

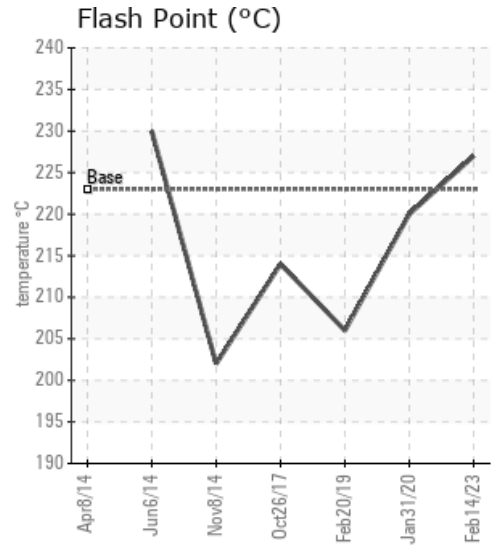
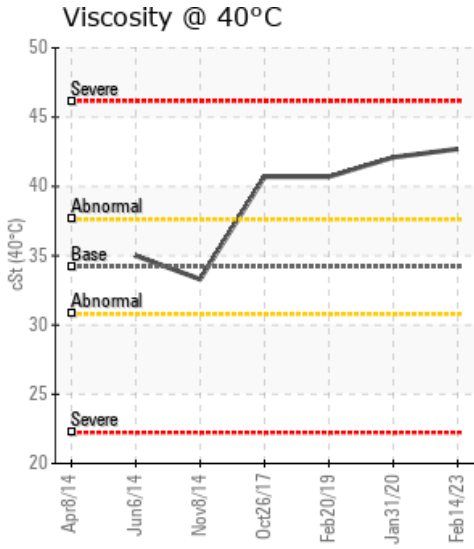
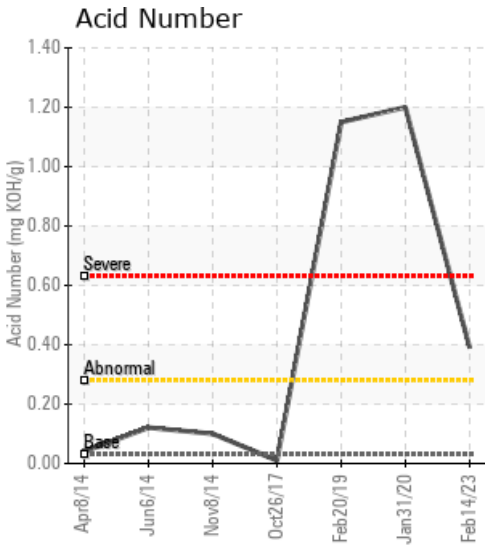
[LSD-13-35-47-10W5] LODGEPOLE

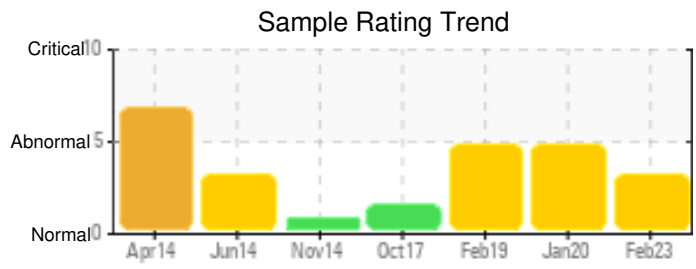
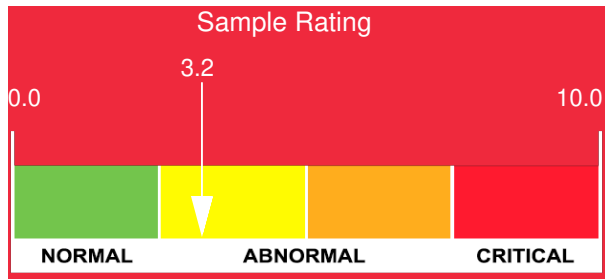
Customer: PTRHTF20136	System Information	Sample Information
I 3 Energy	System Volume: 23000 ltr	Lab No: 02540872
DRAYTON VALLEY, AB Canada	Bulk Operating Temp: 446F / 230C	Analyst: Lyle Dach
Attn: Robert Lightfoot	Heating Source:	Sample Date: 02/14/23
Tel: (780)524-8646	Blanket:	Received Date: 02/21/23
E-Mail: rlightfoot@i3.energy	Fluid: PETRO CANADA PETRO-THERM	Completed: 02/28/23
	Make:	Lyle Dach
		lyle.dach@HFSinclair.com

Recommendation: Fluid does look to be slightly oxidated, the viscosity and acid number are up slightly and pentane insolubles are well beyond our warning limit of >0.5. Filtration should be considered for the high amount of insolubles. Has the fluid been sweetened with new oil to bring down the acid number? Resample in 6 months to confirm the fluids condition, currently the fluid would be acceptable for continued use.

Comments: Pentane Insolubles levels are severely high. Acid Number (AN) is abnormally high. Visc @ 40°C is abnormally high.

