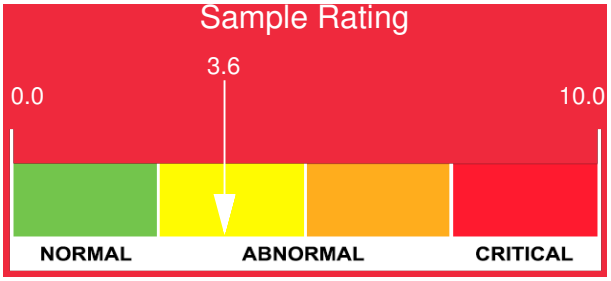
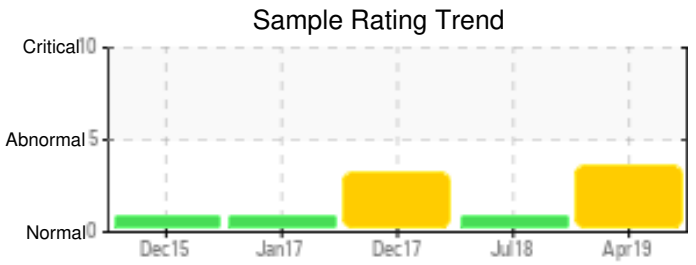




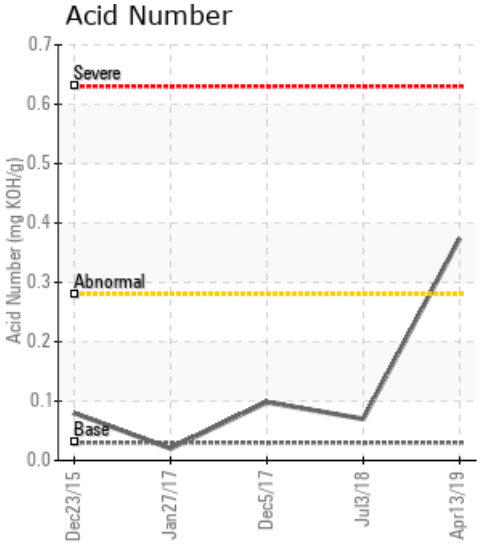
[LSD-SE-26-93-23-W5] OLD ENERGY

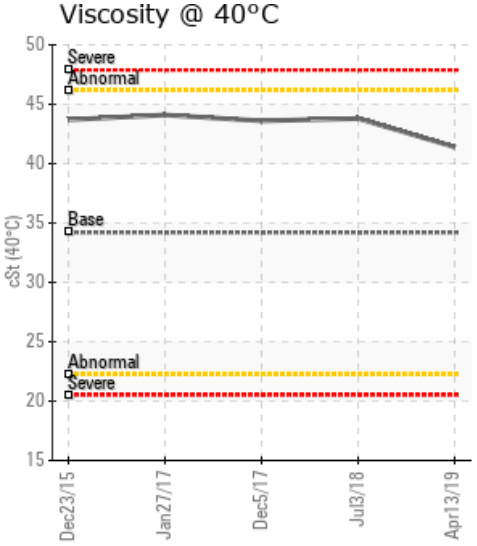
Customer: PTRHTF20170	System Information	Sample Information
MANNING FOREST PRODUCTS DIV OF WEST... 22 KM`S NORTH OF MANNING ON HWY 35 MANNING, AB T0H 2M0 Canada Attn: ARON TUMAMBING Tel: (780)837-4782	System Volume: 5788 ltr Bulk Operating Temp: 491F / 255C Heating Source: Blanket: Fluid: PETRO CANADA PETRO-THERM Make: Wellons	Lab No: 02284294 Analyst: Gordon Susinski Sample Date: 04/13/19 Received Date: 05/09/19 Completed: 05/10/19

