

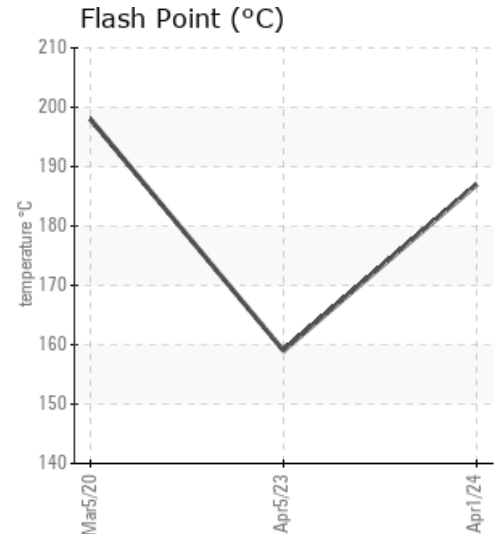
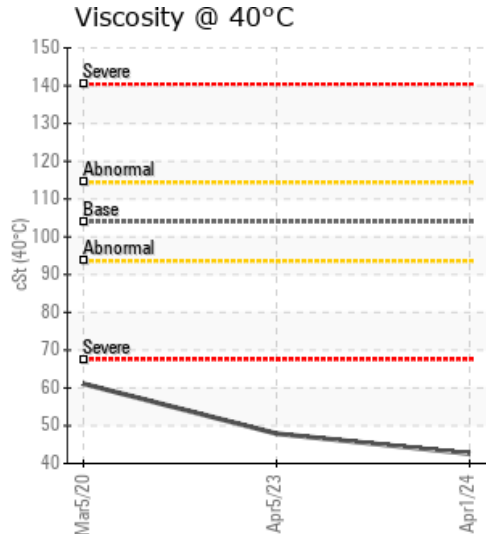
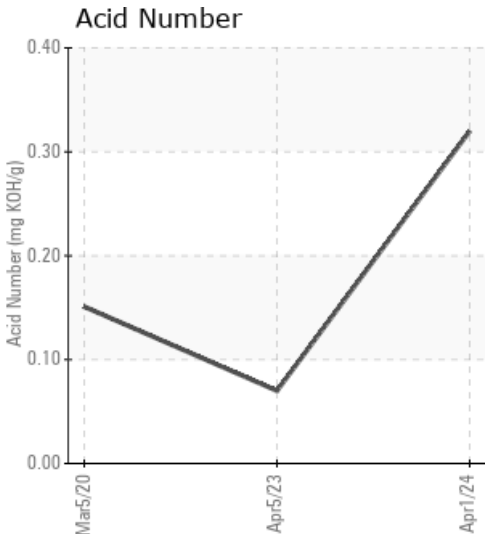
H-3700 D-TRAIN

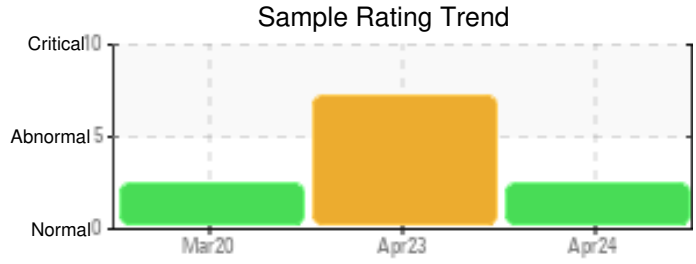
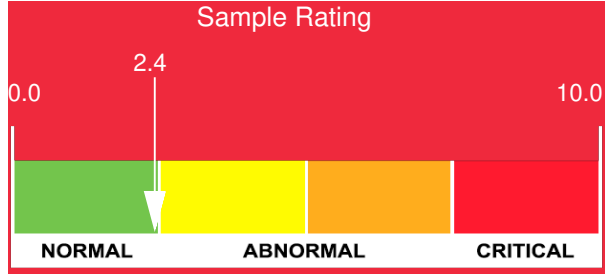
Customer: PTRHTF60070	System Information	Sample Information
Pembina Gas Services 04-25-062-06W6 Grande Prairie, AB T8W 0M1 CA Attn: Mike Janz Tel: (587)298-9421 E-Mail: mjanz@pembina.com	System Volume: 10000 ltr Bulk Operating Temp: 437F / 225C Heating Source: Blanket: Fluid: DURATHERM HF Make: PANAX OIL AND GAS	Lab No: 02627543 Analyst: Clinton Buhler Sample Date: 04/01/24 Received Date: 04/08/24 Completed: 05/13/24 Clinton Buhler Clinton.Buhler@HFSinclair.com

Recommendation: Compared to the 2020 sample, fluid properties have changed: fluid viscosity and GCD temperatures are lower which may be due to mixture with other fluids or fluid degradation. Viscosity is much lower than straight Duratherm HF. Acid Number and solids content are up compared to 2020 which can be associated with fluid oxidation. Please make sure expansion tank blanket gas is operational. Please re-sample within 12 months and please submit a new fluid sample at same time.

