

### [4-21-55-23-W5] H-1311

**Customer: PTRHTF20089**  
 PEYTO ENERGY TRUST - WILDHAY  
 Box 7198  
 Edson, AB T4E 1V4 Canada  
 Attn: Sonny Claybo  
 Tel: (780)817-4339  
 E-Mail: sclaybo@peyto.com

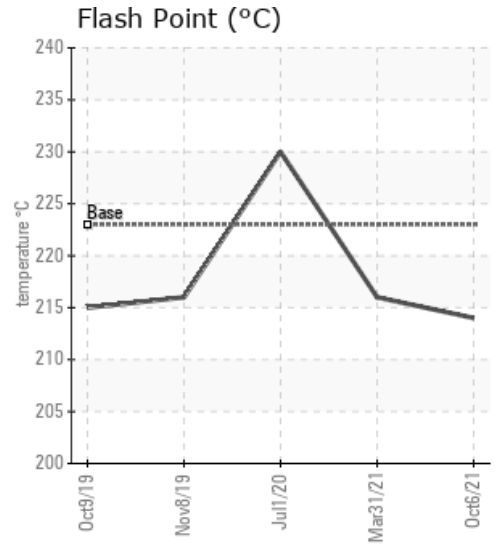
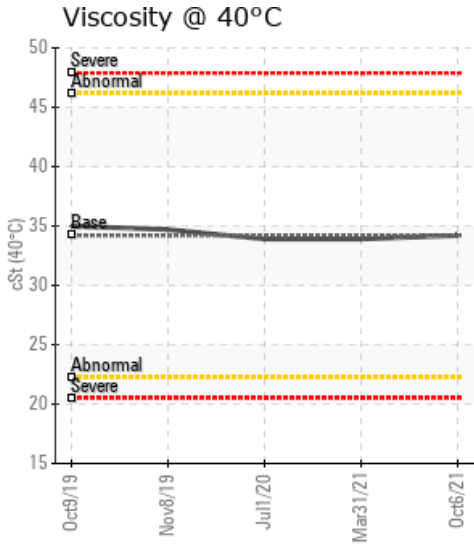
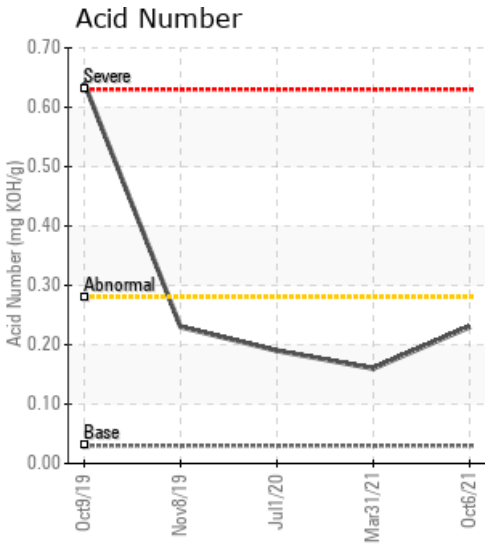
**System Information**  
 System Volume: 18000 ltr  
 Bulk Operating Temp: 351F / 177C  
 Heating Source:  
 Blanket:  
 Fluid: PETRO CANADA PETRO-THERM  
 Make: ALCO

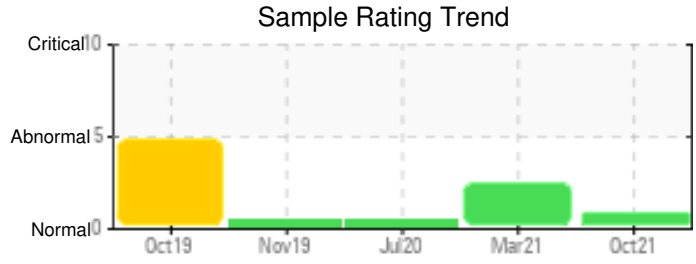
**Sample Information**  
 Lab No: 02450548  
 Analyst: Clinton Buhler  
 Sample Date: 10/06/21  
 Received Date: 10/15/21  
 Completed: 10/21/21  
 Clinton Buhler  
 Clinton.Buhler@hollyfrontier.com

Recommendation: Sample results indicate that the fluid is suitable for continued service. Please note Solids content. Please ensure that blanket gas is operational and plan for filtering of fluid. Please re-sample in 6 months

Comments:

