

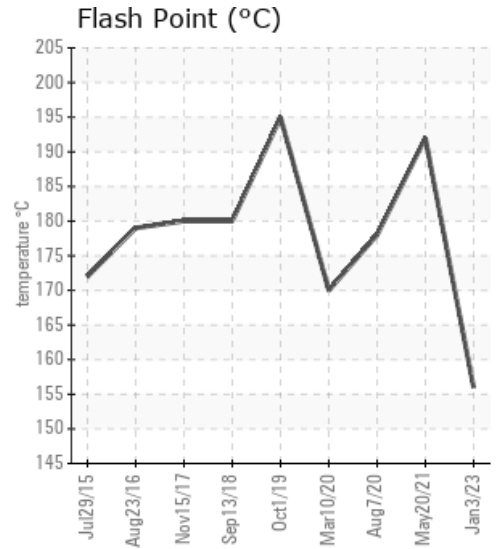
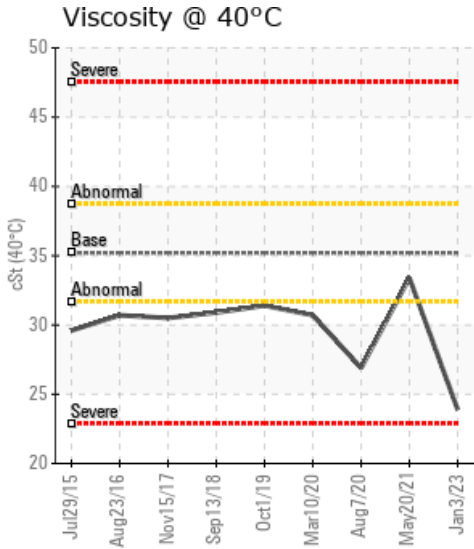
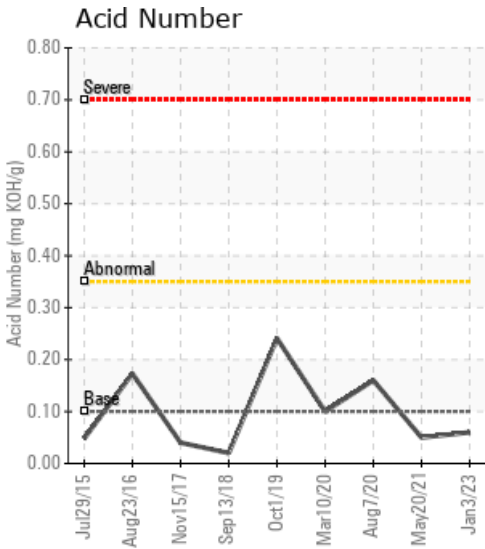
# LINE 1

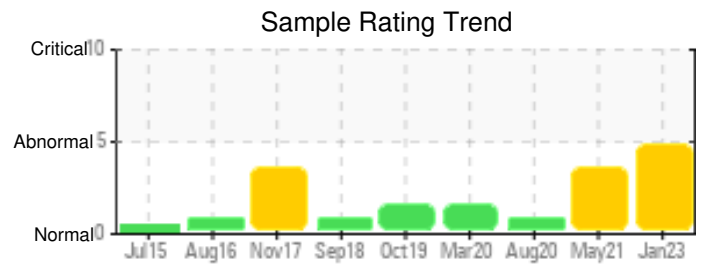
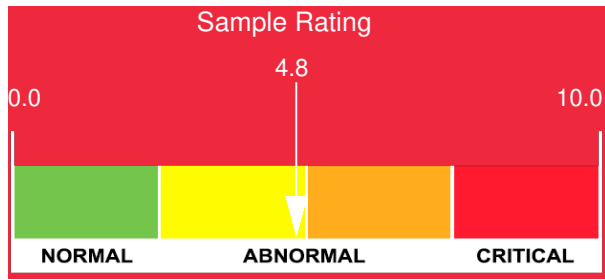
Customer: PTRHTF10164	System Information	Sample Information
Malarkey Roofing 3400 S. Council Rd OKLAHOMA CITY, OK 73179 USA Attn: MALARKEY ROOFING Tel: (405)261-6900 E-Mail: bdaverede@malarkeyroofing.com	System Volume: 2500 gal Bulk Operating Temp: 565F / 296C Heating Source: Blanket: Fluid: PETRO CANADA CALFLO HTF Make: AMERICAN HEATING	Lab No: 02541173 Analyst: Garrett Bapp Sample Date: 01/03/23 Received Date: 02/23/23 Completed: 03/10/23 Garrett Bapp Garrett.Bapp@HFSinclair.com

Recommendation: Thermal degradation is still present in this system. Viscosity has fallen out of grade. Flash Point is 75°C below base line. GCD 335°C continues to be elevated and GCD 10% is below base line reference. All indications that Low Boilers are present. No indication that carbonaceous deposits are present. Recommendation is the vent the system and replace 50% of the system volume. Since the system is still in good health and 600 gallons, we may want to speak about just doing a full system change out before the system gets to a critical state.

Comments: COC Flash Point is severely low. (GCD) 10% Distillation Point is abnormally low. Visc @ 40°C is abnormally low. (GCD) % < 335°C is marginally high.

