

[KEYERA PARTNERSHIP / 3-12-46-14W5] PLANT 2

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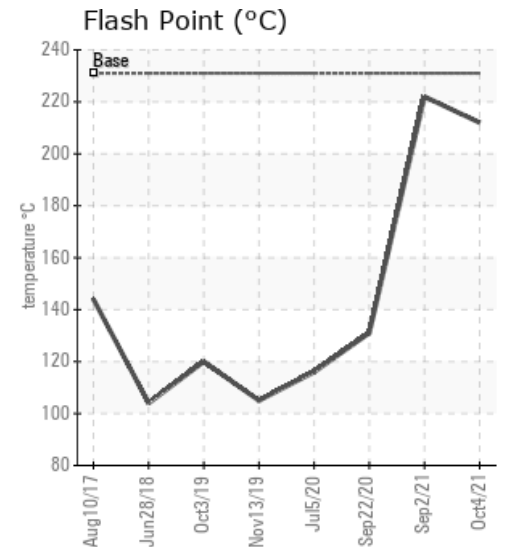
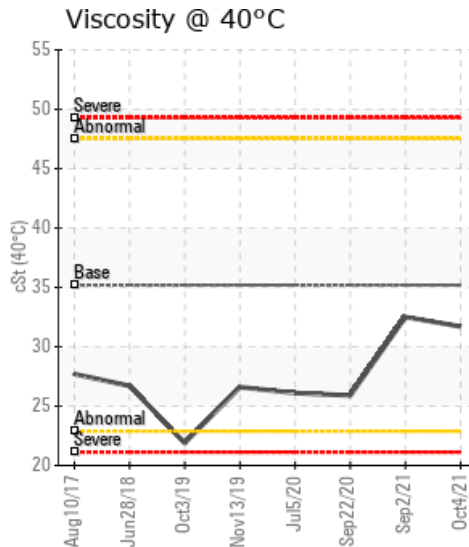
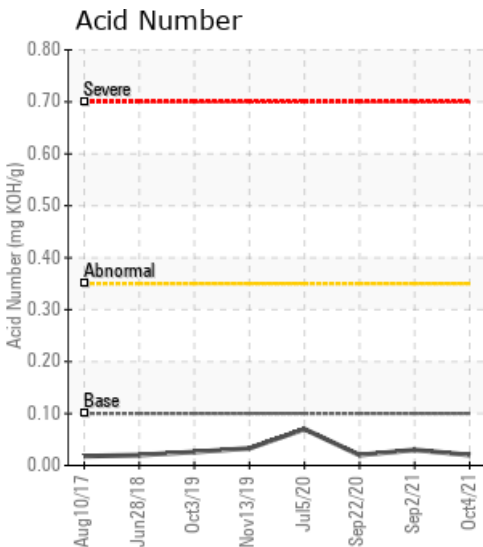
System Information
 System Volume: 14000 ltr
 Bulk Operating Temp: 455F / 235C
 Heating Source:
 Blanket:
 Fluid: PETRO CANADA CALFLO HTF
 Make: PETROTHERM ENG.

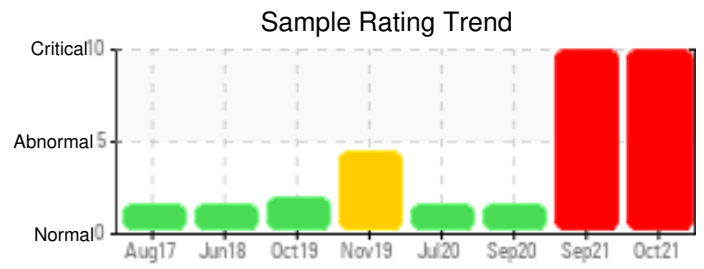
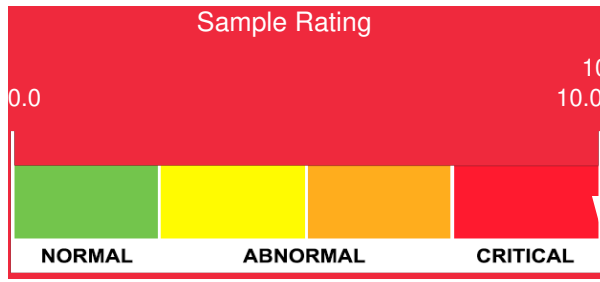
Sample Information
 Lab No: 02449856
 Analyst: Lyle Dach
 Sample Date: 10/04/21
 Received Date: 10/13/21
 Completed: 10/19/21
 Lyle Dach
 lyle.dach@hollyfrontier.com

Recommendation: Appears to have had coolant added to the system at some point in the last year, this sample has improved from Septembers. It is best to try and boil the water off the system and vent the steam as to reduce the chance of an unwanted boil over. Excess water could also lead to corrosion issues. System fluid is Calfo AF not HTF

Comments: Potassium ppm levels are severely high. Water contamination levels are abnormally high. ppm Water contamination levels are abnormally high. Pentane Insolubles levels are abnormally high. Sodium ppm levels are severely high. Boron ppm levels are abnormally high.

