

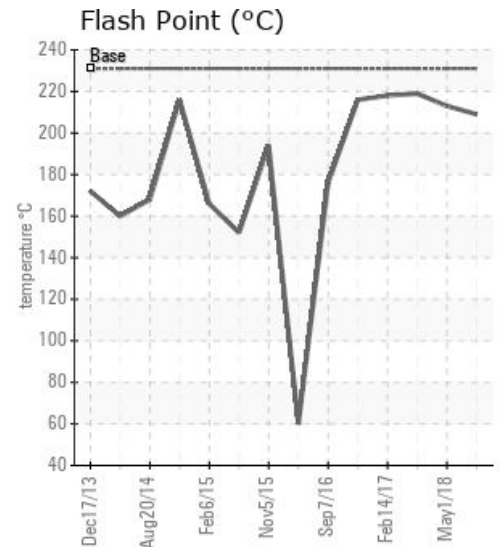
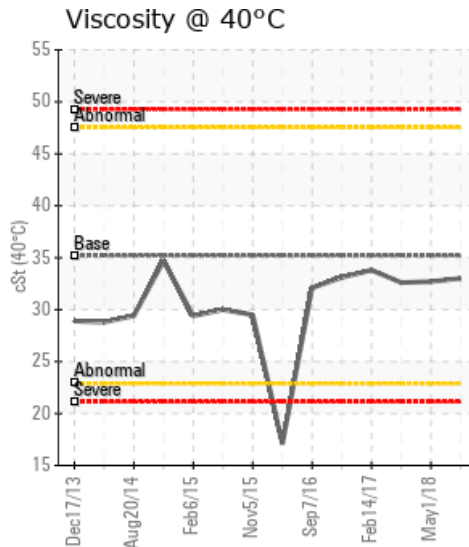
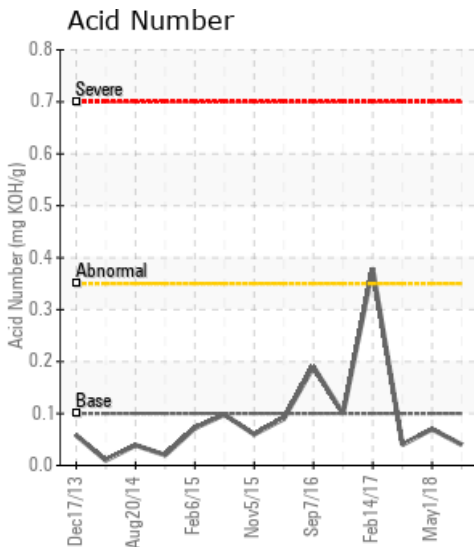
Laminate Storage/Delivery Hot Oil System

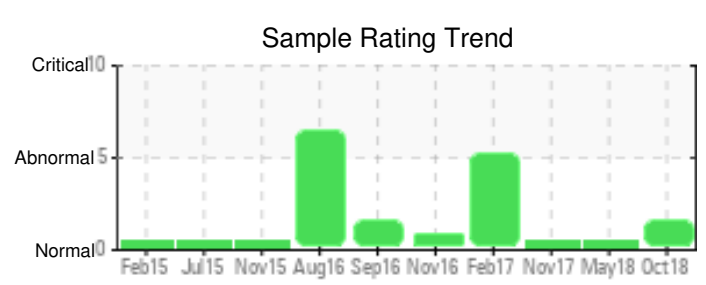
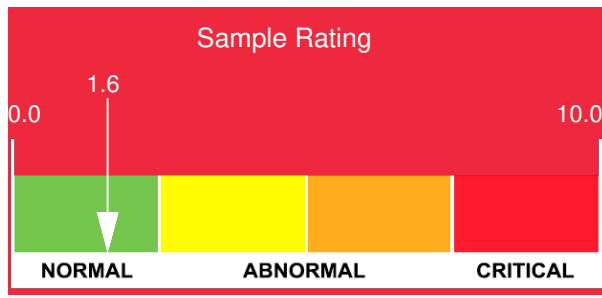
Customer: PTRHTF10141	System Information	Sample Information
TAMKO BUILDING PRODUCTS 2300 35TH ST TUSCALOOSA, AL 35401 USA Attn: Greg Colburn Tel: (205)752-3555 E-Mail: gregory_colburn@tamko.com	System Volume: 110 gal Bulk Operating Temp: 450F / 232C Heating Source: Blanket: Fluid: PETRO CANADA CALFLO HTF Make: Hy-Way	Lab No: 02249082 Analyst: Manny Garcia Sample Date: 10/24/18 Received Date: 11/02/18 Completed: 11/12/18

Recommendation: Fluid is suitable for continued use. Re-sample in October 2019 and re-submit to the lab. Please include time on unit and time on the fluid during the next sample submission.

