

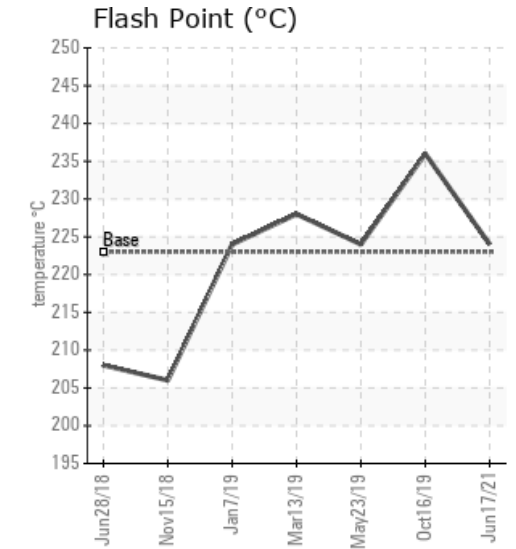
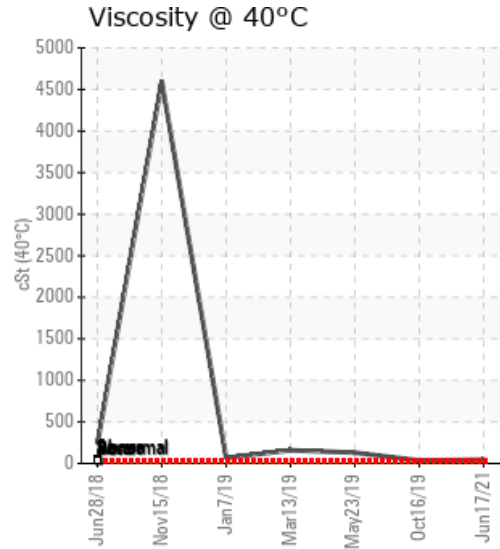
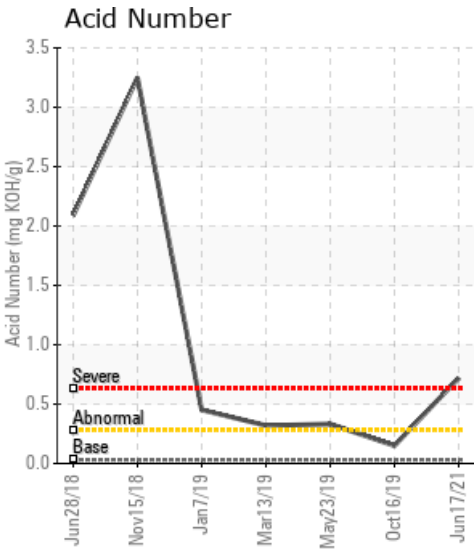
[2-26-52-12W5] HEAT TRANSFER OIL

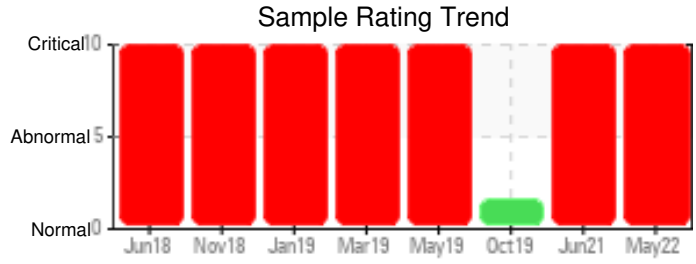
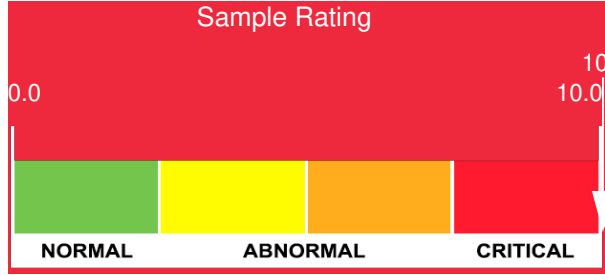
Customer: PTRHTF20201	System Information	Sample Information
JOURNEY ENERGY	System Volume: 14000 ltr	Lab No: 02491873
WHITECOURT, AB T7S 0A2 Canada	Bulk Operating Temp: 410F / 210C	Analyst: Clinton Buhler
Attn: Ken Grebinski	Heating Source:	Sample Date: 05/26/22
Tel: (780)706-1778	Blanket:	Received Date: 05/31/22
E-Mail: kgrebinski@tahoenergy.ca	Fluid: PETRO CANADA PETRO-THERM	Completed: 06/03/22
	Make: ALCO	Clinton Buhler
		Clinton.Buhler@hollyfrontier.com

Recommendation: *** Sample is highly-viscous (sludge) so GCD, KF, Flash Point and AN tests could not be performed ***Under room temperature conditions, the fluid becomes a sludge and not all tests could be performed. The analysis does indicate high solids content and elevated iron levels. This indicates severe degradation of the heat transfer fluid. It is advised to perform a system cleaning and fill with fresh Petro-Therm. Please contact your technical services advisor for further discussion.

