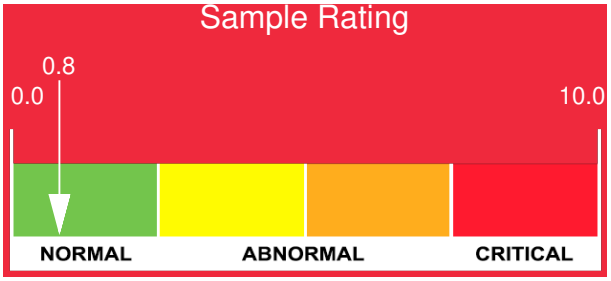
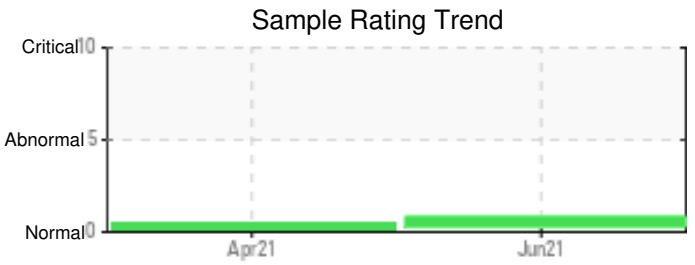




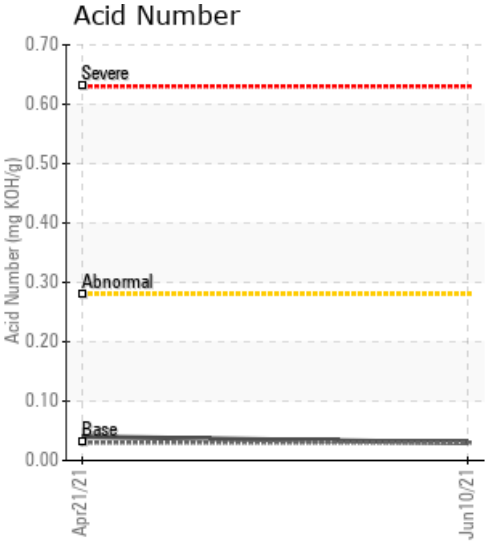
[SE 1/4 SECTION 32 TWP109 RANGE 19W5M] THERMAL ENERGY SYSTEM

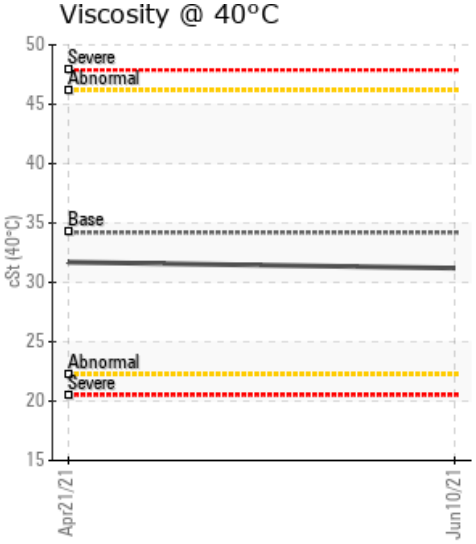
Customer: PTRHTF20250	System Information	Sample Information
TOLKO INDUSTRIES 11401-92 ST HIGH LEVEL, AB T0H 1Z0 Canada Attn: James Malmquist Tel: (780)502-3942 E-Mail: james.malmquist@tolko.com	System Volume: 228000 ltr Bulk Operating Temp: 560F / 293C Heating Source: Blanket: Fluid: PETRO CANADA PETRO-THERM Make: WELLONS INC	Lab No: 02428115 Analyst: Paul Hetherington Sample Date: 06/10/21 Received Date: 06/18/21 Completed: 07/06/21 Paul Hetherington paul.hetherington@hollyfrontier.com

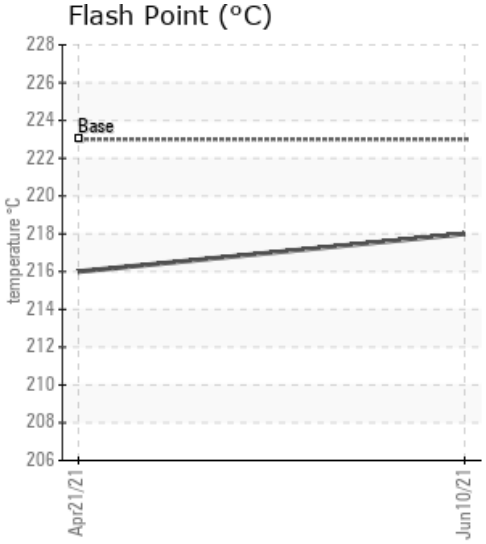
Recommendation: The PMCC (Pensky Martin Closed Cup) flash point is very low again (70C) and actually below the previous sample in April (128C). The COC (Cleveland Open Cup) is similar to the previous sample but slightly higher (218C vs 216C). Even though the PMCC is lower than previous sample, other key analysis indicates that overall there are less low boilers then in the previous sample. Initial boiling point has increased as well %<335C (which is a good indicator of the content of low boilers) is down to 1.81 % which is not a concern. The GCD spectrum also shows less low boilers than the previous sample. Even though the overall volume of low boilers is low, recommend following the standard venting procedure via the expansion tank which may help to increase the PMCC.

