

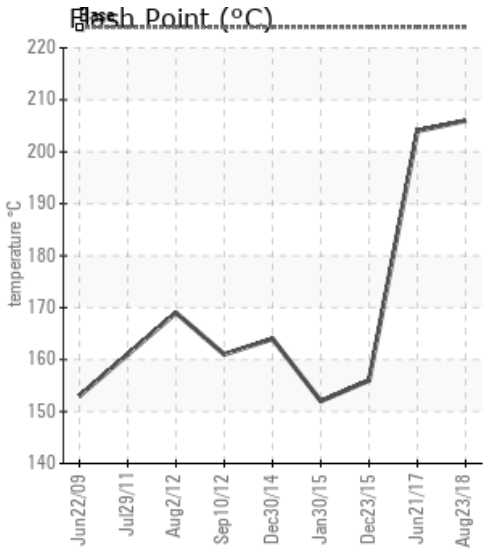
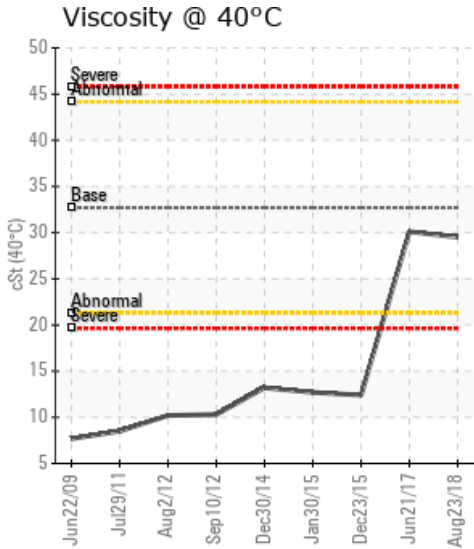
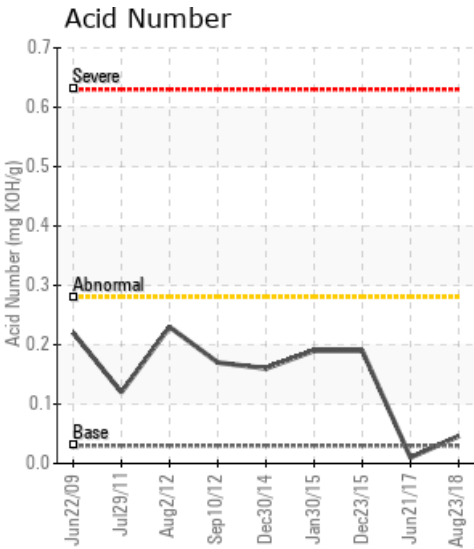
LAMINATE OIL HEATER

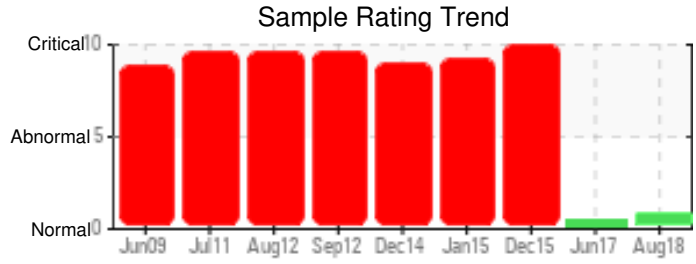
Customer: PTRHTF10067	System Information	Sample Information
CERTAINTEED - SAINT GOBAIN 620 AERO DRIVE SHREVEPORT, LA 71107 USA Attn: Richard Howe Tel: (318)470-4769 E-Mail: richard.howe@saint-gobain.com	System Volume: 1100 gal Bulk Operating Temp: 460F / 238C Heating Source: Blanket: Fluid: PETRO CANADA CALFLO AF Make: FIRST THERMAL HEATER	Lab No: 02237098 Analyst: Gaston Arseneault Sample Date: 08/23/18 Received Date: 08/31/18 Completed: 09/04/18 Gaston Arseneault gaston.arseneault@petrocanadalsp.com

Recommendation: The oil condition is looking good and please resample every year at least.

Comments:

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	%
08/23/18	08/31/18	36m	INLINE FILTER	403 / 206	11.5	29.5	0.046	0.015	697 / 369	798 / 426	902 / 483	1.59
06/21/17	07/18/17	18m	DRAIN LINE	399 / 204	21.5	30.1	0.01	0.038	694 / 368	799 / 426	900 / 482	2.73
12/23/15	01/04/16	0m	FILTER SCREEN DRAIN	313 / 156	42.3	12.4	0.19	0.105	507 / 264	748 / 398	841 / 449	29.70
01/30/15	02/11/15	10m	LAMINATE OIL HEATER	306 / 152	44.8	12.7	0.19	0.119	514 / 268	755 / 402	866 / 464	29.17
12/30/14	01/09/15	0m	LAMINATE RUN TANK PT	327 / 164	19.3	13.2	0.16	0.082	537 / 281	761 / 405	866 / 464	25.48
Baseline Data				435 / 224		32.7	0.03		693 / 367	790 / 421	887 / 475	2.5

