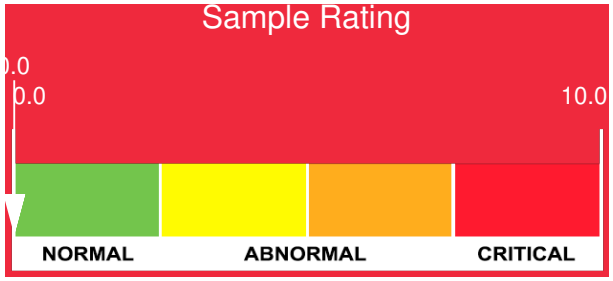
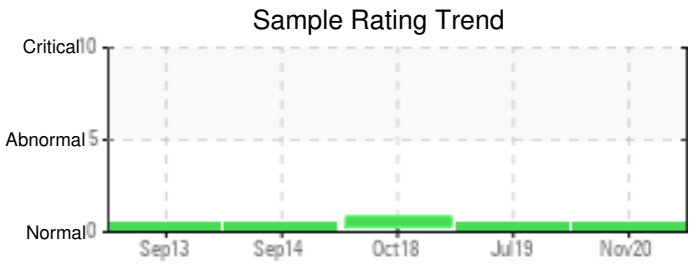




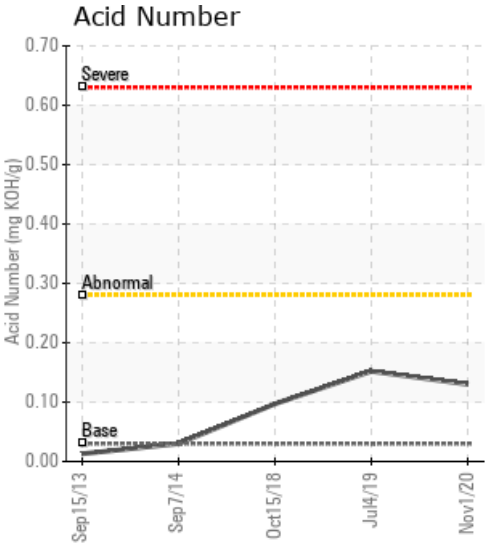
[NE-23-72-4-W5M] TOLKO ATHA-B

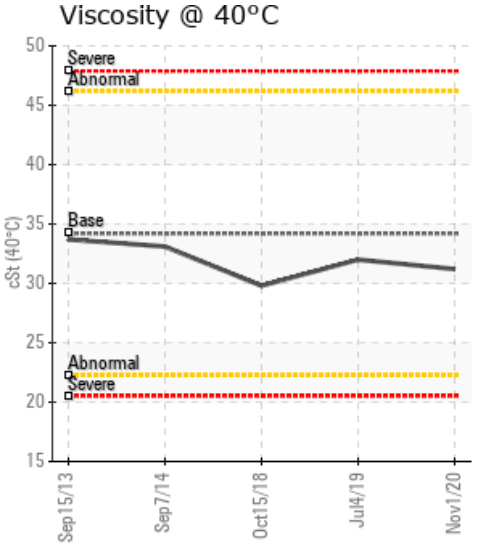
Customer: PTRHTF20126	System Information	Sample Information
TOLKO INDUSTRIES ATHABASCA SLAVE LAKE, AB T0G 2A0 Canada Attn: Lance Battenfelder Tel: (780)805-1562 E-Mail: lance.battenfelder@tolko.com	System Volume: 223000 ltr Bulk Operating Temp: 518F / 270C Heating Source: Blanket: Fluid: PETRO CANADA PETRO-THERM Make: GTS HEATER	Lab No: 02385535 Analyst: Gordon Susinski Sample Date: 11/01/20 Received Date: 11/05/20 Completed: 11/12/20 Gordon Susinski gord.susinski@petrocanadalsp.com

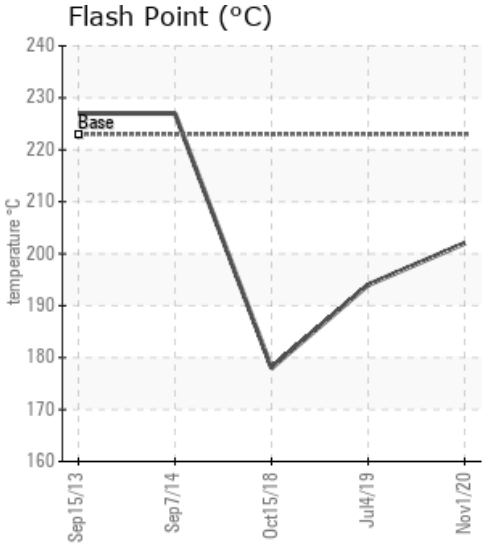
Recommendation: Results are normal. Note the increase in Sulphur. Resample at the next interval and continue to monitor the system.

