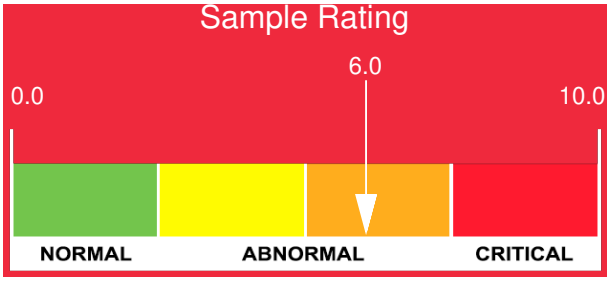
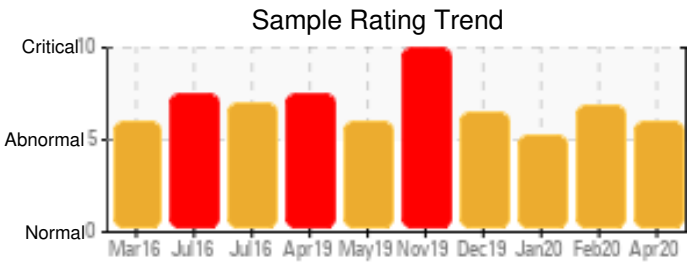




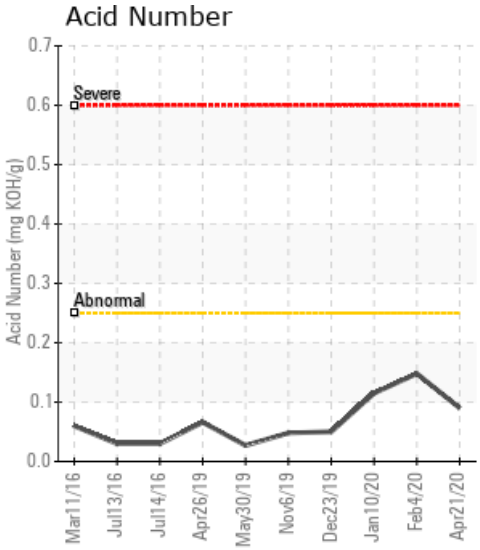
VEOLIA NORTH AMERICA CHICAGO BIOSOLIDS

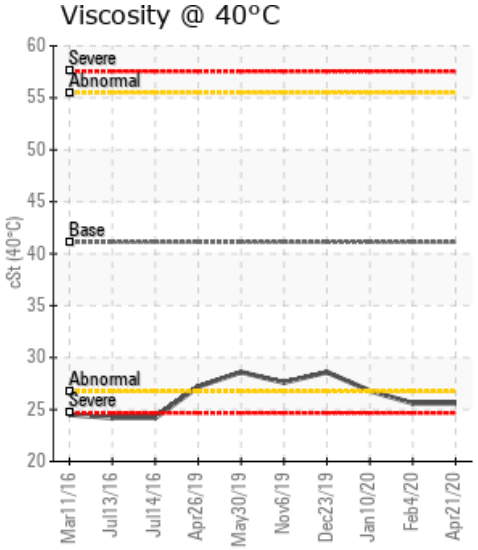
Customer: PTRHTF30090	System Information	Sample Information
VEOLIA NORTH AMERCIA 6001 W. PERSHING RD CICERO, IL 60804 USA Attn: Richard Jania Tel: (708)652-0575 E-Mail: richard.jania@veolia.com	System Volume: 38200 gal Bulk Operating Temp: 585F / 307C Heating Source: Blanket: Fluid: CHEVRON HEAT TRANSFER OIL 46 Make: GTS ENERGY INC	Lab No: 02350020 Analyst: Yvette Trzcinski Sample Date: 04/21/20 Received Date: 04/22/20 Completed: 04/27/20 Yvette Trzcinski yvette.trzcinski@petrocanadalsp.com

