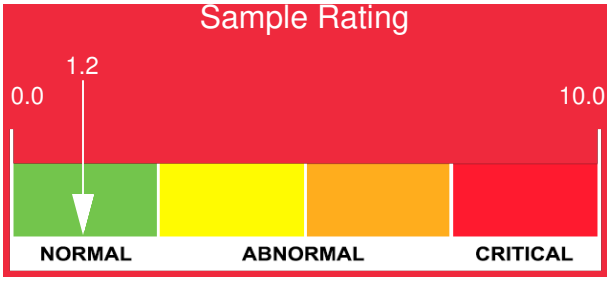
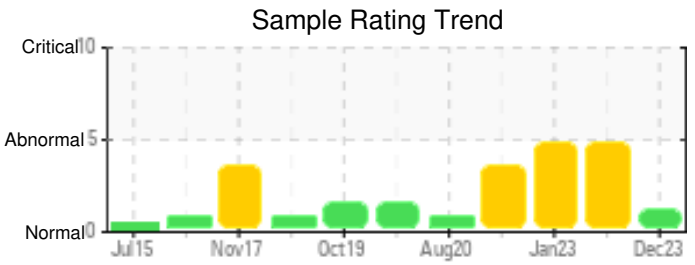




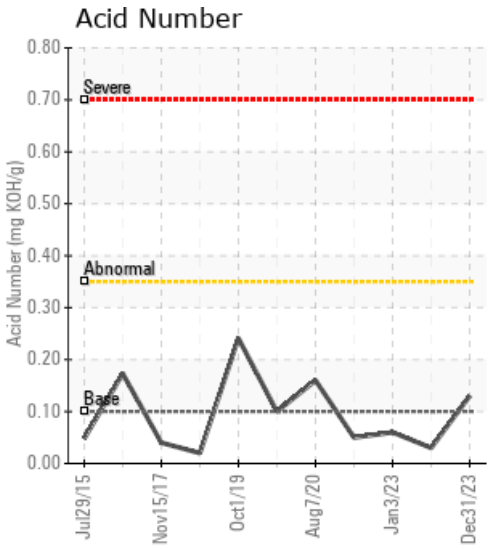
LINE 1

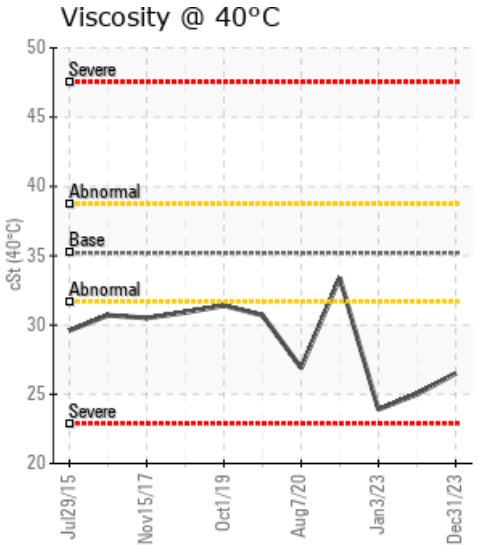
Customer: PTRHTF10164	System Information	Sample Information
Malarkey Roofing 3400 S. Council Rd OKLAHOMA CITY, OK 73179 US Attn: Hunter Lewis Tel: (405)261-6900 E-Mail: hunter.lewis1@holcim.com	System Volume: 2500 gal Bulk Operating Temp: 565F / 296C Heating Source: Blanket: Fluid: PETRO CANADA CALFLO HTF Make: AMERICAN HEATING	Lab No: 02608653 Analyst: Garrett Bapp Sample Date: 12/31/23 Received Date: 01/12/24 Completed: 01/18/24 Garrett Bapp Garrett.Bapp@HFSinclair.com

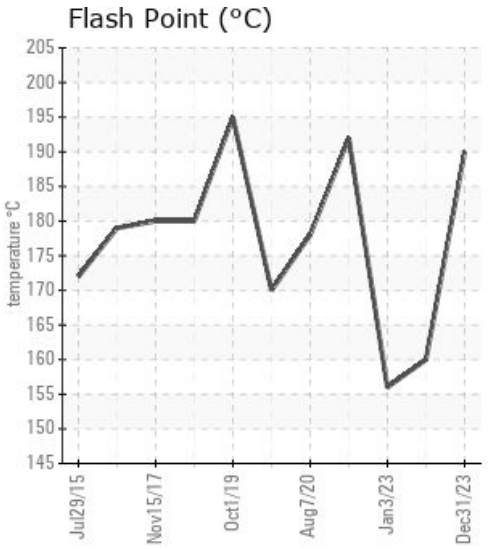
Recommendation: Sample has improved since the March 2023 sample. Viscosity and Flash Point still remain lower than new product but is in safe operating range. GCD profile shows low boilers. Recommend to vent light ends from the system at this time and continue routine sampling.

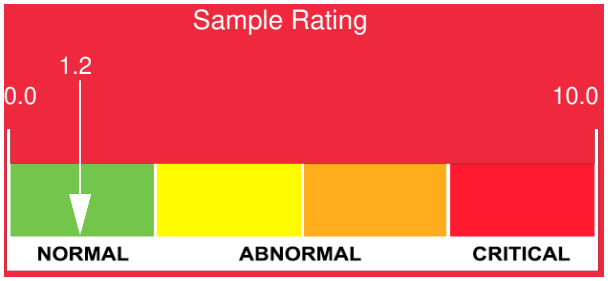
Comments: Visc @ 40°C is abnormally low. COC Flash Point is marginally low.

