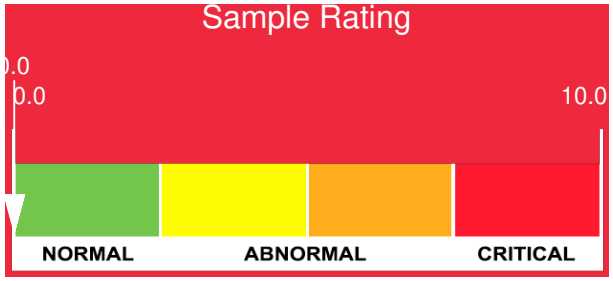
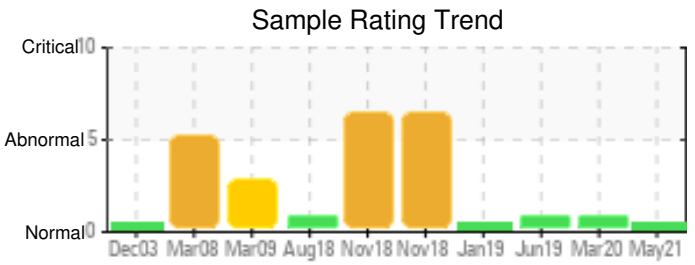




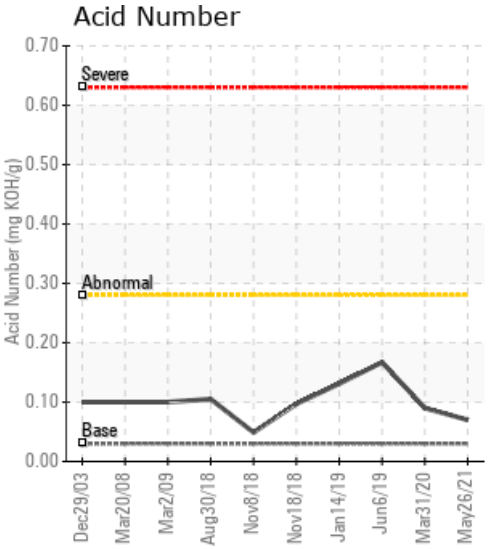
HEAT TRANSFER SYSTEM

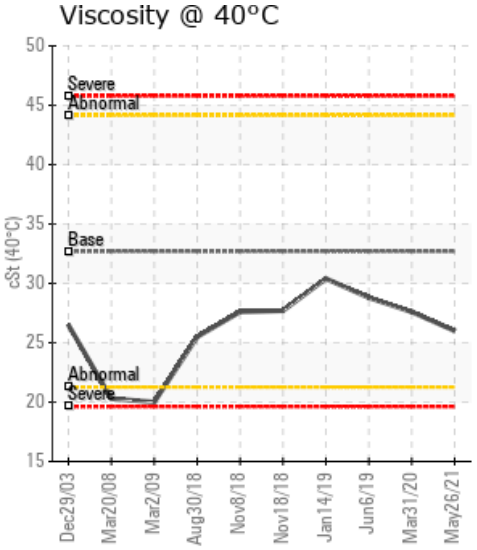
Customer: PTRHTF10008	System Information	Sample Information
ARKEMA 1415 STEELE AVENUE GRAND RAPIDS, MI 49507 USA Attn: RICHARD KOLL Tel: (616)243-4578 E-Mail: richard.koll@arkema.com	System Volume: 3000 gal Bulk Operating Temp: 540F / 282C Heating Source: Blanket: Fluid: PETRO CANADA CALFLO AF Make:	Lab No: 02427531 Analyst: Yvette Trzcinski Sample Date: 05/26/21 Received Date: 06/16/21 Completed: 06/18/21 Yvette Trzcinski yvette.trzcinski@hollyfrontier.com

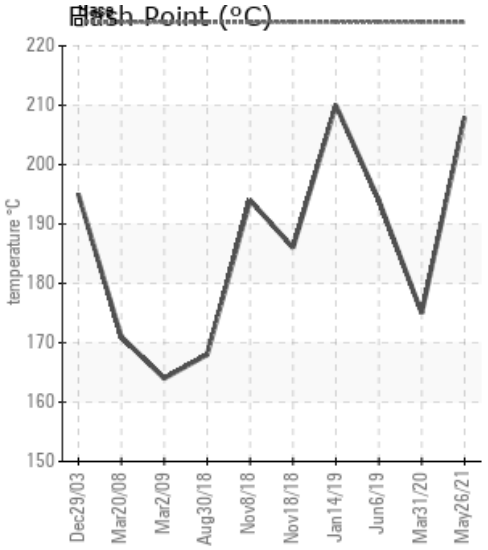
Recommendation: The viscosity continues to drop due to the thermal degradation of some of the molecules but you are keeping the light ends in an acceptable range by venting the system. The flash point, acid number and distillation boiling points are all in specification continue to run the fluid and resample in 6 - 12 months

Comments:

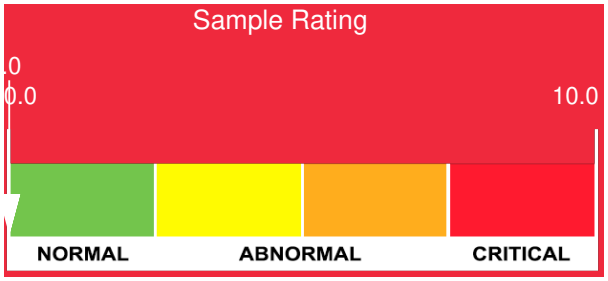
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
05/26/21	06/16/21	30.0m	PUMP AREA	406 / 208	24.1	26.0	0.07	0.128	676 / 358	780 / 416	886 / 474	5.45
03/31/20	04/01/20	16.0m	PUMP AREA	347 / 175	20.1	27.6	0.09	0.136	698 / 370	795 / 424	892 / 478	2.29
06/06/19	06/19/19	7.0m	PUMP AREA	381 / 194	24.5	28.8	0.167	0.123	692 / 367	789 / 421	888 / 476	1.91
01/14/19	01/25/19	3.0m	AT PUMP	410 / 210	16.9	30.4	0.131	0.127	661 / 349	763 / 406	867 / 464	5.33
11/18/18	11/19/18	6.0m		367 / 186	18.9	27.7	0.097	0.293	620 / 326	731 / 388	834 / 446	12.83
Baseline Data				435 / 224		32.7	0.03		693 / 367	790 / 421	887 / 475	2.5

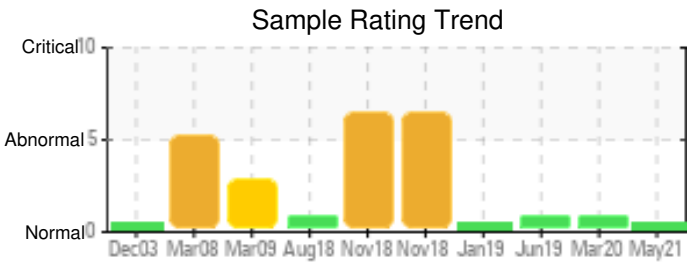






PETRO-CANADA LUBRICANTS

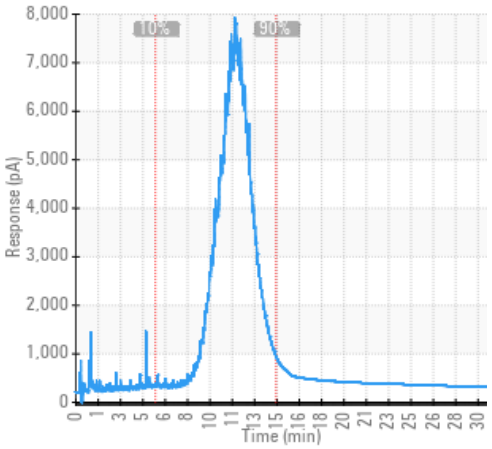




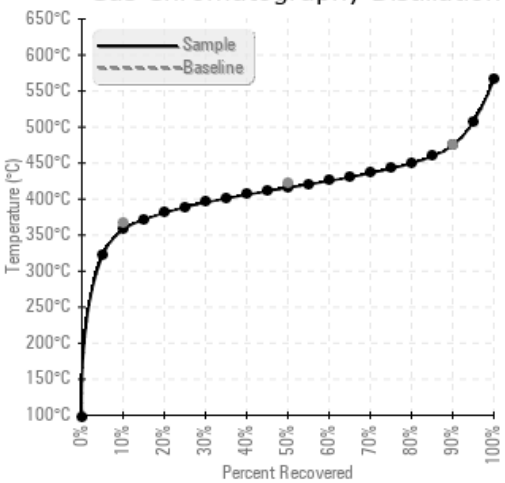
Sample Date	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorus	Zinc
05/26/21	65	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	74	0
03/31/20	40	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	60	0
06/06/19	13	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	59	0
01/14/19	9	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	112	0
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
Baseline Data			0	0						0			0	0					0				270	

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

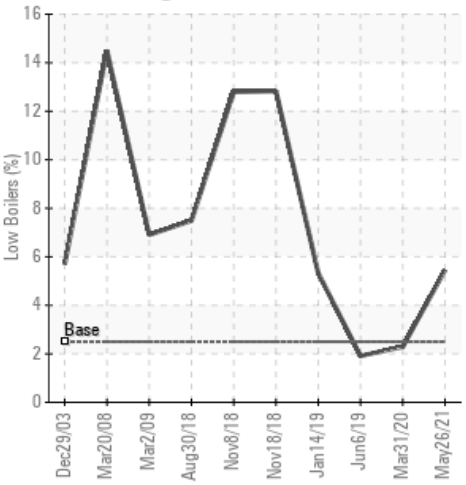
GCD Spectrum



Gas Chromatography Distillation



% Boiling < 335°C



Historical Comments

03/31/20	the flash point appears to have dropped slightly as well as the viscosity which is a sign of some thermal degradation but the fluid boiling points and solids are all within normal used fluid specifications resample in 6 months COC Flash Point is abnormally low.
06/06/19	Flash point and viscosity have lowered since the last sample indicating thermal degradation of the fluid - venting looks to be removing low boilers due to thermal degradation continue to vent low boilers as normal maintenance practices and resample in 6 months COC Flash Point is marginally low.
01/14/19	This is the baseline sample since the system was changed. Some Thermal cracking could be occurring GCD 90% is marginally low. Resample in 3 months (GCD) 90% Distillation Point is marginally low.
11/18/18	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 (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.