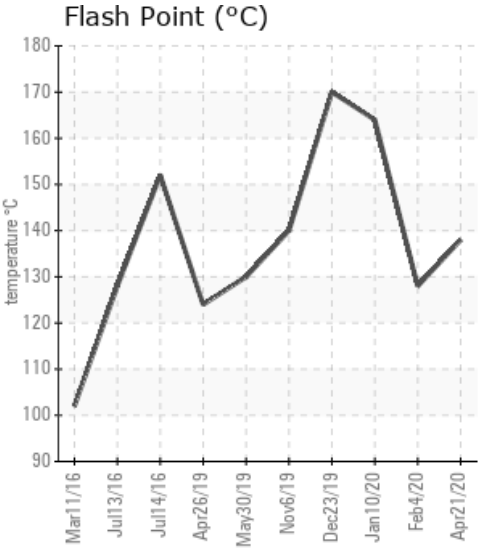
Recommendation: thermal cracking is still occurring at the GCD 10% boiling range it is 14% lower than new oil. the viscosity and flash point seem to be holding similar to the figures from February the viscosity has dropped 37% and the flash point 42% lower than new oil. it is important that the hot oil system bulk oil operating range is held below 550 F/ 287 C to slow the thermal cracking of the fluid further

Comments: (GCD) 10% Distillation Point is severely low. COC Flash Point is severely low. Visc @ 40°C is abnormally low. (GCD) % < 335°C is marginally high.

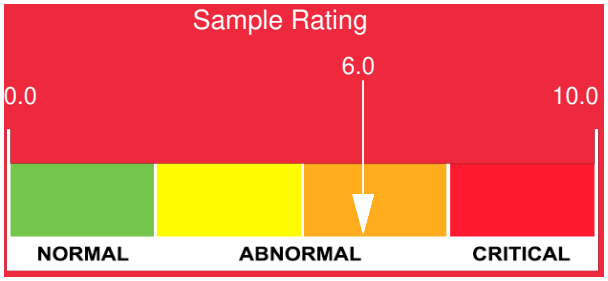
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
04/21/20	04/22/20	0y		280 / 138	13.0	25.6	0.09	0.090	630 / 332	814 / 434	925 / 496	9.78
02/04/20	02/13/20	4y	ANVBAR	262 / 128	7.5	25.6	0.148	0.105	642 / 339	781 / 416	884 / 474	8.84
01/10/20	01/21/20	4y	RETURN LINE	327 / 164	10.1	26.8	0.115	0.030	661 / 349	803 / 428	905 / 485	7.63
12/23/19	12/30/19	0y	RETURN	338 / 170	5.0	28.6	0.050	0.087	622 / 328	790 / 421	909 / 487	10.50
11/06/19	11/21/19	0y	ANVBAR	284 / 140	8.9	27.6	0.048	0.057	412 / 211	681 / 361	846 / 452	41.97
Baseline Data				464 / 240		41.1			727 / 386	828 / 442	932 / 500	1.4

