

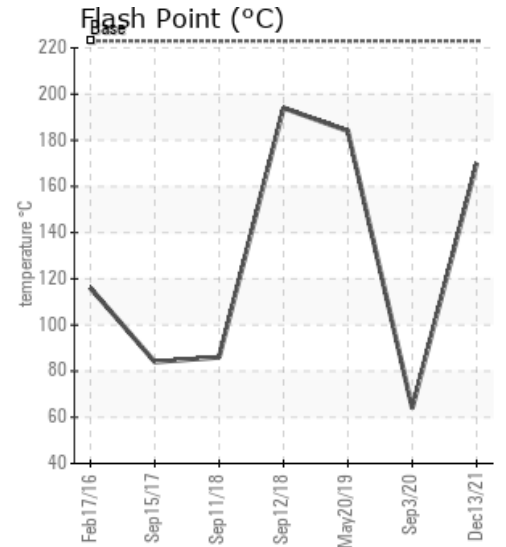
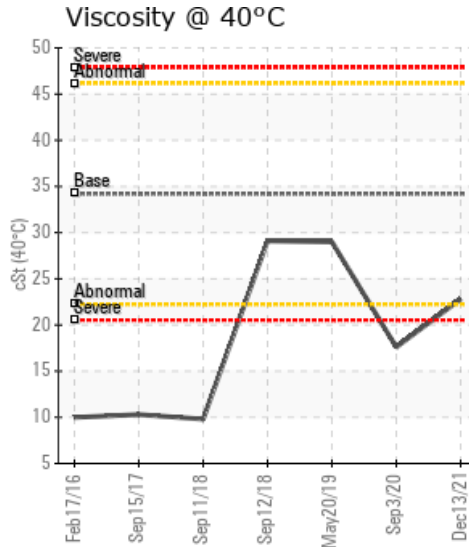
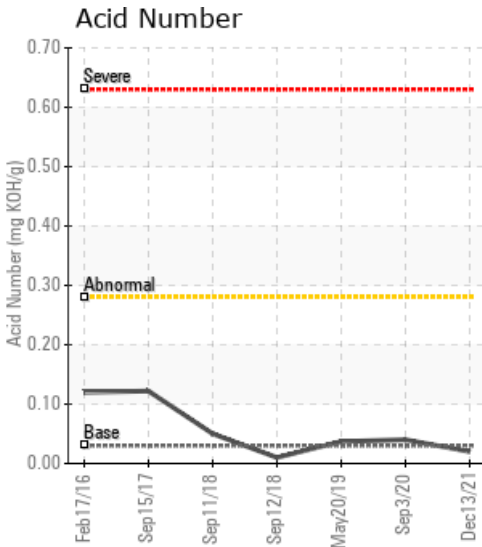
[6-10-44-12W5] HEAT TRANSFER

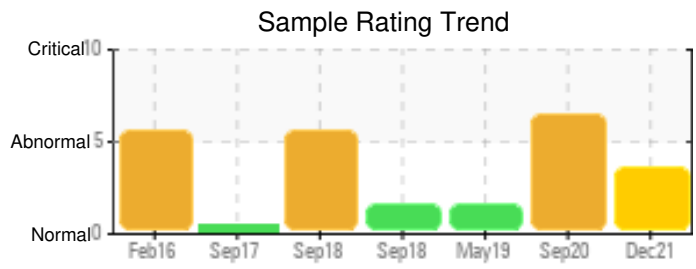
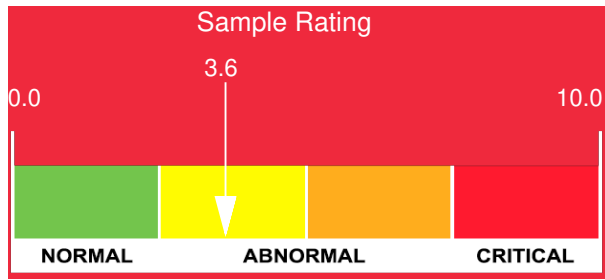
Customer: PTRHTF20171	System Information	Sample Information
Keyera Energy - Nordegg River Gas P... 06-10-044-12w5 Nordegg, AB T0M 2H0 Canada Attn: Todd Kjorlien Tel: (780)514-8988 E-Mail: todd_kjorlien@keyera.com	System Volume: 42000 ltr Bulk Operating Temp: 356F / 180C Heating Source: Blanket: Fluid: PETRO CANADA PETRO-THERM Make: STEARNS-ROGERS	Lab No: 02464406 Analyst: Lyle Dach Sample Date: 12/13/21 Received Date: 12/30/21 Completed: 01/07/22 Lyle Dach lyle.dach@hollyfrontier.com

Recommendation: Fluid has improved from last sample but fluids viscosity is still low, GCD%<335°C is on the high side, 10% distillation temperature is low and flash point is also low. Fluid is seeing some thermal degradation or could be contaminated by process fluid. Lower boilers (light ends) should be vented off at the expansion tank. If possible confirm the Petro-Therm has not been contaminated with process products. Resample in 6 months to ensure venting is helping improve fluid quality.