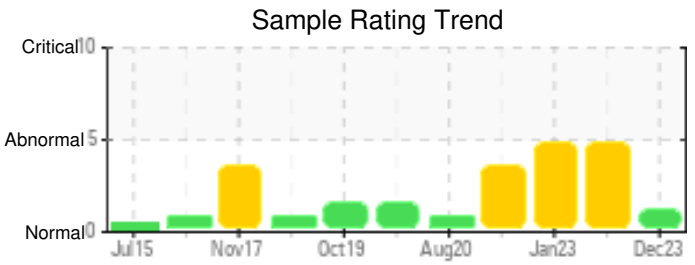
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
12/31/23	01/12/24	10.0y		374 / 190	11	26.5	0.13	0.049	668 / 354	803 / 429	911 / 489	7.39
03/27/23	04/12/23	10.0y		320 / 160	17.8	25.0	0.03	0.061	634 / 334	799 / 426	906 / 486	9.59
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
Baseline Data				448 / 231		35.20	.1		712 / 378	810 / 432	910 / 488	1.75





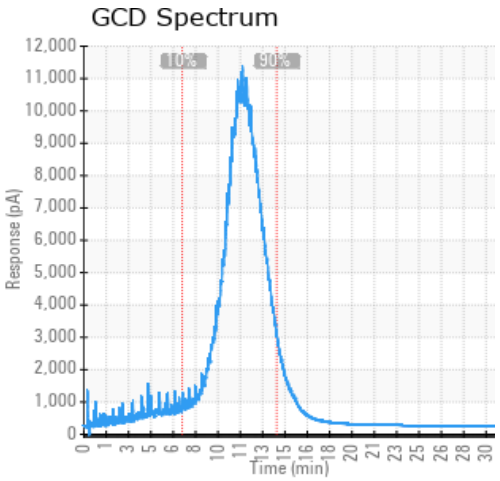


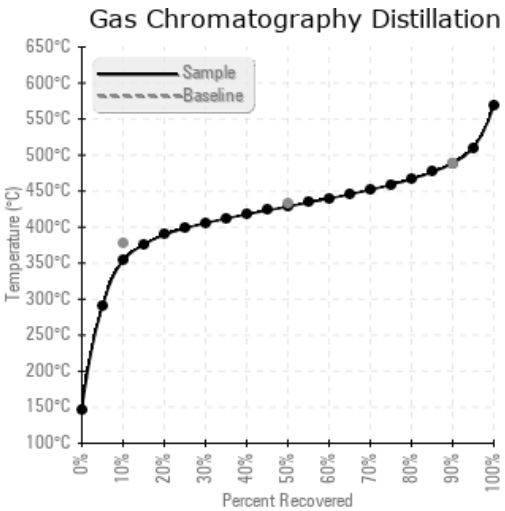


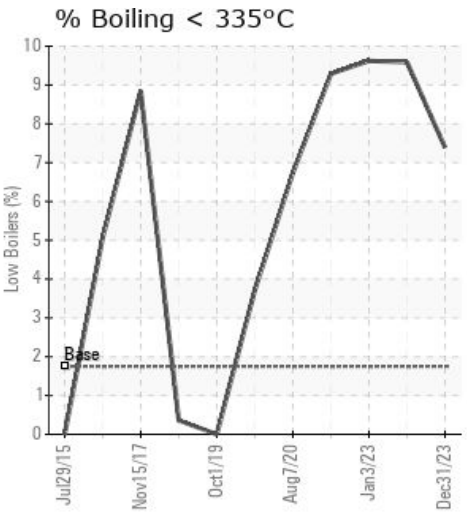


Sample Date	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorus	Zinc
12/31/23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26	0
03/27/23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	0
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	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	12	0
Baseline Data			0	0						0			0	0				0	0				280	

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







Historical Comments

03/27/23	Report come back the same as previous sample. Fluid is no longer fit for use the way it is. Either a 50-75% change out will need to occur to bring the flash point back up to a safe point or a full system change will need to occur. The facility has had proven success with Calflo HTF for many years and recently, i expect when design/expansion changes where made, it took a major toll on the fluid. Putting Calflo HTF back in with the current system configuration gives me worries that the fluid will degrade rapidly again like we've seen in the last few years. Some areas to ask questions with to your designer of the expansion.1. What the heater changed and is it now overheating the system and cooking the oil.2. What the pump changed? It maybe undersides and allowing the fluid to say in the heater to long causing the issue. 3. Was the expansion tank changed during system upgrades? Is it large enough for the low boilers that are happening. 4. Has the facility been doing the recommended of sweetening the system and venting the low boilers? Looking at the recent oil analysis reports, there is something going on with the current configuration that needs to be figured out. The current fluid needs to be addressed soon before coking occurs and causes bigger issues. If current system design/maintenance isn't addressed, I'm recommending to downgrade your fluid to PetroTherm which is a economical solution for system that can't get the longevity that Calflo HTF is designed for. 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.
01/03/23	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. 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.
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.