

[Nig Creek / LSD D-59-G/94-H-4] Storm Resources Nig Creek D-59-G/94-H-4

Customer: PTRHTF20175
 QUADRA CHEMICALS
 7802 98 STREET
 CLAIRMONT, AB T0H 0W0 Canada
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 E-Mail: quadra_samples@quadra.ca

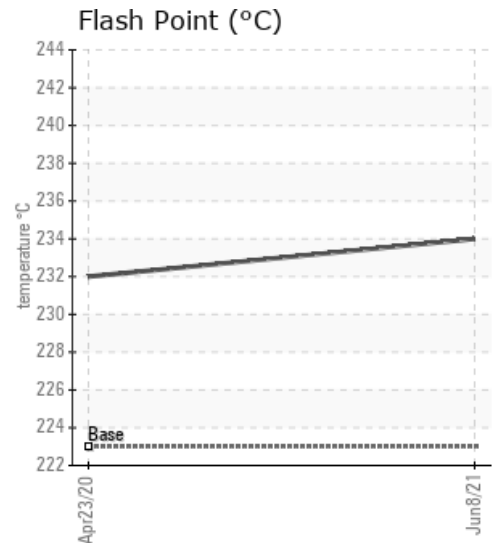
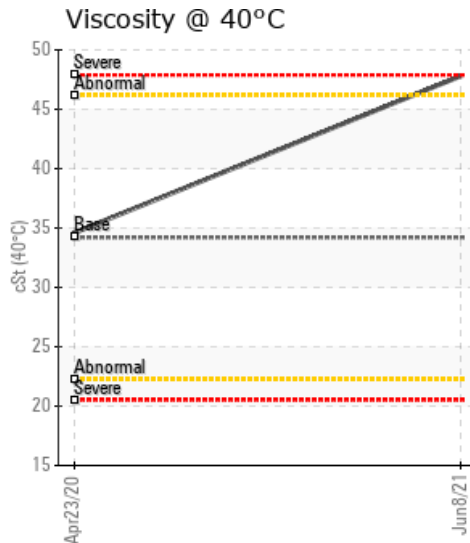
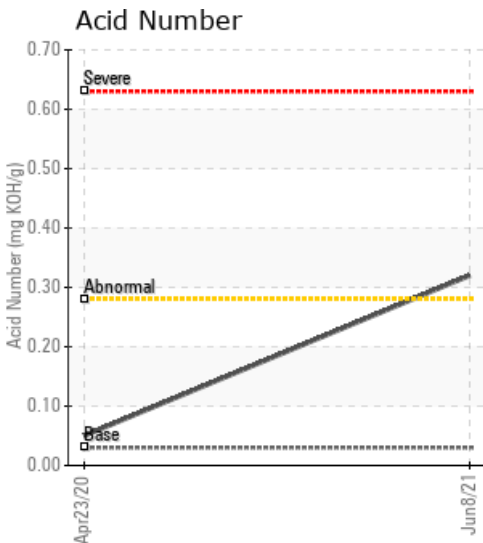
System Information
 System Volume: 46000 ltr
 Bulk Operating Temp: 401F / 205C
 Heating Source:
 Blanket:
 Fluid: PETRO CANADA PETRO-THERM
 Make: HEATEC

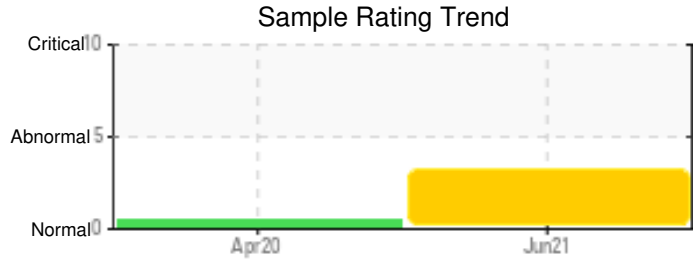
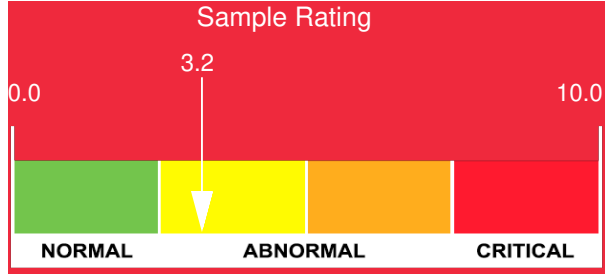
Sample Information
 Lab No: 02426839
 Analyst: Clinton Buhler
 Sample Date: 06/08/21
 Received Date: 06/14/21
 Completed: 06/22/21
 Clinton Buhler
 Clinton.Buhler@hollyfrontier.com

