2	0	0	0	0	0	0	2	0		0	0		0			0	2	0	49	2
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

11/08/18	Thermal Degradation is occurring in this system causing a reduction in flash point reduction in 90% distillation point – this thermal degradation can lead to the formation of coke material that can foul the system and lead to operation issues and system in efficiency and safety concerns with the fluid over time based on the flash point of the system. Recommend looking at replacing a portion of the system or the entire system. Depending on deposits a cleaning of the system might be required (GCD) 90% Distillation Point is severely low. (GCD) % < 335°C is abnormally high. (GCD) 10% Distillation Point is abnormally low. (GCD) 50% Distillation Point is marginally low. COC Flash Point is marginally low.
08/30/18	Viscosity has increased since the last sample but is still 20% lower than new oil - it appears part or all of the fluid was replaced in 2012. Flash point is low which points to low boilers as a result of thermal cracking in the fluid which is also shown in the presence of molecules with boiling points below 335 C and the lower boiling point temperatures at 10% and 50 % distillation point. recommend venting the system and resampling to see if that raises the flash point. Thermal cracking is evident in the system which causes carbonaceous deposit can create insulation in pipes and residues in the system COC Flash Point is abnormally low.
03/02/09	
03/20/08	
12/29/03	