Comments: Pensky-Martens Flash Point is severely low.

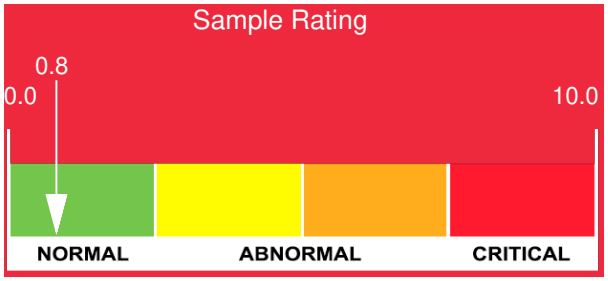
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
06/10/21	06/18/21	20.8m	MAIN PUMP DISCHARGE	424 / 218	15.7	31.2	0.03	0.044	717 / 381	803 / 428	915 / 491	1.81
04/21/21	04/29/21	19.0m	primary pump 3	421 / 216	27.9	31.7	0.04	0.033	708 / 376	797 / 425	915 / 491	3.08
Baseline Data				433 / 223		34.2	0.03		720 / 382	817 / 436	900 / 482	1.00

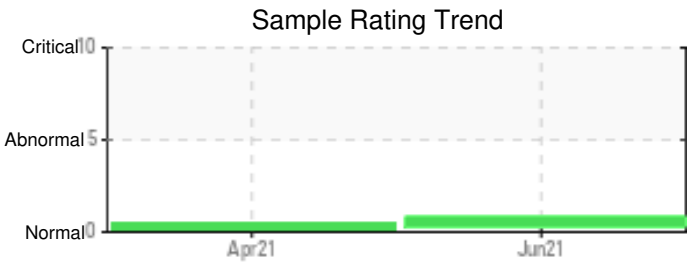






PETRO-CANADA LUBRICANTS

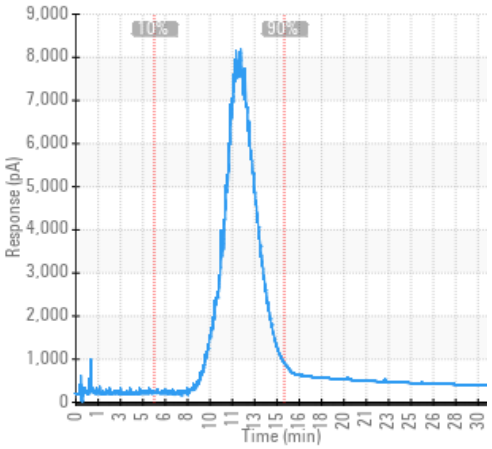




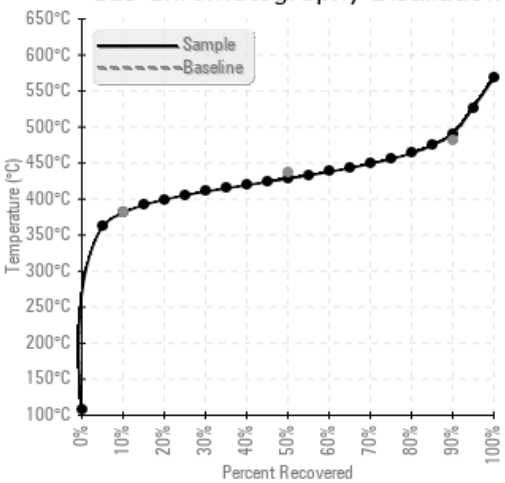
Sample Date	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorus	Zinc
06/10/21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04/21/21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Baseline Data			0	0						0			0	0					0				0	

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

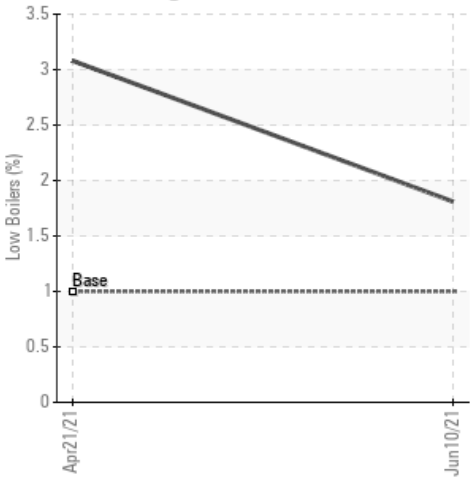
GCD Spectrum



Gas Chromatography Distillation



% Boiling < 335°C



Historical Comments

04/21/21	The Pensky-Martens Closed Cup (PMCC) flash point is significantly lower than expected. In addition the Initial Boiling Point (IBP) is also significantly lower. ALL other parameters are normal and in virtually 'as new' condition. Low flash on the PMCC and low IBP might be related to addition of a solvent at some point and time (i.e. maybe at commissioning)?? Pensky-Martens Flash Point is abnormally low.