Recommendation: Sample results indicate that oxidative fluid degradation is ongoing based on elevated fluid viscosity and Acid Number; fluid acidity may be contributing to corrosion as noted in iron content increase. Elevated solids content of 0.932% may be associated to oxidation but may also be related to thermal degradation (see low boiling vapor content increase to 3.49%). Please ensure blanket gas is properly operational. For large systems, it is generally advised to sweeten the system when acid number reaches ~0.4. Before doing this, another sample should be taken to confirm results. Please ensure that the sample is taken from pump discharge and that the sample valve and tubing is thoroughly purged before gathering a sample.

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

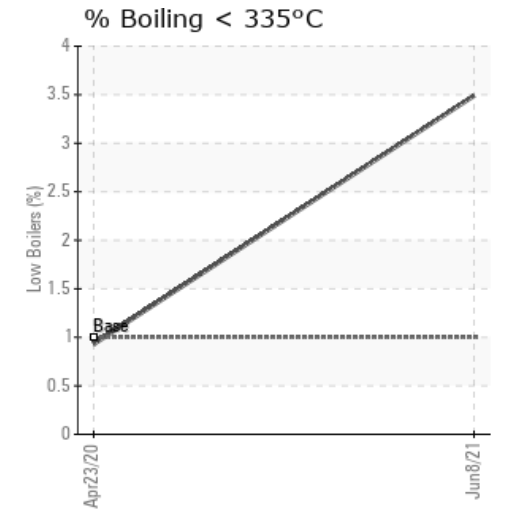
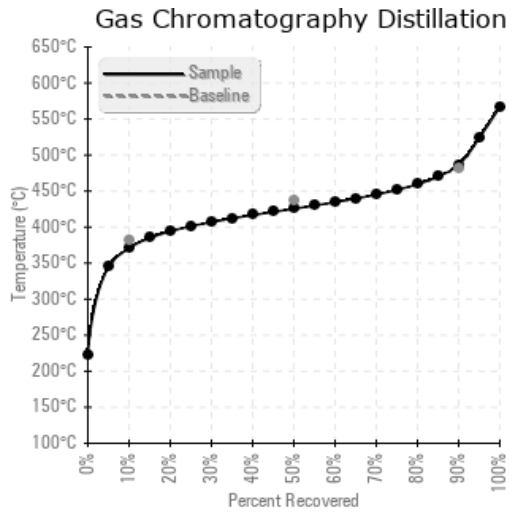
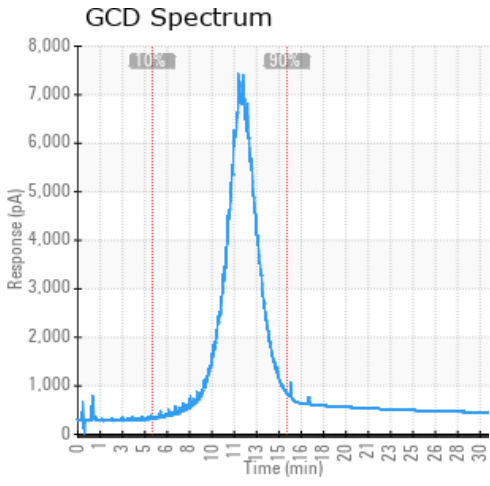
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
06/08/21	06/14/21	0.0m	C/S REBOILER	453 / 234	319.9	47.8	0.32	0.932	700 / 371	798 / 426	908 / 486	3.49
04/23/20	06/01/20	3.0m	RETURN TO PUMP	450 / 232	31.2	34.6	0.05	0.097	737 / 392	823 / 440	905 / 485	0.93
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
06/08/21	51	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	4	0	0	0
04/23/20	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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

04/23/20	Sample results indicate that the heat transfer fluid is suitable for continued service. Please re-sample in 6 months to build a trend

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