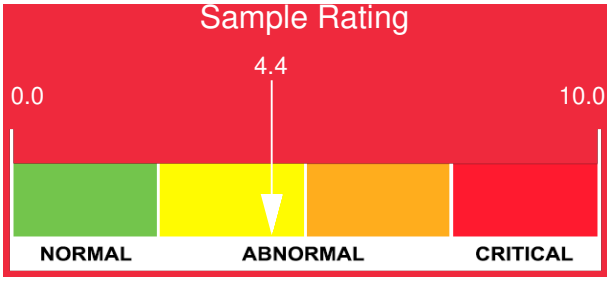
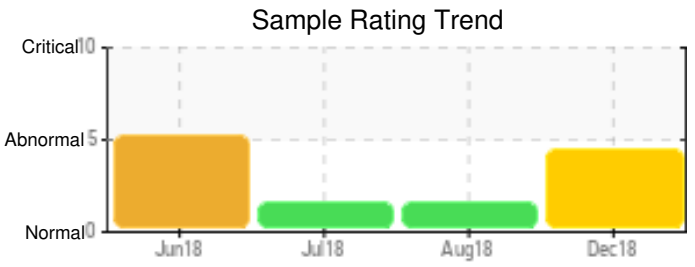




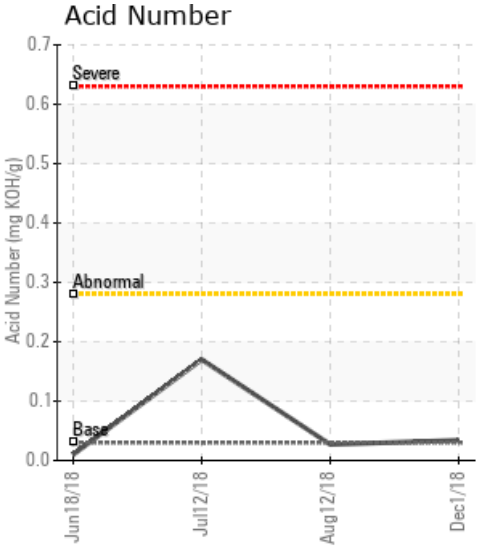
[13-25-80-16-W6M] H-5500-1 - Train 1

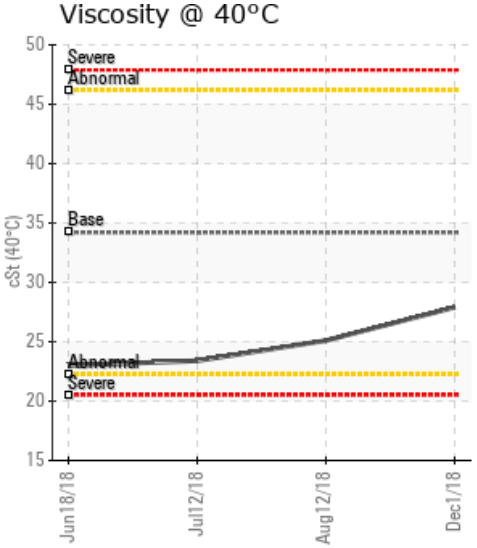
Customer: PTRHTF20156	System Information	Sample Information
TOURMALINE OIL 9920 98a Ave FORT ST. JOHN, BC V1J 1S2 Canada Attn: Brandon Braun Tel: (250)262-5420 E-Mail: Brandon.braun@tourmalineoil.com	System Volume: 40000 ltr Bulk Operating Temp: 464F / 240C Heating Source: Blanket: Fluid: PETRO CANADA PETRO-THERM Make: PROPAK	Lab No: 02258128 Analyst: Bill Quesnel CLS,OMA II,MLA-III,LLA-I Sample Date: 12/01/18 Received Date: 12/18/18 Completed: 08/12/20 Bill Quesnel CLS,OMA II,MLA-III,LLA-I

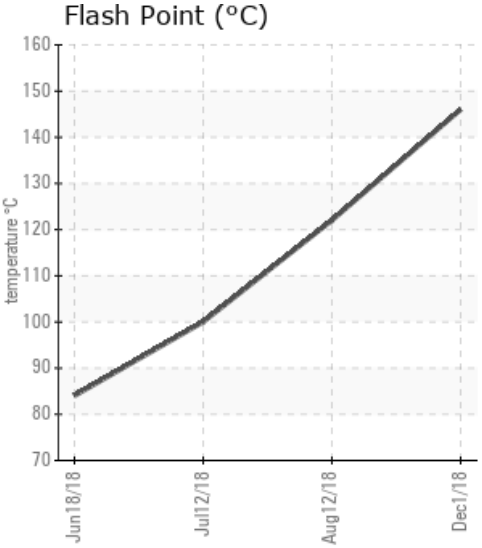
Recommendation: The fluid is in a reasonable condition and suitable for further use but there are indications of either thermal degradation, blanket gas ingress or, considering previous analysis results, indications of an internal process fluid leak. Viscosity, Flash Point and GCD 10% temperature are low. % boil-off below 335 degrees C is high. If an internal process fluid leak is suspect this has to be corrected. In any case it is recommended to vent off the low boiler vapors (light ends) to atmosphere. Please resample in 6 months.