Comments:

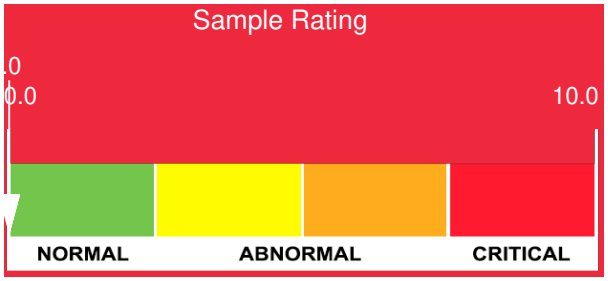
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
11/01/20	11/05/20	13y	Primary Pump	396 / 202	62.0	31.2	0.13	0.079	703 / 373	807 / 431	905 / 485	3.52
07/04/19	07/12/19	6y		381 / 194	0.00	32.0	0.152	0.068	708 / 375	805 / 429	905 / 485	1.32
10/15/18	10/23/18	10y		352 / 178	32.7	29.8	0.097	0.066	685 / 363	792 / 422	893 / 478	4.11
09/07/14	09/08/14	1y		441 / 227	10.0	33.1	0.03	0.152	693 / 367	779 / 415	898 / 481	0.41
09/15/13	09/16/13	5y		441 / 227	7.6	33.7	0.013	0.134	710 / 376	810 / 432	900 / 482	1.21
Baseline Data				433 / 223		34.2	0.03		720 / 382	817 / 436	900 / 482	1.00

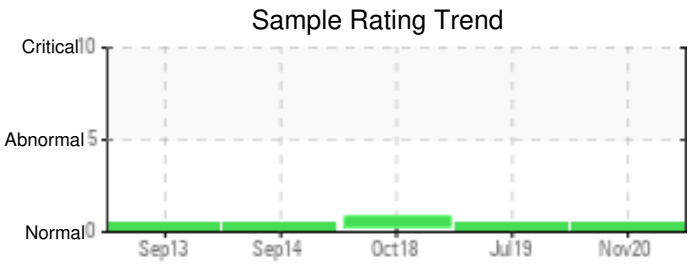






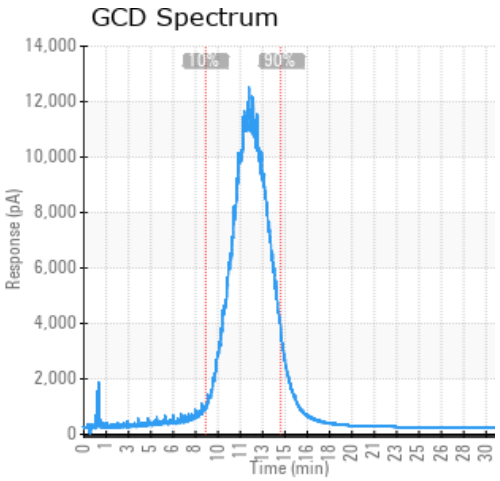
PETRO-CANADA LUBRICANTS

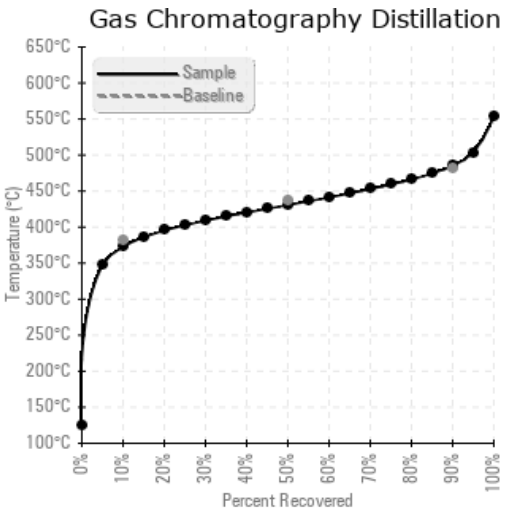


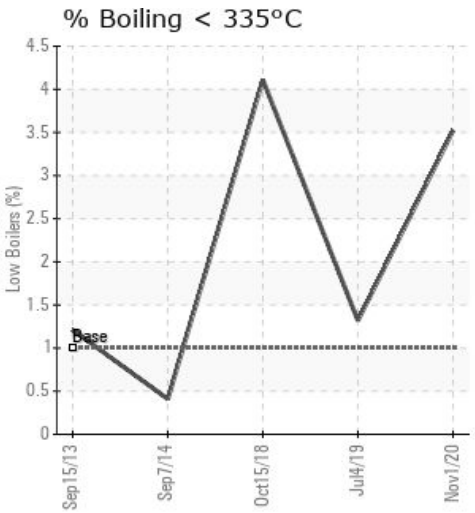


Sample Date	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorus	Zinc
11/01/20	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07/04/19	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/15/18	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09/07/14	35	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	1
09/15/13	0	0	0	0	0	0	0	0	0	0	2	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

07/04/19	Results are normal.
10/15/18	Based on the analysis results, it appears that the oil may have experienced some thermal degradation. This may be due in part to the length of service on the oil (10 of years indicated). 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.Thermal degradation: In the presence of excess heat, the hydrocarbon molecules reach the breaking point of normally stable C-C covalent bonds and crack into lighter hydrocarbons chains. These chains, when formed may have lower viscosities, lower flash points and start to boil before normal fresh oil would thus, affecting the overall fluid efficiency in a negative way by requiring greater amounts of energy to produce the same amount of heat. As the oil thermally degrades it may deposit heavy carbonaceous material by baking it on the tubes and then act as an insulation layer. These carbonaceous layers can flake away and produce hot spots on the tubes possibly resulting in a tube rupture. The carbon residues that get carried away can settle downstream and obstruct the flow in small lines. Make sure the operating temperature is below the flash point of the oil. Although they are within acceptable limits, note the water increase and the acid number increase. 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. Resample at mid interval and continue to monitor the system. COC Flash Point is abnormally low.
09/07/14	Fe content is starting rise but it is not an immediate concern, we will monitor with the next sample. There is also some oxidation with this sample, GCD final boiling point is abnormally high.Continue with next scheduled sample in one year.
09/15/13	The oil is in good condition and suitable for further use. Please sample on an annual basis to monitor the condition of the fluid.