

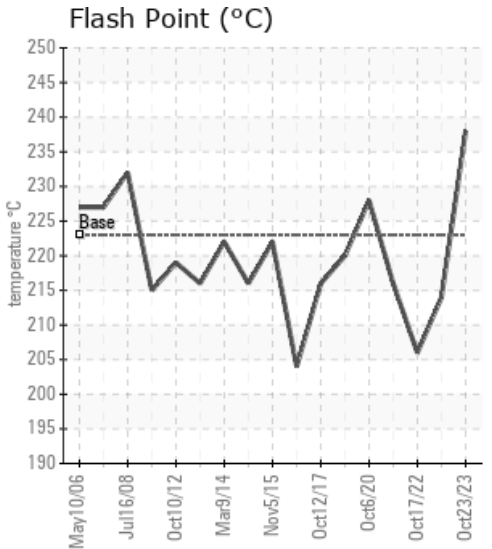
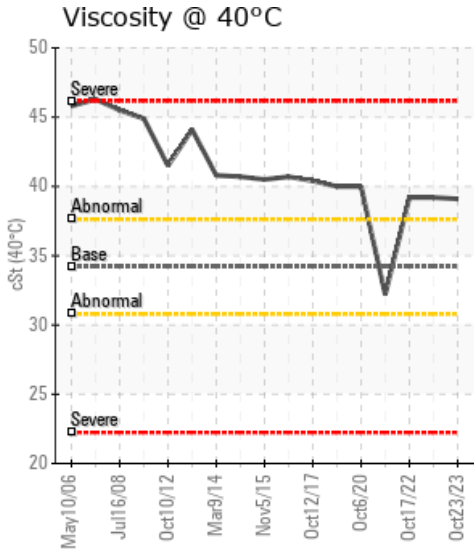
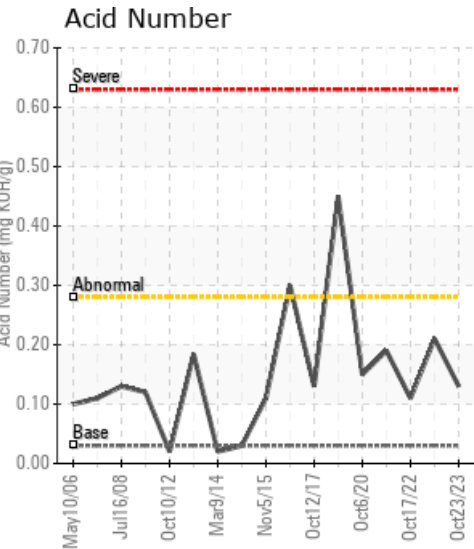
WELLONS

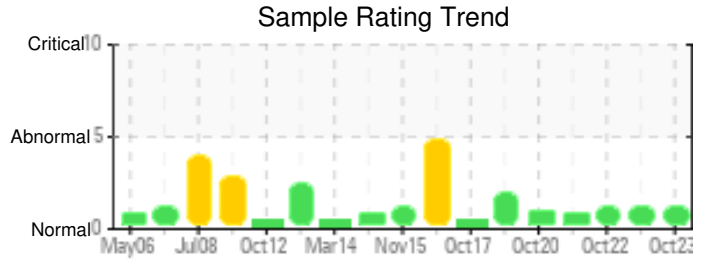
Customer: PTRHTF20077	System Information	Sample Information
TOLKO 180 HODGSON ROAD WILLIAMS LAKE, BC V2G 2P6 CA Attn: Barry Riley Tel: (250)392-0736 E-Mail: barry.riley@tolko.com	System Volume: 0 ltr Bulk Operating Temp: 254F / 123C Heating Source: Blanket: Fluid: PETRO CANADA PETRO-THERM Make: WELLONS	Lab No: 02595666 Analyst: Ray Rolston Sample Date: 10/23/23 Received Date: 11/10/23 Completed: 11/14/23 Ray Rolston Ray.Rolston@HFSinclair.com

Recommendation: The viscosity @ 40 C reflects the viscometrics of the previous formulation of Petro-Therm which had a higher fresh oil viscosity (43 cSt @ 40 C) compared with the current formulation (35.8 cSt @ 40 C). The Gas Chromatography Distillation (GCD) values % < 335 C and Initial Boiling Point reflect the presence of low boilers due to thermal cracking. All other inspections indicate that the Petro-Therm is suitable for continued use including low Acid Number and Pentane Insolubles (solids content). Recommend re-sampling in 6 months to monitor the fluid's condition.

Comments: Visc @ 40°C is abnormally high. (GCD) 90% Distillation Point is marginally high.

