

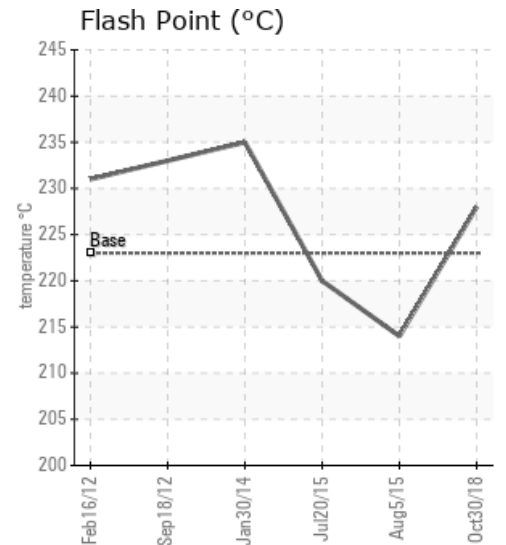
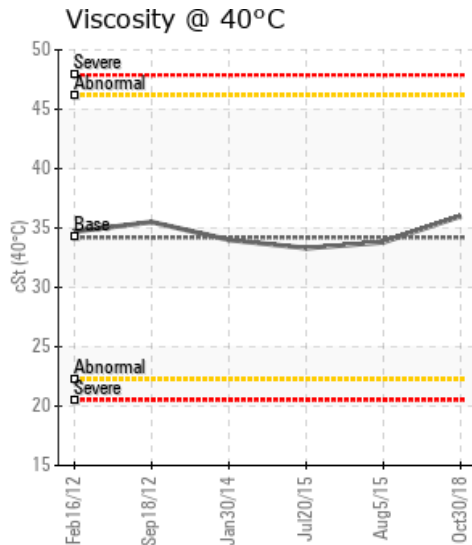
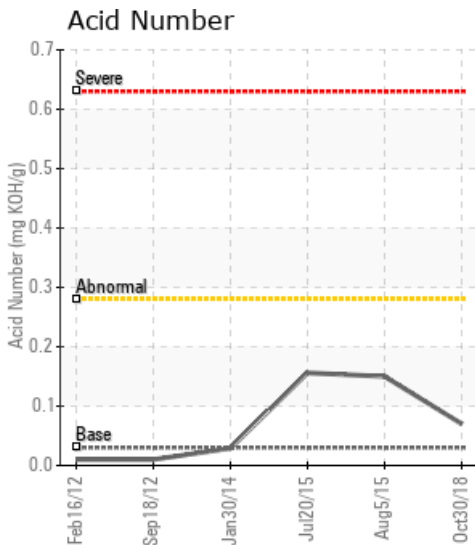
## TOURMALINE WILDRIVER REFRDGE 2

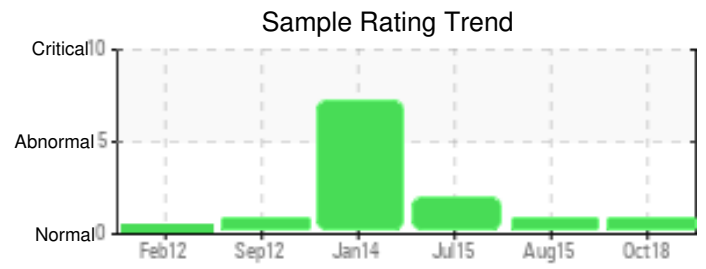
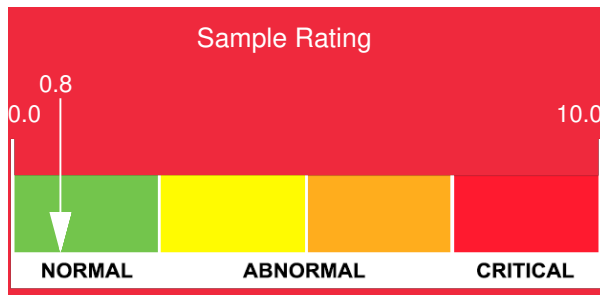
Customer: PTRHTF20046	System Information	Sample Information
QUADRA CHEMICALS 12925 146TH STREET EDMONTON, AB T5L 2H6 CANADA Attn: Quadra Samples Tel: E-Mail: quadra_samples@quadra.ca	System Volume: 29000 ltr Bulk Operating Temp: 428F / 220C Heating Source: Blanket: Fluid: PETRO CANADA PETRO-THERM Make:	Lab No: 02249317 Analyst: Peter Harteveld Sample Date: 10/30/18 Received Date: 11/05/18 Completed: 11/11/18

Recommendation: The fluid is in good condition and suitable for further use but the Pentane Insoluble (solids) content is getting close to the warning limit of 0.5%. It is recommended to start planning filtration of the fluid.