Comments:

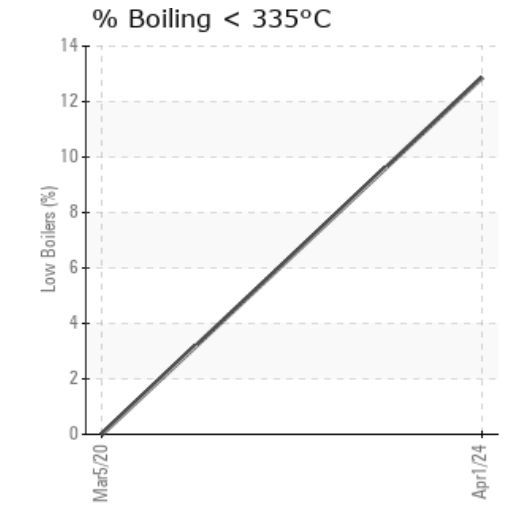
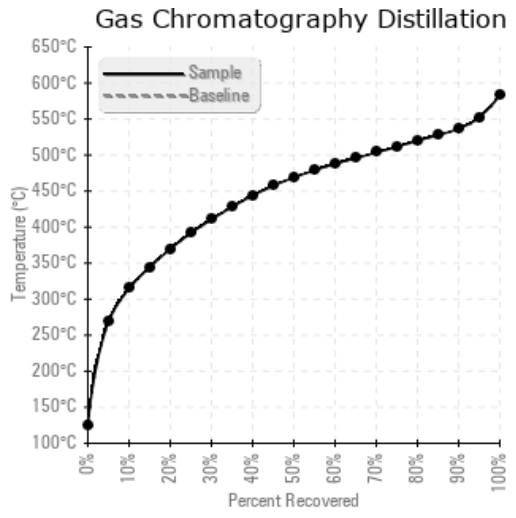
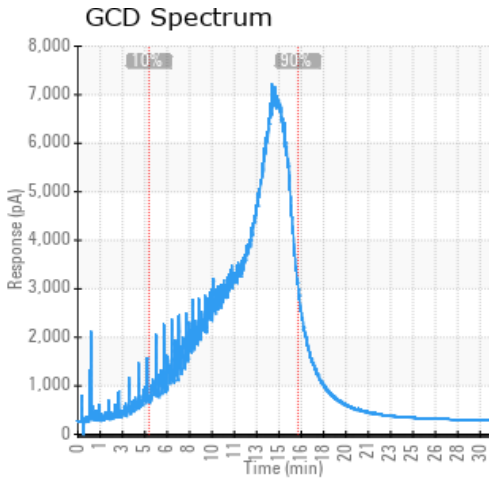
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
04/01/24	04/08/24	9.0y		369 / 187	12	42.6	0.32	0.253	598 / 315	876 / 469	998 / 537	12.87
04/05/23	05/03/23	9.0y	off of discharge pmp	318 / 159	213.6	47.9	0.07	0.406				
03/05/20	03/16/20	5.5y	REBOILER RETURN	388 / 198	40.2	61.1	0.151	0.084	831 / 444	935 / 501	1029 / 554	0.00
Baseline Data				531 / 277		104						





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
04/01/24	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	69	0
04/05/23	37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	85	0
03/05/20	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	59	0
Baseline Data			0	0						0			0	0				0	0				0	

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



Historical Comments

04/05/23	Sample results indicate free water was present in the sample container, although the measured water content in the fluid itself was 213 ppm. The free water prevented the lab from performing GCD testing. Fluid viscosity does not match the listed fluid (Chevron 22), suggesting that there may be a mix of fluids (please confirm which fluid is in service). The fluid's flashpoint is low, suggesting the presence of low boiling vapors; it is advised to vent these vapors. Solids content is alarming at 0.406, which is related thermal degradation= system fouling. Please re-sample in 3 months after the expansion tank has been vented thoroughly, and please thoroughly purge the sample point before drawing the sample. Pentane Insolubles levels are abnormally high. Visc @ 40°C is severely high. COC Flash Point is abnormally low.
03/05/20	Sample results indicate that the fluid is likely suitable for continued service, but please consider that the analyzing lab did not have a reference sample for Duratherm HF. Please submit a new oil reference sample next time a sample is taken so that all parameters can be compared to new. Note that both the fluid's viscosity and flash point are lower than what Duratherm HF lists in its data sheet (110cSt @40C and 276C respectively; this sample: 61 cSt @40C and 198C). This could indicate a mixture of fluids or contamination. 10% and 90% GCD temperatures seem to indicate that oxidation and thermal degradation is either not ongoing or at least in balance to each other. Please resample in 6 months and include a new oil reference sample and please label it as such. Please thoroughly purge the sample valve and piping prior to obtaining samples and fill in all relevant sample registration information. COC Flash Point is severely high. Visc @ 40°C is severely low.

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