

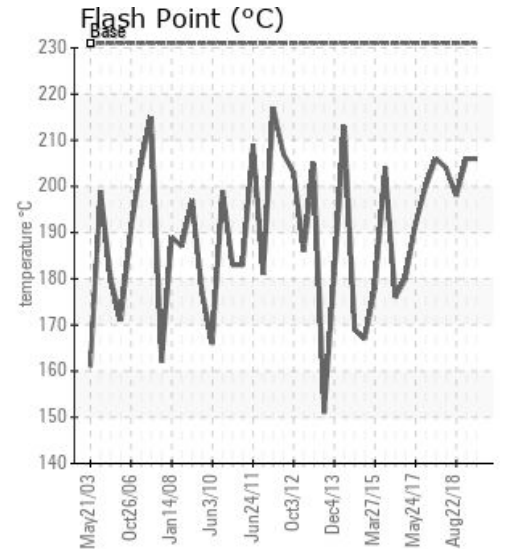
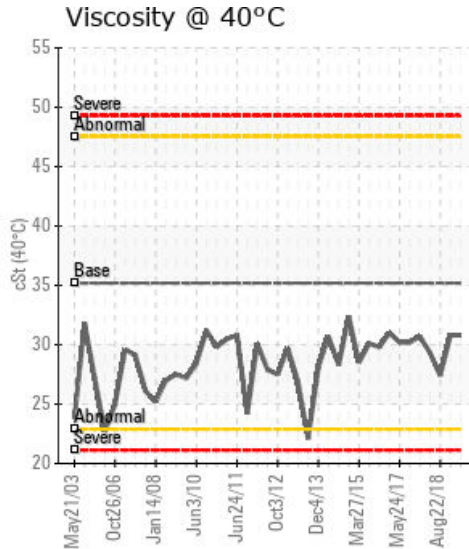
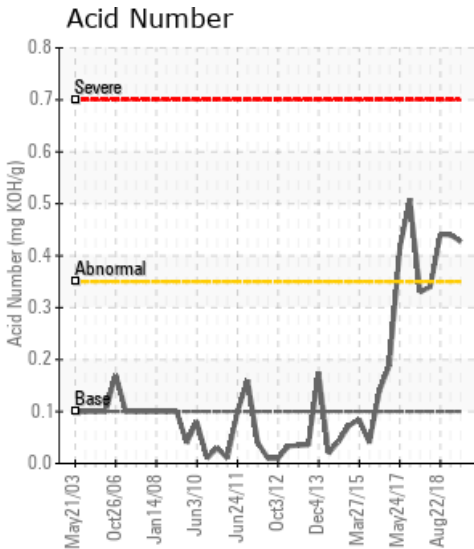
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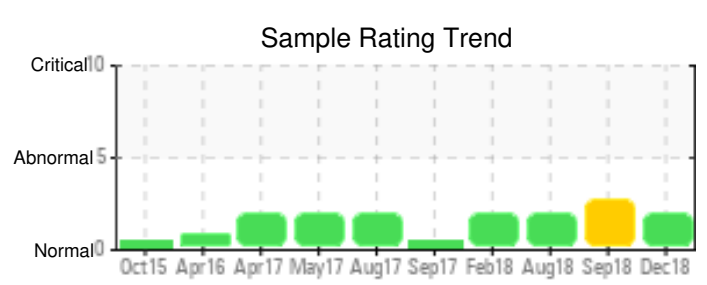
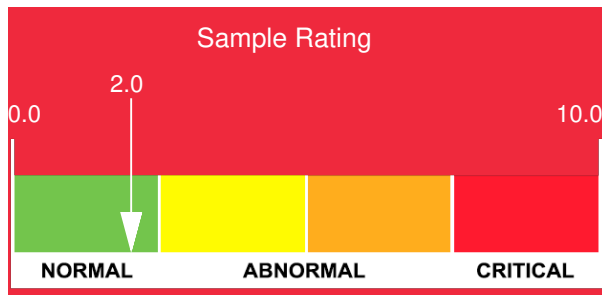
Customer: PTRHTF10036	System Information	Sample Information
CERTAITEED - SAINT GOBAIN 6400 STEVENSON BLVD FREMONT, CA 94538-2468 USA Attn: Dan Arata Tel: (510)490-0890 E-Mail: dan.d.arata@saint-gobain.com	System Volume: 5000 gal Bulk Operating Temp: 450F / 232C Heating Source: Blanket: Fluid: PETRO CANADA CALFLO HTF Make: FIRST THERMAL	Lab No: 02262942 Analyst: Gaston Arseneault Sample Date: 12/19/18 Received Date: 01/17/19 Completed: 01/18/19

Recommendation: The results are identical to the last sample. The Acid Number remains high at 0.43 so recommendations from the last sample still apply. We suggested to replace a certain percentage of the fluid, like 20% in order to dilute the oxidation products present.

Comments: Acid Number (AN) is abnormally high. (GCD) 90% Distillation Point is marginally low.