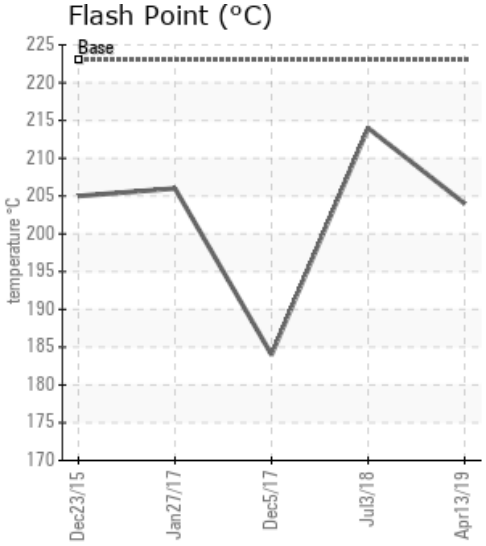
Recommendation: For what appears to be 5 years of service on the oil, results are higher than expected. The silicon result indicated the presence of airborne dust or dirt and may have been introduced during sampling. The acid number is a measure of the acidic compounds in the oil. Increases in the acid number are likely due to the formation of oxidation by products in the oil. This value will increase exponentially once the process begins. Tendencies are for sludge and deposits to increase and corrosion to occur if the fluid continues to be utilized beyond its limits. The 90% GCD result, indicates that high boilers may be present. High boilers are normally associated with carbonaceous deposits in the system that can foul heat exchanger surfaces or plug small lines.

Comments: Silicon ppm levels are abnormally high. Acid Number (AN) is abnormally high. (GCD) 90% Distillation Point is marginally high.

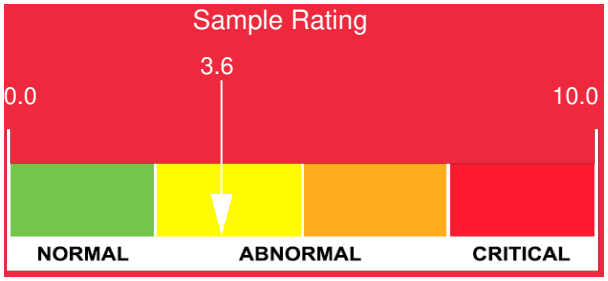
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
04/13/19	05/09/19	0y		399 / 204	97.9	41.4	0.374	0.145	736 / 391	836 / 447	921 / 494	0.52
07/03/18	07/10/18	0y		417 / 214	32.8	43.8	0.07	0.399	674 / 357	791 / 422	896 / 480	3.20
12/05/17	12/05/17	0y		363 / 184	33.8	43.6	0.098	0.412	740 / 394	845 / 452	920 / 493	1.55
01/27/17	02/13/17	3y	DOWNSTREAM OF PUMP	403 / 206	24.8	44.1	0.02	0.181	719 / 382	832 / 445	920 / 493	2.68
12/23/15	12/24/15	0y		401 / 205	10.5	43.7	0.08	0.090	708 / 376	830 / 443	910 / 488	4.33
Baseline Data				433 / 223		34.2	0.03		720 / 382	817 / 436	900 / 482	1.00