Comments: Pentane Insolubles levels are abnormally 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	%
10/30/18	11/05/18	0y		442 / 228	114.9	36.0	0.07	0.481	716 / 380	807 / 431	911 / 489	0.69
08/05/15	09/02/15	24y		417 / 214	23.5	33.8	0.15	0.069	719 / 382	814 / 435	919 / 493	0.88
07/20/15	07/29/15	19y		428 / 220	0.00	33.3	0.156	0.114	717 / 381	815 / 435	920 / 493	1.23
01/30/14	02/06/14	1y	EXPANSION TANK	455 / 235	633.5	34.0	0.029	0.043	721 / 383	814 / 434	922 / 494	0.63
09/18/12	09/21/12			451 / 233	67	35.5	0.01	0.005	713 / 379	806 / 430	907 / 486	1.188
02/16/12	02/17/12	8y	REFRIDGE #2 DE-ETHAN	448 / 231	45	34.7	0.01	0.001	713 / 378	806 / 430	904 / 485	1.284
Baseline Data				433 / 223		34.2	0.03		720 / 382	817 / 436	900 / 482	1.00

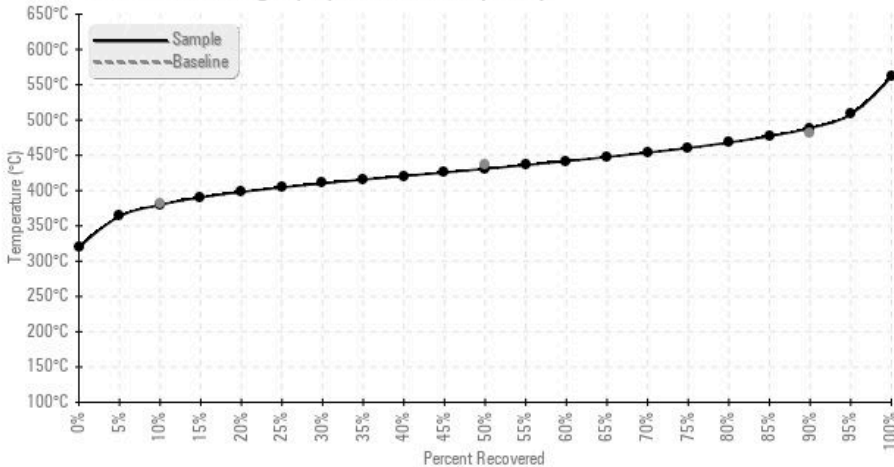




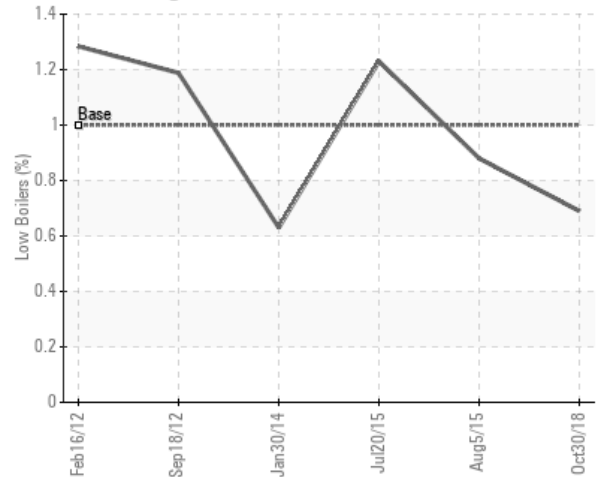
Sample Date	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorus	Zinc
10/30/18	21	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0
08/05/15	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07/20/15	33	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
01/30/14	4	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	1	0	1	2
09/18/12	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	4	0
02/16/12	0	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 analysis results (above) in parts per million (ppm). [10,000 ppm = 1.0%]

### Gas Chromatography Distillation (GCD)



### % Boiling < 335°C



### Historical Comments

08/05/15	Fluid condition is similar to the previous sample. The 90% GCD temperature and TAN are slightly high. The solids content has decreased (filtration?). The condition reflects initial oxidation which has not progressed further. The fluid is in good condition and suitable for further use. (GCD) 90% Distillation Point is marginally high.
07/20/15	The fluid is in good condition and suitable for further use. The 90% GCD temperature is elevated. This in combination with an increase in TAN and Pentane Insolubles (solids) indicates initial oxidation of the fluid. At this moment there is no reason for concern but please ensure that the fluid does not contact outside air (oxygen) at high temperature conditions as this increases the rate of oxidative degradation. Please re-sample in 6 months. (GCD) 90% Distillation Point is marginally high.
01/30/14	This seems to be a fresh fill of Petro-Therm. Fluid service life has been reported to be 1 month. Water content is high. Sulfur content is high. The reasons for this can be: 1. Sample port is at a low position and has not been flushed out properly prior to taking the sample. In this case the sample is not representative for the fluid in the system and re-sampling is recommended. 2. Water ingress took place when the system was filled. Water vapor needs to be vented off via the expansion tank. Please contact pharteveld@suncor.com for instructions on efficient venting. Water contamination levels are abnormally high. (GCD) 90% Distillation Point is marginally high.
09/18/12	The oil condition is acceptable at this time. At your convenience, please email Gaston Arseneault the system total volume and operating temperature of each system so we can complete our files. This makes for more accurate result interpretation when we know the size of the system and operating conditions.
02/16/12	The sample looks very much like fresh oil. No apparent contamination nor degradation based on the results. Please re-sample once per year at least to monitor the fluid condition.

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