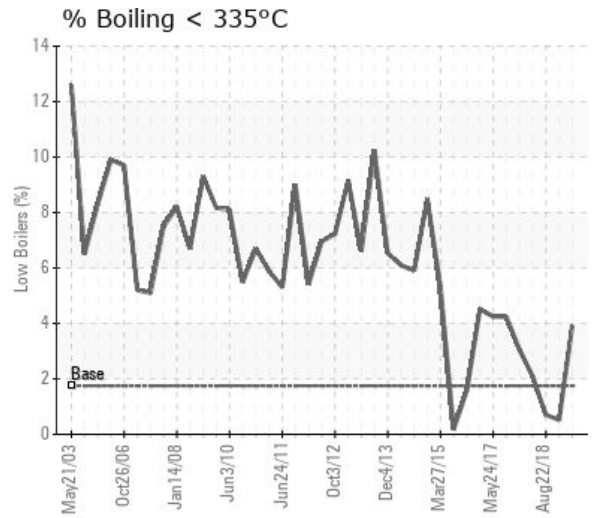
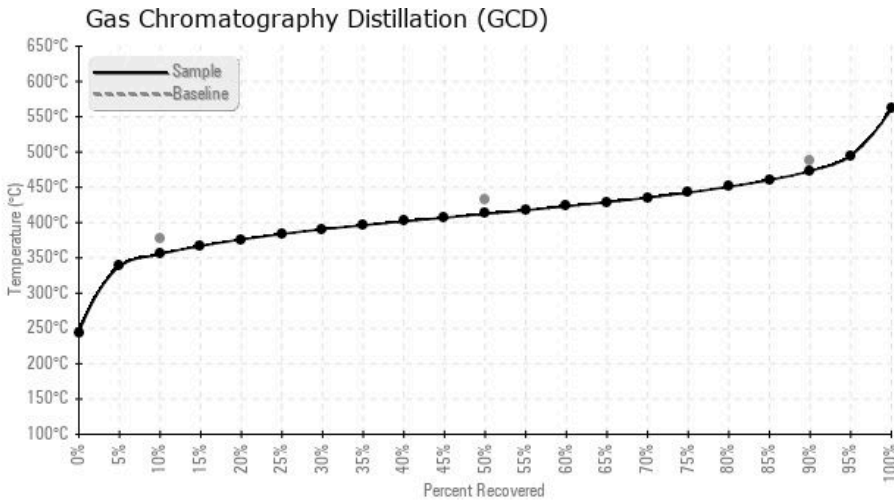
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
12/19/18	01/17/19	0y		403 / 206	5.8	30.8	0.427	0.083	671 / 355	774 / 412	884 / 473	3.91
09/19/18	10/01/18	6y		403 / 206	2.7	30.8	0.44	0.048	700 / 371	790 / 421	878 / 470	0.52
08/22/18	08/31/18	6y	MAIN SUPPLY	388 / 198	9.1	27.4	0.441	0.083	699 / 371	795 / 424	905 / 485	0.70
02/21/18	03/02/18	0y		399 / 204	5.6	29.3	0.34	0.030	688 / 365	781 / 416	869 / 465	2.08
09/22/17	10/11/17	0y		403 / 206	11.1	30.7	0.33	0.075	697 / 369	806 / 430	912 / 489	3.06
08/17/17	08/30/17	4y	MAIN SUPPLY HTR AFTR	392 / 200	21.3	30.2	0.509	0.052	687 / 364	802 / 428	911 / 488	4.24
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
12/19/18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	92	0
09/19/18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	129	0
08/22/18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	128	0
02/21/18	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	134	0
09/22/17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	116	0
08/17/17	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	138	0
<b>Baseline Data</b>			0	0						0			0	0					0				280	

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



Historical Comments	
09/19/18	The Acid Number remains high at 0.44. It was always a bit elevated but it might be best to dilute these degradation products by replacing a part of the fluid with fresh oil, so that this fluid charge can be run for many more years. Replacing 20% will bring down the Acid Number to below 0.4 which is sort of our initial warning limit. Moreover, we suggest to look into the possible causes of the high Acid Number and oil oxidation. Make sure the nitrogen blanket works and that the fluid is not allowed to boil off for days on end because that's when the hot oil gets in contact with air and accelerates its oxidation. Acid Number (AN) is abnormally high. (GCD) 90% Distillation Point is abnormally low.
08/22/18	Flash Point is low and acid number high. Recommend venting to reduce low boilers thereby reducing the low flash point issues. Replace 50% of the fluid to bring the acid number down. Check the pumping system to insure the flow is high enough to minimize thermal cracking in the heater. Thermal cracking generates low boilers and reduces the flash point of the fluid. It also generates high boilers that obstruct downstream piping and elbows. Check the nitrogen blank to insure it is working. By minimizing the presence of oxygen will greatly reduce the oxidation process thereby extending fluid life.
02/21/18	The fluid condition resembles the previous samples. We will keep monitoring the acid number before it keeps rising. Other properties look normal. No action needed at this time, other than re-sample at next scheduled interval.
09/22/17	The Acid Number is going down which is surprising, unless new oil was added to dilute the previous high results. Everything is now normal with no data flagged. Sample at next scheduled interval.
08/17/17	The high Acid Number appears to be the new normal as it is still high, indicating the oil is getting oxidized. The main cause for oil oxidation is hot oil getting in contact with air, hence the previous comment about checking if the nitrogen blanket is operational and in good working condition. We suggest to keep sampling quarterly and if this oxidation trend continues over the next 6 months, we will recommend, at some point, to partially replace the system fluid (30-40%) instead of letting it oxidize until a full cleaning and flushing is required. Acid Number (AN) is abnormally high. COC Flash Point is marginally low.

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