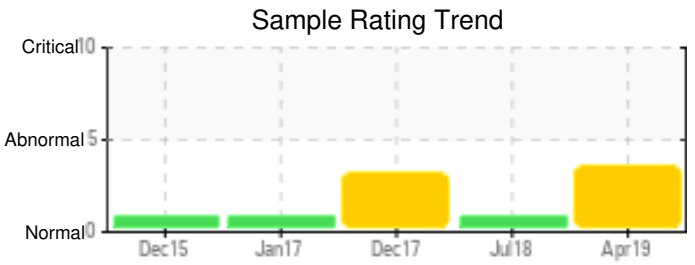






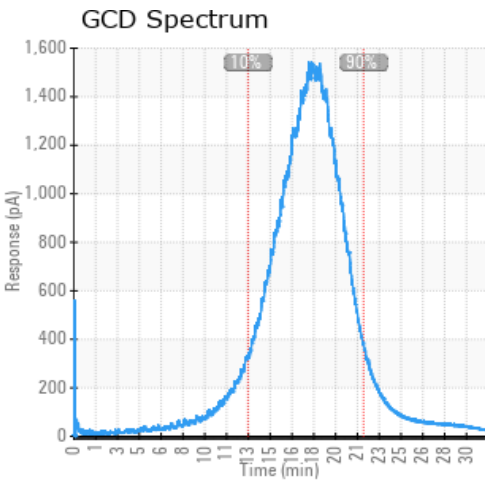
PETRO-CANADA LUBRICANTS

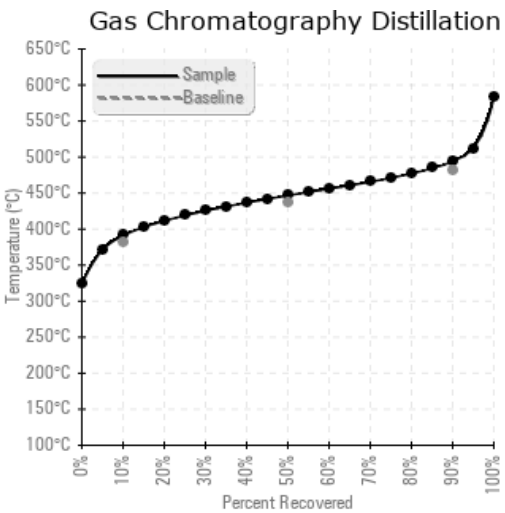


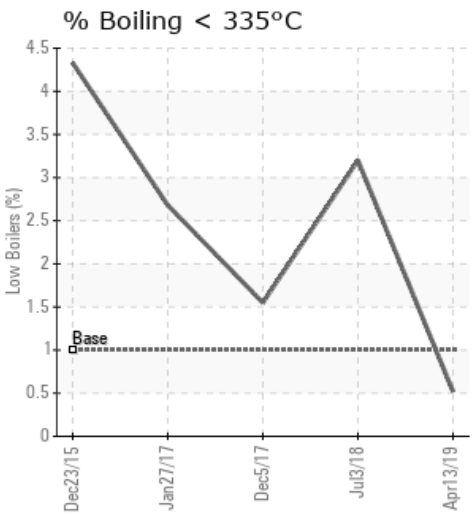


Sample Date	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorus	Zinc
04/13/19	7	0	0	0	0	0	0	0	0	0	39	0	0	0	0	0	0	0	0	0	0	0	0	0
07/03/18	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/05/17	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01/27/17	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/23/15	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	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

07/03/18	Based on the analysis results, it appears that the oil may have experienced some Thermal Degradation. This may or may not be due in part to the length of service on the oil (none indicated). Thermal Degradation and oxidation, are associated with abnormally high Pentane Insolubles results. Pentane Insolubles is the amount of contaminants in used heat transfer oils and may contain insoluble materials such as oxidation by products, dirt, carbonaceous material, and system wear components. Pentane Insolubles levels are abnormally high.
12/05/17	Based on the analysis results, it appears that the oil may have experienced oxidation of the oil and possibly thermal degradation. This may be due in part to the length of service on the oil; however the service time was not indicatedPentane Insolubles are abnormally high. This analysis determines the amount of contaminants in used heat transfer oils, and is indicative of the amount of insoluble materials such as oxidation by products; dirt, carbonaceous material, and system wear components. These contaminants as a group are called pentane insolubles.The final boiling point (FBP) Increase corresponds to high boilers present which are normally associated with carbonaceous deposits in the system that can foul heat exchanger surfaces or plug small lines and support the abnormally high Pentane Insolubles. The flash point is the lowest temperature at which the fluids vapor will momentarily ignite when contacted by an ignition source. Reduction is typically associated with thermal degradation of the heat transfer oil or possibly contamination. Test result should not be the single determinant in the oils suitability for continued use, but should be interpreted using other results as well. It is important to make sure that the system operating temperature is lower than the flash point. Depending on the actual oil service (Possibly >3 years?) this system may require some increased filtration to help reduce the amount of pentane insolubles in the system. Resample at the next interval and continue to monitor the system for insolubles and possible thermal degredation. Pentane Insolubles levels are abnormally high. (GCD) 50% Distillation Point is marginally high. (GCD) 90% Distillation Point is marginally high. COC Flash Point is marginally low.
01/27/17	The 90% distillation point is marginally high. This Increase is associated with high boilers that are normally associated with carbonaceous deposits in the system that can foul heat exchanger surfaces or plug small lines. Also note the viscosity increase. Petro-Therm is an ISO VG 32 and not a 46 as indicated in the result. Viscosity is the fluids ability to resist flow and increases in viscosity in a heat transfer system is normally attributed to the oxidation process but may also be due to a heavier fluid being added? The oxidation is process increase the size of the molecules and increases the oils viscosity. The IBP result is lower than expected as well. A low initial boiling point indicates that low boilers are present. This result can be corroborated by a lower flash point (flash point is lower but still within acceptable guidelines). This result can lead to pump cavitation. Resample to confirm the product viscosity IBP and also ensure that proper sampling techniques are being used so that there is no chance of the sample possibly becoming contaminated. (GCD) 90% Distillation Point is marginally high.
12/23/15	Results are within acceptable guidelines. Continue to monitor unit and resample at the next scheduled interval. (GCD) 90% Distillation Point is marginally low.