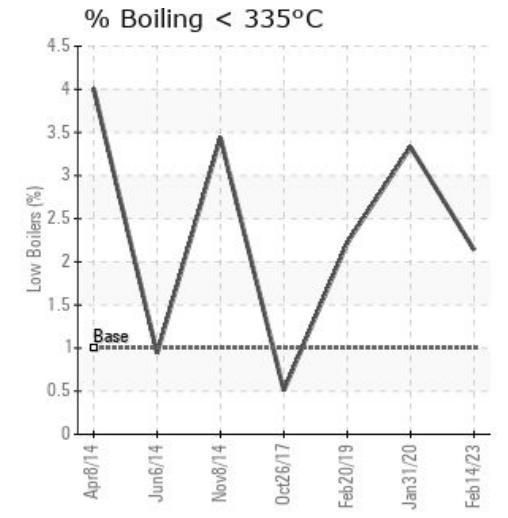
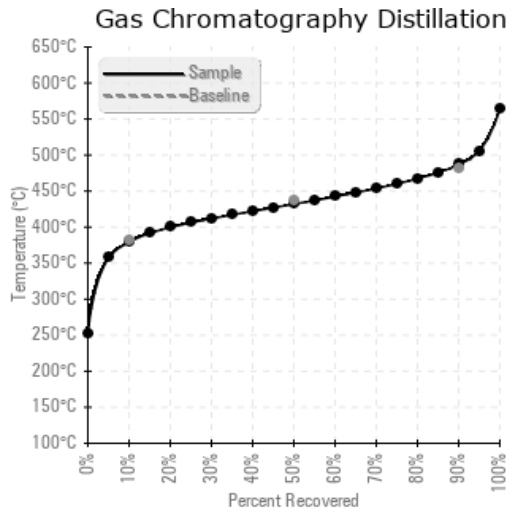
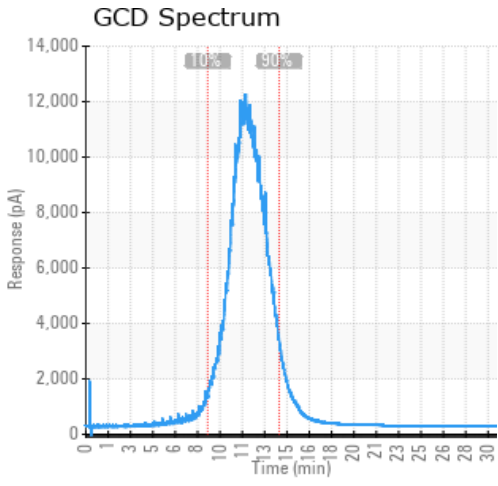
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
02/14/23	02/21/23	0.0m	top of expansion loo	441 / 227	44.7	42.7	0.39	1.76	715 / 379	810 / 432	908 / 487	2.14
01/31/20	02/07/20	67.0m	DISCHARGE	428 / 220	98.6	42.1	1.20	1.45	739 / 393	804 / 429	887 / 475	3.33
02/20/19	02/25/19	56.0m	PUMP DISC HI POINT	403 / 206	54.7	40.7	1.15	0.777	709 / 376	809 / 432	912 / 489	2.22
10/26/17	11/02/17	40.0m	PUMP DISCHARGE HIPNT	417 / 214	73.9	40.7	0.01	0.944	717 / 381	809 / 432	901 / 483	0.51
11/08/14	11/14/14	5.0m	LOW PRESS BUILD HEAT	396 / 202	37.2	33.3	0.10	0.296	706 / 374	812 / 434	927 / 497	3.44
Baseline Data				433 / 223		34.2	0.03		720 / 382	817 / 436	900 / 482	1.00





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
02/14/23	19	0	0	0	0	0	0	0	0	0	4	4	0	0	0	0	0	0	0	0	0	0	0	0
01/31/20	23	0	0	0	0	0	0	0	0	0	1	3	0	0	0	0	0	0	0	0	0	0	2	0
02/20/19	22	0	0	0	0	0	0	0	0	0	1	4	0	0	0	0	0	0	0	0	0	0	3	0
10/26/17	26	0	0	0	0	0	0	0	0	0	2	6	0	0	0	0	0	0	0	0	0	0	4	0
11/08/14	9	0	0	1	0	0	0	0	0	0	4	2	7	0	0	0	0	0	2	0	4	0	3	1
Baseline Data			0	0						0			0	0					0				0	

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



Historical Comments	
01/31/20	Acid number and Pentane Insolubles are abnormally high. This is usually due to oxidation of the heat transfer oil. Ensure nitrogen or gas blanket is in place on the system. Resample in 6 months. Pentane Insolubles levels are severely high. Acid Number (AN) is severely high.
02/20/19	TAN is significantly higher than normal and Pentane Insolubles is elevated. As part of a regular maintenance program, the system should be vented to eliminate light ends from the system. Resample in 6 months. Pentane Insolubles levels are severely high. Acid Number (AN) is severely high.
10/26/17	The fluid is in a good condition and suitable for further use. Viscosity and Pentane Insoluble (solids) content has increased. It is recommended to consider filtration of the fluid to lower the solids content. The above comments assume that the sample has been taken from the discharge side of a heat medium pump with the pump running. If this is not the case the sample may not be representative for the fill of the system. Pentane Insolubles levels are severely high.
11/08/14	The fluid is in good condition and suitable for further use. Please re-sample in 6 months. Fill out the sample label including location and system volume. (GCD) 90% Distillation Point is marginally high.

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