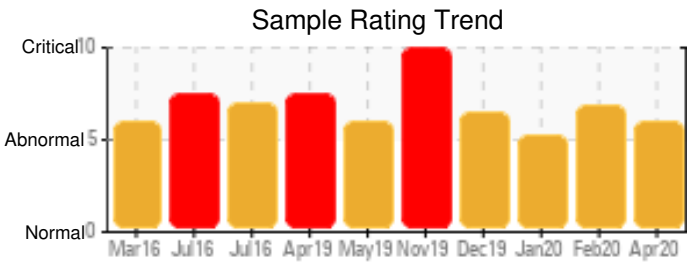






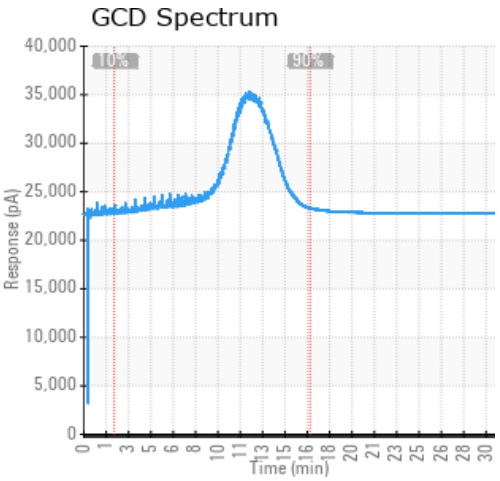
PETRO-CANADA LUBRICANTS

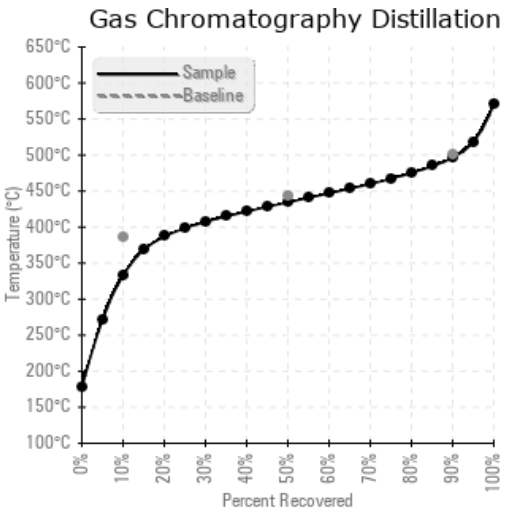


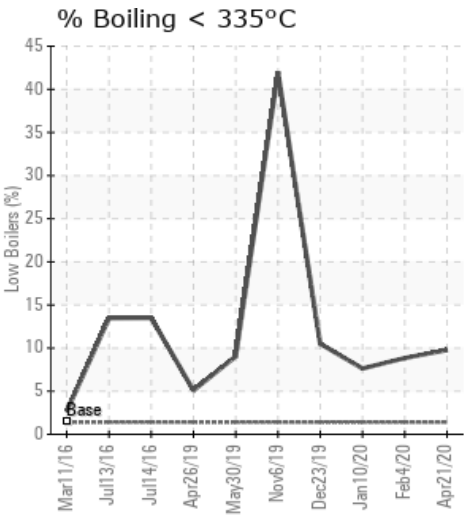


Sample Date	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorus	Zinc
04/21/20	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02/04/20	14	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
01/10/20	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/23/19	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/06/19	29	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	3	2
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

02/04/20	The fluid is continuing to thermally degrade - indicated by the continued drop in viscosity, flash point and boiling points of the fluid (GCD) The venting appears to be holding the low boilers at 8-9% but the thermal cracking of the fluid is still causing a severely low flash point and will develop carbonaceous material that will begin to deposit in the system, affecting the efficiency of the system and it's performance (GCD) 90% Distillation Point is severely low. COC Flash Point is severely low. (GCD) 10% Distillation Point is abnormally low. Visc @ 40°C is abnormally low. (GCD) % < 335°C is marginally high.
01/10/20	Venting is helping to remove the light ends and vapors from the system, but the fluid is continuing to break down - as can be seen by the reduction in viscosity moving from an ISO 46 to ISO 32 to an ISO 22 in this last sample. The GCD 90% distillation point is still below the temperature it should be indicating the system operation is continuing to thermally break down the lubricant molecules into smaller molecule sizes lowering the boiling point of the fluid as well as the flash point at very low levels. Recommend scheduling a system change out to a heat transfer fluid that is rated for your system bulk operating temperature COC Flash Point is severely low. (GCD) 90% Distillation Point is abnormally low. (GCD) % < 335°C is marginally high. (GCD) 10% Distillation Point is marginally low.
12/23/19	The venting has helped to reduce the low boilers from 42 % down to 10 % which has helped to increase the flash point from 140 C/284 F to 170 C/338 F though it is still critically low. The initial boiling range of the heat transfer fluid has dropped by close to 15%. The fluid will continue to degrade affecting the equipment operation and system performance and the flash point is still critically low. Recommend continuing to vent the system regularly and consider changing the fluid to one that is designed to operate under the specifications of the operating system - resample in 1 month (GCD) 10% Distillation Point is severely low. COC Flash Point is severely low. (GCD) % < 335°C is marginally high. (GCD) 90% Distillation Point is marginally low.
11/06/19	The fluid is showing signs of severe degradation and a large amount of light ends - GCD % < 335 C is much higher at 41.97 % compared to last samples. Recommend venting the system immediately and consider changing the heat transfer fluid and charging with a fluid that can handle the bulk oil operating temperature of 587 F the current fluid is only rated for bulk oil temperatures of 550 F. (GCD) % < 335°C is severely high. (GCD) 10% Distillation Point is severely low. (GCD) 50% Distillation Point is severely low. (GCD) 90% Distillation Point is severely low. COC Flash Point is severely low.