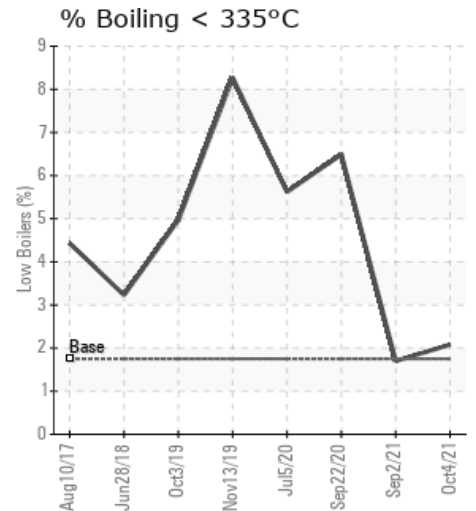
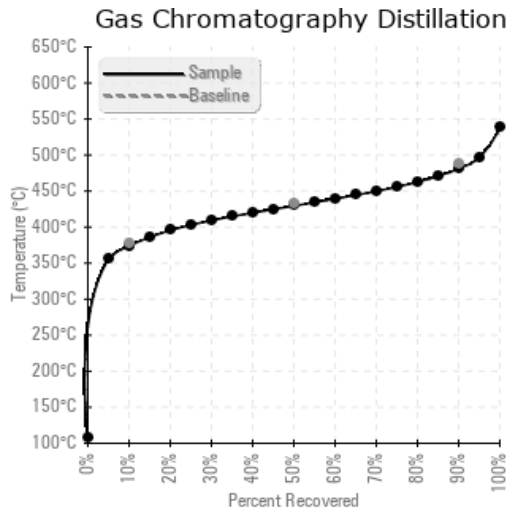
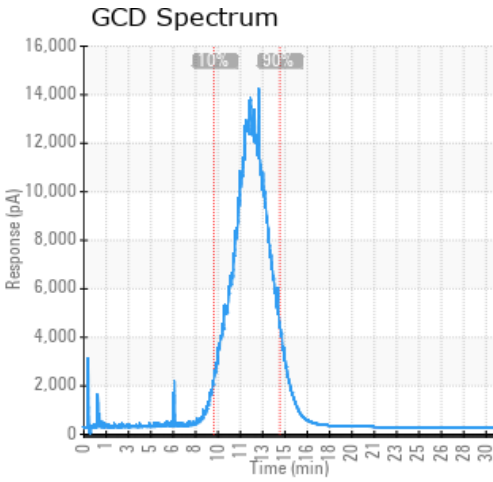
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
10/04/21	10/13/21	0.5y	after pump	414 / 212	966.8	31.7	0.02	0.441	705 / 374	805 / 429	898 / 481	2.08
09/02/21	09/20/21	14.0y		432 / 222	1255.2	32.5	0.03	0.408	707 / 375	806 / 430	900 / 482	1.70
09/22/20	09/29/20	0.0y	Slip stream filter	268 / 131	33.5	25.9	0.02	0.092	681 / 361	805 / 430	906 / 486	6.49
07/05/20	07/14/20	5.0y		241 / 116	245.8	26.1	0.07	0.030	691 / 366	808 / 431	906 / 486	5.62
11/13/19	11/20/19	0.0y	PUMP DISCHARGE	221 / 105	67.0	26.6	0.033	0.085	649 / 343	782 / 417	886 / 474	8.27
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
10/04/21	44	0	0	0	0	0	0	0	0	0	1	46	95	0	0	0	0	0	29	1	3	0	125	0
09/02/21	41	0	0	0	0	0	0	0	0	0	2	56	258	0	0	0	0	0	40	1	3	0	134	0
09/22/20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07/05/20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/13/19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Baseline Data			0	0						0		0	0					0	0				280	

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



Historical Comments

09/02/21	Sample collected at an improper location and possibly a contaminated container. Keyera has collected a new sample waiting on results. Potassium ppm levels are severely high. Water contamination levels are severely high. ppm Water contamination levels are severely high. Pentane Insolubles levels are abnormally high. Sodium ppm levels are severely high. Boron ppm levels are abnormally high.
09/22/20	Fluid remains in good condition overall with very little change from the previous sample in July 2020. Viscosity is slightly low and the flash point is really low. Given the history of this system these lower values are likely from a previous exchanger leak. Flash point can be increased by venting the surge tank head space or partial fluid changeout. Continue to submit annual samples to proactively monitor fluid condition. COC Flash Point is severely low.
07/05/20	Fluid remains in good condition overall. The viscosity is slightly low and the flash point is really low. Given the history of this system, these lower values are likely from a previous exchanger leak. Continue to submit annual samples to proactively monitor fluid condition. COC Flash Point is severely low.
11/13/19	The very low flash point combined with low viscosity are symptoms of thermal cracking, but given the history of this system likely from a prior exchanger leak. Fortunately these low values are not significantly worsening since previous sample. Suggest submitting annual samples or sooner if fluid becomes stressed or if exchanger leak is suspected.

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