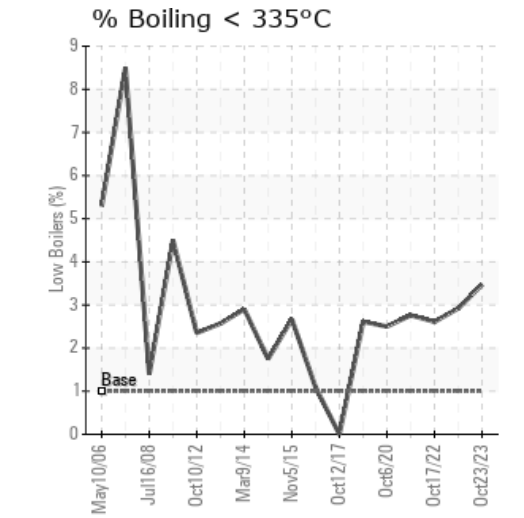
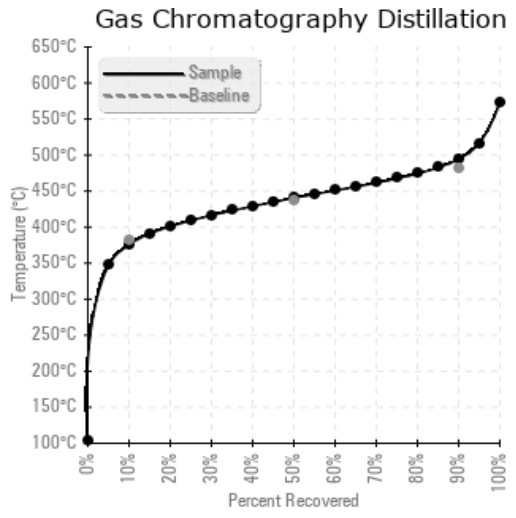
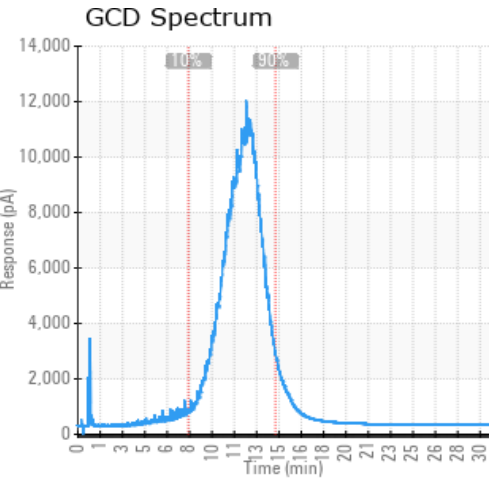
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
10/23/23	11/10/23	0.0y	PUMP PRESSURE GAUGE	460 / 238	22.0	39.1	0.13	0.054	708 / 376	825 / 440	922 / 494	3.47
06/13/23	06/22/23	0.0y	PRESSURE G	417 / 214	11.5	39.2	0.21	0.203	713 / 378	826 / 441	921 / 494	2.92
10/17/22	11/11/22	30.0y	expansion tank	403 / 206	0.00	39.2	0.11	0.152	717 / 380	827 / 442	920 / 494	2.61
04/19/22	05/16/22	30.0y	circulation pump	421 / 216	25.1	32.2	0.19	0.103	716 / 380	828 / 442	925 / 496	2.76
10/06/20	10/22/20	0.0y	Pressure gauge	442 / 228	29.5	40.0	0.15	0.117	717 / 380	828 / 442	922 / 495	2.50
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
10/23/23	5	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06/13/23	7	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
10/17/22	4	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04/19/22	11	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/06/20	12	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Baseline Data			0	0						0			0	0					0				0	

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



Historical Comments	
06/13/23	The viscosity of the oil is 39.2 cSt @ 40 C, the same as the previous sample. In April 2022, it was reported as 32.2 cSt @ 40 C, and in 2020 it was 40.0 cSt, so I'd consider the April 2022 viscosity an anomaly. The GCD distillation results are good, but the AN (Acid Number) has increased to 0.21, and the Pentane Insolubles (solids content) has increased to 0.203 wt%. The fluid is suitable for continued use, but it is starting to show signs of aging and deterioration. Recommend sampling in 6 months to monitor. Visc @ 40°C is abnormally high. (GCD) 90% Distillation Point is marginally high.
10/17/22	Viscosity at 39.2 cSt @ 40 C is slightly low but reflects a blend of the previous ISO VG 32 Petro-Therm formulation with the current ISO VG 46 formulation. The COC Flash Point at 206 C is showing a dropping trend, but it is still above the 150 C condemning guideline. Pentane Insolubles (solids) content of 0.152 wt% is below the condemning limit of > 0.5 wt%. All other inspections are normal. The oil is suitable for continued use and should be re-sampled in one year. Visc @ 40°C is abnormally high. (GCD) 90% Distillation Point is marginally high.
04/19/22	Water content and Acid Number remain low and within an acceptable range. Viscosity at 40 C at 32.2 cSt is closer to fresh oil typical of 35.8 cSt vs. historic values. GCD 90% and FBP Distillation Points indicate the presence of high boilers. Pentane insolubles (sludge) content remains low at 0.103 wt%. Petro-Therm is suitable for continued use; re-sample in one year to monitor the oil's condition. (GCD) 90% Distillation Point is marginally high.
10/06/20	The Petro-Therm fluid is in good condition. The Total Acid Number (TAN) has decreased from 0.45 on the last sample where it was at a warning level to 0.15. This is possibly due to a slight variation in sampling practice/location or test method repeatability. Viscosity @ 40°C is high, but this is likely because the fluid used to initially fill the system was an older formulation of Petro-Therm when it was an ISO 46 viscosity grade, this may also affect the GCD results and be the reason for the GCD at 90% being slightly different. Recommend taking sample in six months to monitor trends. (GCD) 90% Distillation Point is marginally high.

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