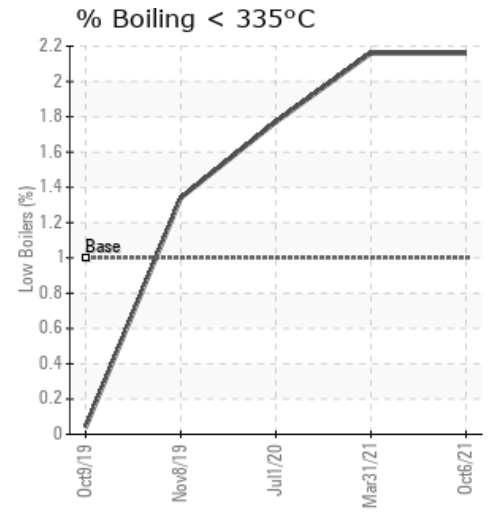
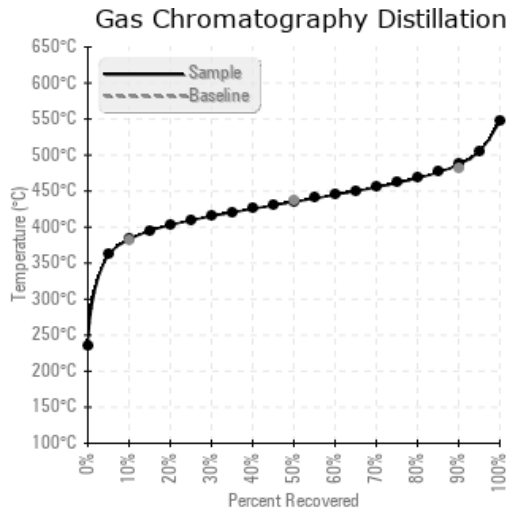
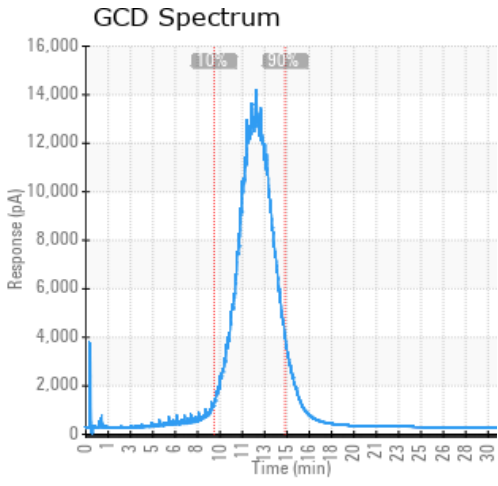
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
10/06/21	10/15/21	18556.0h	pump discharge	417 / 214	20.5	34.2	0.23	0.541	721 / 383	815 / 435	908 / 487	2.16
03/31/21	04/06/21	14127.0h	disch side of pump	421 / 216	10.1	33.9	0.16	0.641	715 / 379	811 / 433	923 / 495	2.16
07/01/20	09/28/20	11.0h	Pump Discharge	446 / 230	14.5	33.9	0.19	0.316	725 / 385	817 / 436	910 / 488	1.77
11/08/19	11/18/19	90.0h	DISCHARGE	421 / 216	0.8	34.7	0.230	0.253	711 / 377	805 / 430	899 / 481	1.34
10/09/19	10/16/19	60.0h		419 / 215	5.8	35.0	0.641	0.462	741 / 394	832 / 445	927 / 497	0.04
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
10/06/21	43	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0	0	0
03/31/21	32	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0	0	0
07/01/20	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
11/08/19	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
10/09/19	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	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

03/31/21	Sample results indicate that the fluid is suitable for continued service. Please note increase in Solids content (0.641%). This can be associated with thermal and oxidative degradation and possibly from corrosion although Iron content has not elevated over the last several samples. Please ensure that blanket gas is operational and plan for filtering of fluid. Please re-sample in 6 months
07/01/20	Sample indicates that the fluid looks to be in good condition. Resample in 6 months.
11/08/19	The fluid is in a good condition and suitable for further use. The AN has decreased to 0.23 which is acceptable. The fluid is no longer acidic which minimizes corrosion. Please re-sample in 6 months.
10/09/19	For a fluid that has been in service for 60 days it is in poor condition. The AN is high, fluid is slightly acidic. Fe content of 30 ppm is indicative of that. (corrosion) The 90% GCD temperature is high. This in combination with the high AN indicates fluid degradation by oxidation. Pentane Insoluble (solids) content is slightly high with 0.46% (reportable limit is 0.5%). Filtration of the fluid has to be considered. To stop the fluid from becoming more acidic, causing further system corrosion, it is recommended the sweeten 25% of the fill with fresh fluid. Please re-sample after sweetening. Pentane Insolubles levels are abnormally high. Acid Number (AN) is severely high. (GCD) 90% Distillation Point is abnormally high.

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