Comments: Iron ppm levels are severe. PQ levels are severe. Pentane Insolubles levels are severely 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	%
05/26/22	05/31/22	3.0y	PUMP DISCHARGE					3.36				
06/17/21	06/24/21	2.0y	Tnk Truck dur. repr	435 / 224	19608.3	44.8	0.72	1.52	702 / 372	795 / 424	903 / 484	3.12
10/16/19	10/29/19	4.0y	BOTTOM OF SIGHT GLAS	457 / 236	70.6	35.9	0.150	0.624	693 / 367	788 / 420	893 / 478	2.39
05/23/19	05/31/19	0.0y		435 / 224	63.3	130	0.332	2.78	723 / 384	814 / 434	915 / 490	0.63
03/13/19	03/20/19	0.0y	SIGHT GLASS	442 / 228	161.2	159	0.32	2.07	701 / 372	800 / 426	903 / 484	3.62
Baseline Data				433 / 223		34.2	0.03		720 / 382	817 / 436	900 / 482	1.00

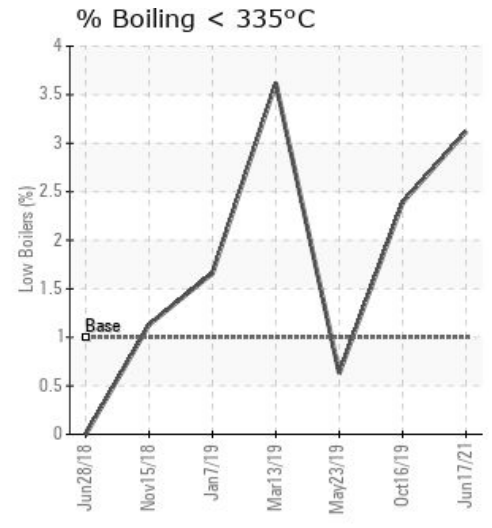




Sample Date	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorus	Zinc
05/26/22	730	0	0	3	0	0	0	0	0	0	13	0	11	0	0	0	11	1	3	0	5	0	0	3
06/17/21	485	0	0	2	0	0	0	0	0	0	8	1	0	0	0	0	8	0	3	0	2	0	0	0
10/16/19	63	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	0
05/23/19	836	0	0	3	0	0	0	0	0	0	5	5	0	0	0	0	11	0	0	0	2	0	2	1
03/13/19	1191	0	0	5	0	0	0	0	0	0	8	8	0	0	0	0	15	0	0	0	3	0	1	1
Baseline Data			0	0						0			0	0					0				0	

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

GCD Spectrum



Historical Comments	
06/17/21	Sample results indicate excessive water contamination. It is understood that the sample was taken from a tank truck during system repairs. If this is representative, the water needs to be removed from the system. Venting of steam is required as this amount of water contamination is a risk for boil over but it will also degrade the fluid (see Acid Number increase to 0.72 and fluid viscosity increase to 44.8). Solids content is still high at 1.52% which is 3x the warning limit. Please re-sample in 1 month after venting all water via steam from the expansion tank. Please ensure sample is taken from pump discharge and only after sample valve and piping has been thoroughly purged.
10/16/19	The fluid is in a good condition and suitable for further use but the Pentane Insoluble (solids) content is high with 0.624%. This is just over the reportable limit of 0.5%. It is therefore recommended to start filtration of the fluid. Please re-sample in 6 months. Pentane Insolubles levels are severely high.
05/23/19	The fluid is in a poor condition and it is recommended to change out the fluid before the winter because efficient system operation can't be guaranteed for much longer. The Pentane Insoluble (solids) content is the main problem. At 2.78% it is more than 5x higher than the reportable limit of 0.5%. The solids content of the fluid is also partly the reason for the very high viscosity of 130 cSt/40C. The Fe content of the fluid is high but this is remaining from prior to sweetening of the fluid when the AN was at 3.25. The current AN is elevated but within limits. Please contact your Petro-Canada Tech Service Advisor for assistance with cleaning/flushing of the system. Iron ppm levels are severe. PQ levels are severe. Pentane Insolubles levels are severely high. Visc @ 40°C is severely high. Acid Number (AN) is abnormally high.
03/13/19	The fluid is in a poor condition but suitable for further use. Was this sample pulled from a low point in the system? (Increased water and solids content) Viscosity is high. It is recommended to start planning cleaning/flushing of the system. Iron ppm levels are severe. PQ levels are severe. Pentane Insolubles levels are severely high. Visc @ 40°C is severely high. Acid Number (AN) is abnormally high.

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