Comments: COC Flash Point is severely low. (GCD) % < 335°C is marginally high. (GCD) 10% Distillation 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	%
12/01/18	12/18/18	0m		295 / 146	12.1	27.9	0.034	0.117	659 / 348	794 / 423	902 / 483	7.83
08/12/18	08/31/18	5m	PUMP SUCTION	252 / 122	6.9	25.1	0.027	0.033	679 / 360	801 / 427	904 / 484	6.27
07/12/18	07/13/18	5m	PUMP SUCTION	212 / 100	0.6	23.4	0.17	0.135	703 / 373	785 / 418	892 / 478	2.42
06/18/18	06/20/18	5m	13-25-80-16-W6M	183 / 84	27.5	23.0	0.01	0.048	639 / 337	767 / 408	870 / 466	9.23
Baseline Data				433 / 223		34.2	0.03		720 / 382	817 / 436	900 / 482	1.00







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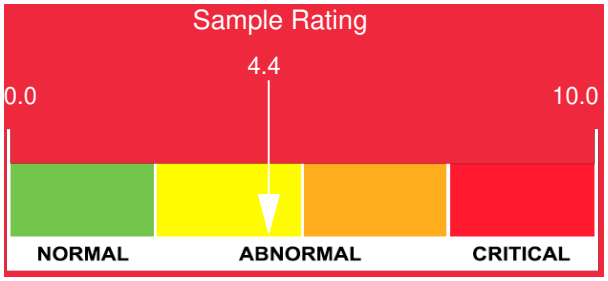
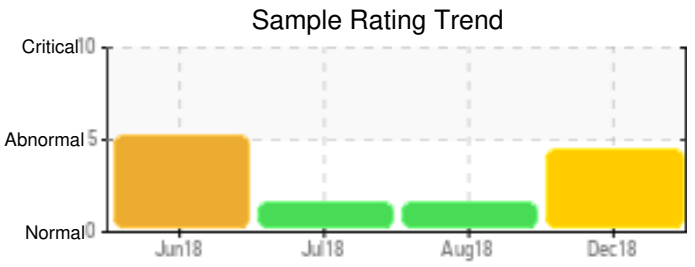
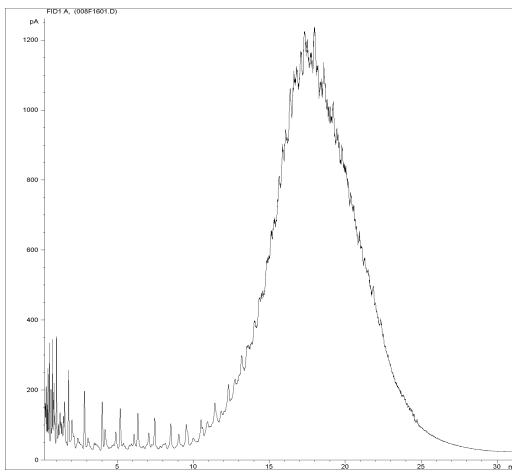




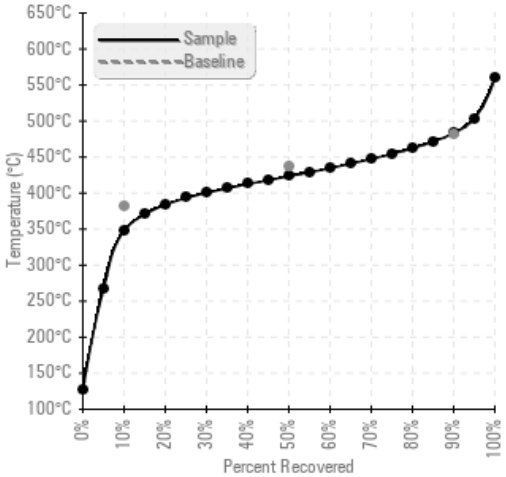
Sample Date	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorus	Zinc
12/01/18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
08/12/18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0
07/12/18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
06/18/18	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0
Baseline Data			0	0						0			0	0					0				0	

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

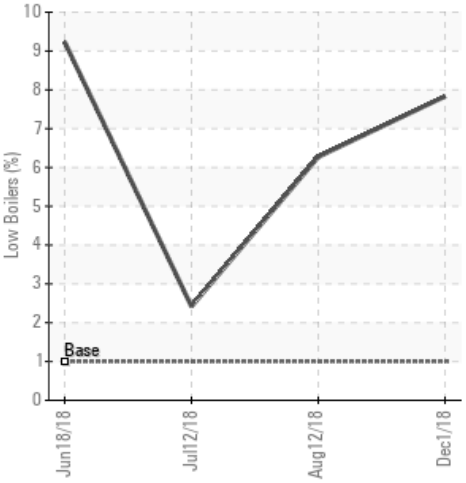
GCD Spectrum



Gas Chromatography Distillation



% Boiling < 335°C



Historical Comments

08/12/18	Flash Point is severely low. Low flash point is a safety concern. % boil-off has increased to 6.27% from 2.42%. This may be attributed to either the condensate contamination and/or thermal degradation. This should be less than 1. Viscosity remains low; currently at 25 cSt vs 34 cSt of new fluid. Consider fluid replacement as the safest method to bring flash point back to acceptable values. Re-sample once fluid has been restored.
07/12/18	Sample results indicate that the fluid has a very low flash point (100C). This can be a safety risk. There is some improvement since the last sample in flash point and distillation values, however, AN has increased. If venting has been occurring since the last sample, exposing the fluid to air can increase acidity via oxidation. Consider fluid replacement as the safest method to bring flash point back to acceptable values. Re-sample once fluid has been restored. COC Flash Point is severely low.
06/18/18	Sample results indicate the this heat transfer fluid is not suitable for continued service. Most concerning is the extremely low Flash Point value of 84C. This poses a safety hazard to continue use. Flash point has gone from 210C in the previous sample to 84C, fluid viscosity has gone from 33.4 to 23 cSt and % of fluid boil off < 335C has gone from 1% to more than 9%.Fluid replacement is recommended and mitigation of the source of dilution is required. After the entire system has been cleaned and new fluid has been filled, obtain a sample from the system before start-up. Once system has been in operation at normal temperatures for 24 hours, please obtain a second fluid sample to establish new trend. Please contact Petro-Canada Lubricants for further support