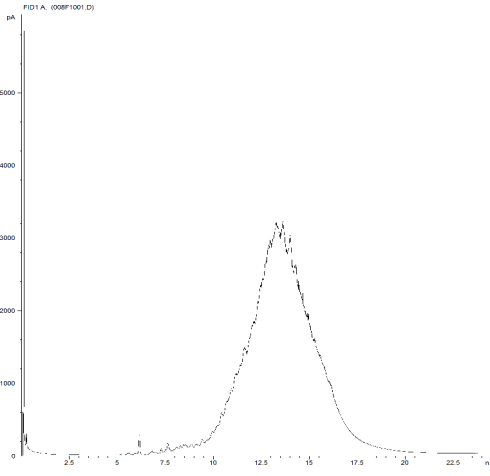




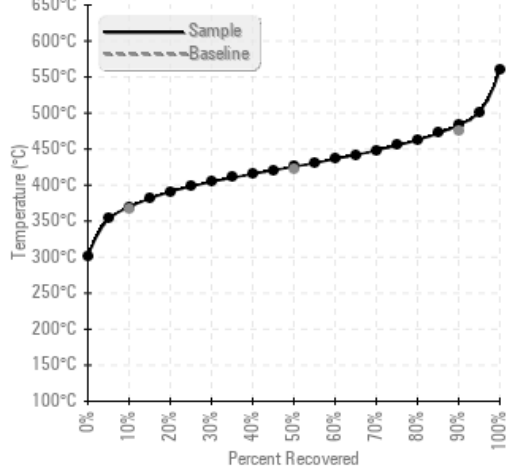
Sample Date	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorus	Zinc
08/23/18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29	0
06/21/17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	0
12/23/15	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	1
01/30/15	49	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	51	1
12/30/14	36	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	51	0
Baseline Data			0	0						0			0	0					0				270	

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

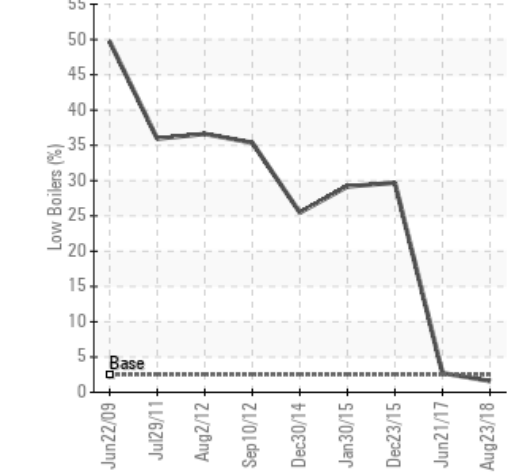
GCD Spectrum



Gas Chromatography Distillation



% Boiling < 335°C



Historical Comments	
06/21/17	The oil appears to be in excellent condition. Based on the results there are no signs of degradation or contamination by asphalt, water or other foreign elements. Viscosity, flash point and other properties look normal. Re-sample yearly
12/23/15	This system primarily contains Therminol 55 that is in the state of thermal degradation. The viscosity and COC Flash Point are well below that expected for Therminol 55, and the lower temperature boilers (GCD vapors) are significantly higher than expected for Therminol 55. In order to avoid the continuous maintenance costs of partial drain and refills, that may not show benefit, it is advisable to totally drain, flush, and refill with Petro-Therm. Once running on Petro-Therm, Calflo AF can be used as a top up fluid. The use of Petro-Therm as an initial fill fluid is consistent with Saint-Gobain policy. I am not sure if there is a volume threshold for when the use of Petro-therm as an initial fill fluid is mandatory. (GCD) % < 335°C is severely high. (GCD) 10% Distillation Point is severely low. (GCD) 90% Distillation Point is severely low. COC Flash Point is severely low. Visc @ 40°C is severely low.
01/30/15	After review of historical oil analysis reports, it appears that the vast majority of the fluid volume is Therminol 55. The tested phosphorus level is 51 ppm, where the nominal phosphorus level for Calflo AF is 270 ppm. The viscosity for Therminol 55 is 19 cSt, and the tested viscosity of 12.7 cSt @40C is significantly lower than new Therminol 55. The fluid flash point remains lower than that of Therminol 55. However, the insoluble solids and Acid Number are well within normal. In summary the system fluid continues to thermally degrade without leaving significant amounts of harmful deposits detectable by oil analysis. As long as heat transfer efficiency has not currently reduced, I recommend a six month routine of venting low boilers and draining and refilling 20% of the volume to ensure consistent thermal conductivity and reduce fluid volatility at potential leaks. Another option to reduce maintenance costs, is to totally drain, flush, and refill with Petro-Therm. Once running on Petro-Therm, Calflo AF can be used as a top up fluid. The use of Petro-Therm as an initial fill fluid is consistent with Saint-Gobain policy. I am not sure if there is a volume threshold for when the use of Petro-therm as an initial fill fluid is mandatory. (GCD) % < 335°C is severely high. (GCD) 10% Distillation Point is severely low. COC Flash Point is severely low. Visc @ 40°C is severely low. (GCD) 90% Distillation Point is marginally low.
12/30/14	Assuming the sampled fluid is Calflo AF, drain entire volume, flush, and fill with Calflo AF. Analysis results indicate either severe thermal cracking. Viscosity is less than half of baseline. Flash point is significantly low. GCD curve is significantly lower than normal. For all samples submitted, please complete all fields on the Sample Information Form. COC Flash Point is severely high. (GCD) % < 335°C is abnormal.

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