Comments:

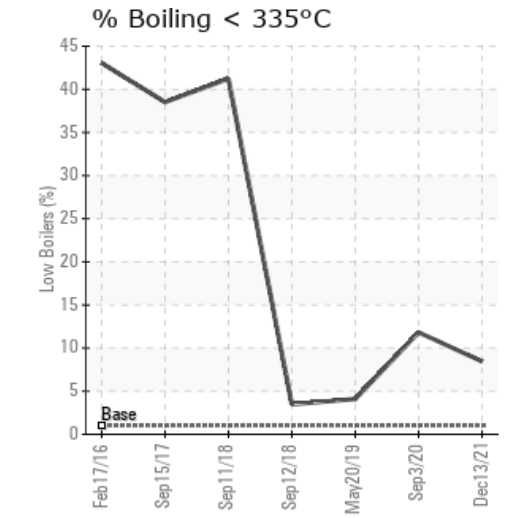
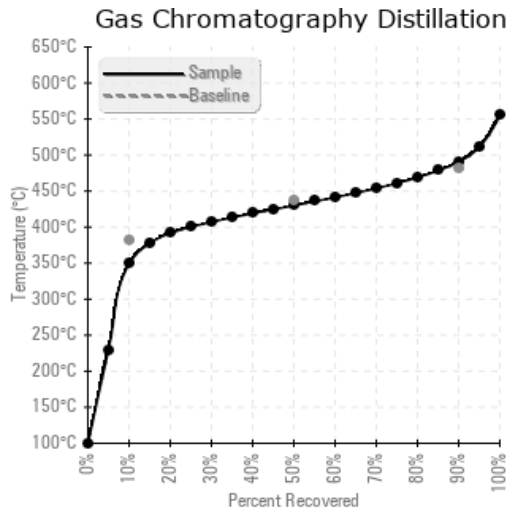
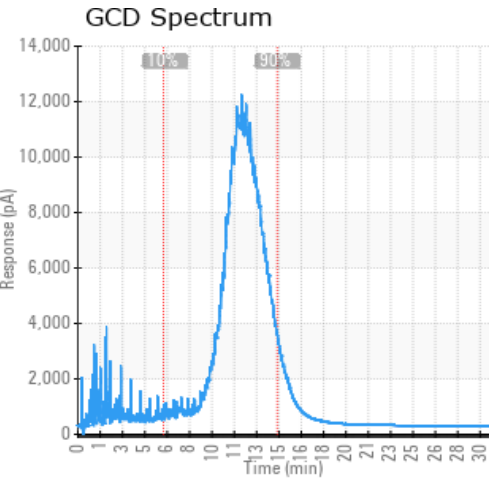
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
12/13/21	12/30/21	3.5y	pump dis	338 / 170	13.2	22.8	0.02	0.044	661 / 349	806 / 430	915 / 491	8.45
09/03/20	09/23/20	2.5y	OFF HOT OIL PUMP	147 / 64	31.4	17.6	0.04	0.069	548 / 287	802 / 428	912 / 489	11.82
05/20/19	05/21/19	0.0y		363 / 184	227.3	29.0	0.037	0.040	704 / 373	812 / 433	934 / 501	4.10
09/12/18	09/27/18	5.0y	9556979-1	381 / 194	362.2	29.1	0.01	0.049	709 / 376	805 / 429	908 / 486	3.48
09/11/18	10/03/18	0.0y	956979-2	187 / 86	97.5	9.8	0.05	0.181	468 / 242	701 / 372	849 / 454	41.23
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	
12/13/21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	
09/03/20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	
05/20/19	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	4	0	0	0	0
09/12/18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0
09/11/18	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	36	0	6	0	0
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	
09/03/20	Very low viscosity & flash point are caused either by thermal cracking or possibly process exchanger leaking condensate into HT fluid. If thermal cracking is the cause there will be carbonaceous deposit in the system as a result. Contact PC Tech Services to discuss remedial action. Viscosity and flash point extremely low
05/20/19	Fluid condition generally very good overall. Viscosity & Flash Point are a little low, likely from previous residuals. Essentially no significant change from the previous sample Sept 2018. GCD 90% is just into the abnormal range
09/12/18	Fluid is in excellent condition. The only concern is the water content which is a little higher than expected. Suggest annual sample submissions - sooner if fluid gets exposed to severe conditions or contamination is suspected. Water contamination levels are marginally high.
09/11/18	Severely low flash point & viscosity from suspected contamination. Very little change from the previous sample September 2017. As I understand it this fluid has been replaced which is good. (GCD) 10% Distillation Point is severely low. COC Flash Point and visc @ 40°C are severely low. Calcium ppm levels are abnormally high. (GCD) 90% Distillation Point is marginally low.

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