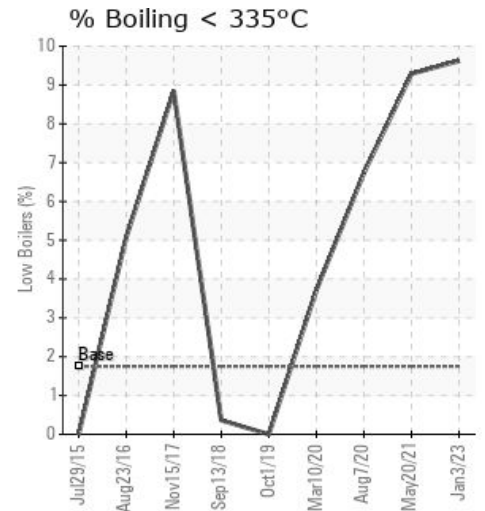
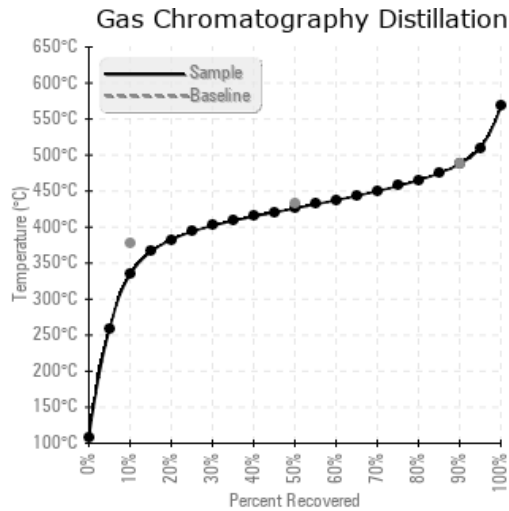
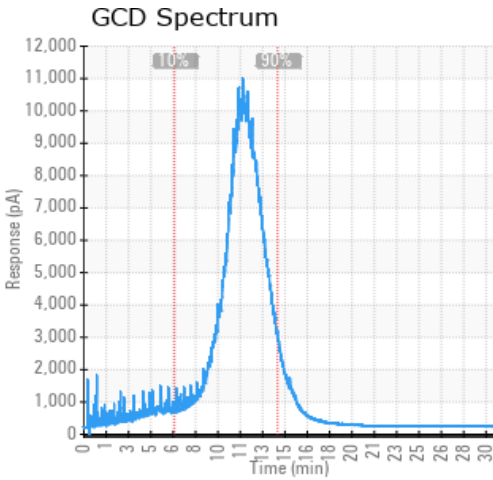
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
01/03/23	02/23/23	10.0y	before pump	313 / 156	0.2	23.9	0.06	0.045	633 / 334	799 / 426	910 / 488	9.62
05/20/21	05/28/21	4.0y	Line #1	378 / 192	11.9	33.4	0.05	0.098	638 / 337	780 / 416	905 / 485	9.29
08/07/20	08/20/20	8.0y	EXIT EXCHANGE PORT	352 / 178	25.7	26.9	0.16	0.065	674 / 356	803 / 428	917 / 492	6.74
03/10/20	04/06/20	8.0y	SAMPLE PORT	338 / 170	6.5	30.7	0.10	0.154	697 / 370	805 / 430	919 / 493	3.72
10/01/19	10/15/19	5.0y		383 / 195	12.8	31.4	0.241	0.210	726 / 386	821 / 438	936 / 502	0.00
Baseline Data				448 / 231		35.20	.1		712 / 378	810 / 432	910 / 488	1.75





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	
01/03/23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	
05/20/21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0
08/07/20	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0
03/10/20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	0
10/01/19	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	0
<b>Baseline Data</b>			0	0						0			0	0				0	0					280	

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



Historical Comments	
05/20/21	Thermal degradation of the fluid represented by GCD %<335°C, lower than normal COC Flash Point and Low GCD 10%. All other parameters are on spec. Recommended to vent light ends from the system and sweeten with 20% fluid volume. (GCD) 10% Distillation Point is abnormally low. (GCD) % < 335°C is marginally high. COC Flash Point is marginally low.
08/07/20	Fluid continues to show signs of thermal cracking but is suited for continued use. Recommend to vent light ends from system and sample at next interval. COC Flash Point is abnormally low.
03/10/20	System is in good health. Fluid continues to show signs of thermal degradation. COC Flash Point of 170°C is 61°C below new. All other parameters are within targets. Recommend venting of low boilers from the expansion tank. COC Flash Point is severely low.
10/01/19	Fluid is suitable for continued use. There is evidence of oxidation and thermal cracking. Acid number is rising. Viscosity is slightly reduced but still within viscosity grade. Flash point is 36°C lower than specified for new fluid. (GCD) 90% Distillation Point is slightly elevated. Pentane Insolubles has increased from previous sample. To increase the longevity of fluid, vent low boilers and a 20% drain and refill during the next system shutdown should help. Continue monitoring and yearly sampling. System wear in good health. System contaminants in good health. (GCD) 90% Distillation Point is marginally high. COC Flash Point is marginally low.

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