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	%
10/24/18	11/02/18	0m		408 / 209	66.5	33.0	0.04	0.061	672 / 356	799 / 426	896 / 480	6.36
05/01/18	05/09/18	6m	PORT	415 / 213	91.5	32.7	0.07	0.031	694 / 368	807 / 430	902 / 483	4.03
11/02/17	11/13/17	9m		426 / 219	2.3	32.6	0.04	0.024	695 / 368	806 / 430	903 / 484	4.08
02/14/17	02/21/17	3m	PORT	424 / 218	656.3	33.8	0.379	0.177	721 / 383	814 / 435	919 / 493	1.85
11/04/16	11/11/16	1m	PORT	421 / 216	74.5	33.1	0.10	0.036	715 / 380	813 / 434	918 / 492	2.43
09/07/16	09/16/16	1m	SAMPLE PORT	349 / 176	13.7	32.1	0.19	0.063	714 / 379	811 / 433	919 / 493	2.47
Baseline Data				448 / 231		35.20	.1		712 / 378	810 / 432	910 / 488	1.75

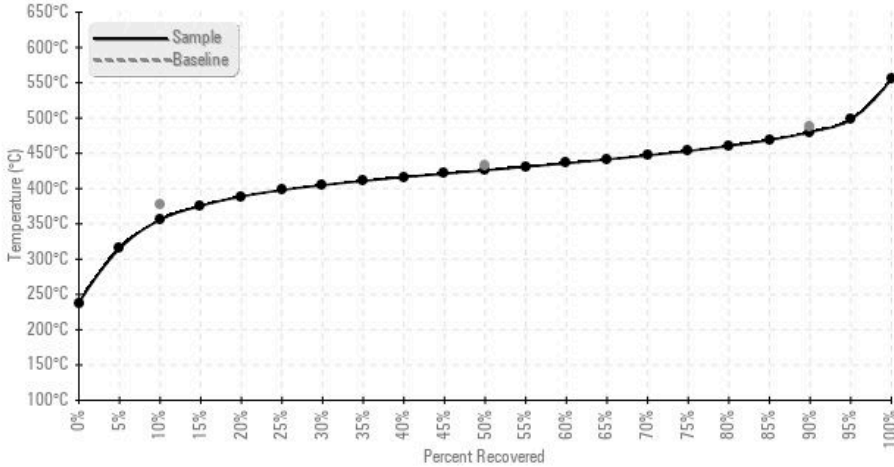




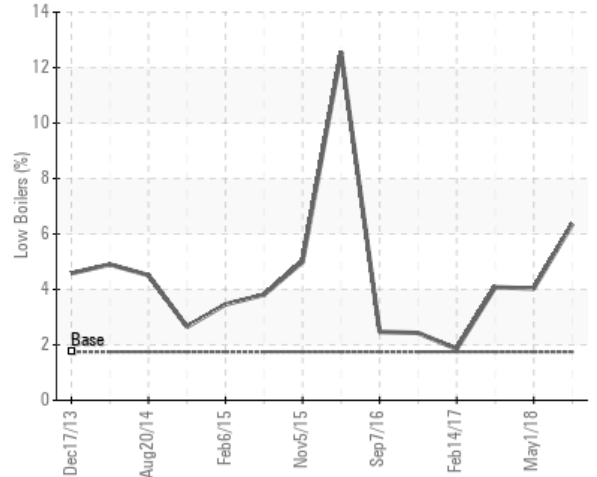
Sample Date	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorus	Zinc
10/24/18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	56	0
05/01/18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	57	0
11/02/17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	59	0
02/14/17	41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	64	0
11/04/16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	45	0
09/07/16	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	61	0
Baseline Data			0	0						0			0	0					0				280	

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

Gas Chromatography Distillation (GCD)



% Boiling < 335°C



Historical Comments

05/01/18	Fluid is suitable for continued use. Please re-submit annual sample on May 1, 2019. All parameters of this fluid are satisfactory. There was some 'light' visible debris contamination that could be filtered out safely during any future shutdowns.
11/02/17	Oil is suitable for continued use; if appropriate, any system filters should be changed OR kidney loop filtration is recommended during the next shutdown to extend the life of the oil. Wear Metals are Low; Contamination Levels are low; 2.3ppm water - low; Very Low Acid Numbers; 32.6 CsT @ 40oC Viscosity; 219 oC COC Flash Point; Pentane Insolubles are low; Very Light White Metal and debris visible
02/14/17	This system had poor results in August of 2016 and since that time 2 samples were submitted that were very good. Unfortunately, this latest sample shows high metal content and debris that may be assisted by filtering the oil safely when appropriate to get these numbers back into check. Pulling off the water must be addressed and the acidity can only be assisted by 'sweetening' the existing charge. Please check the time on the 110 gallons in this system and it might be time for a complete drain, flush and re-charge with premium Petro Canada Callo HTF as a last resort. Iron ppm levels are abnormal at 41ppm. Water contamination levels are abnormally high. 656.3ppm of Water. .2% of Free Water/.5% emulsified water. Acid Number (AN) is abnormally high. Viscosity is good at 33.8 CsT @40oC. COC Flash Point is satisfactory at 218oC. Distillation Curves are good in all cases. Pentane In-solubles are satisfactory. Very Light white metals/Very light debris.
11/04/16	Fluid distillation figures at 90% are high and 'venting' the system can bring these numbers back into check. Water in the oil can be boiled off or during operation/drained off during extended shutdown. Wear metals are acceptable/Contaminant is satisfactory/Water is high at 74.5ppm/Acid numbers are low/Viscosity is good at 33.1 CsT at 40oC/COC Flash point is good at 216oC and up from 176oC at the last evaluation/(GCD) 90% Distillation Point is marginally high/pentane insoluble are low/very light debris visible in fluid. There was emulsified water seen by lab technician at sample receipt/crackle test performed, followed by Karl Fischer
09/07/16	This sample result is much better than the previous sample from 8/12 where it was recommended to vent the system to assist in increasing the flash point and the getting distillation figures back in check. Please vent the system again to mitigate any issues and send sample in to see if the 'venting' proved to work. Wear metals are low. Water is low. Acid number is satisfactory. Viscosity is good. COC Flash Point is abnormally low 176oC vs a recommended 223oC. (GCD) 90% Distillation Point is marginally high

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