

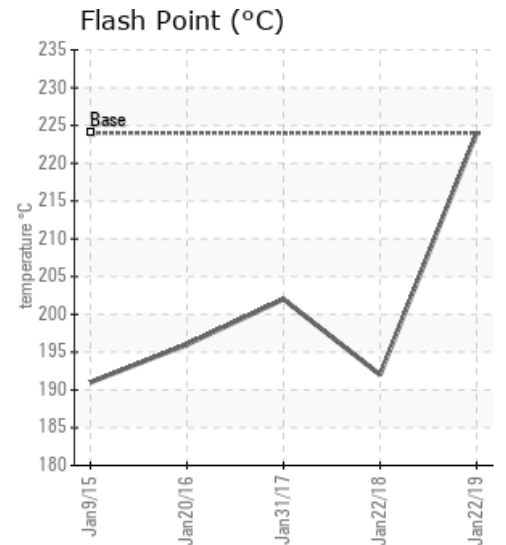
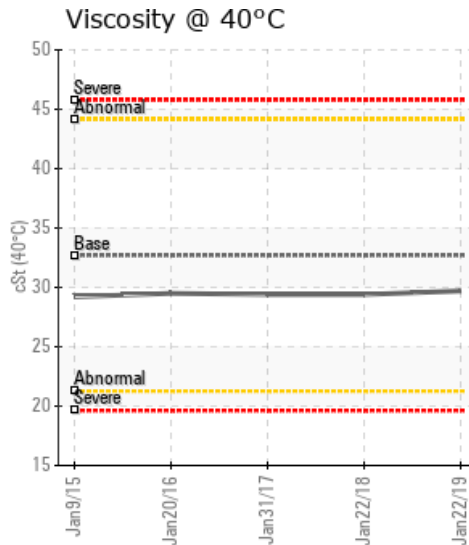
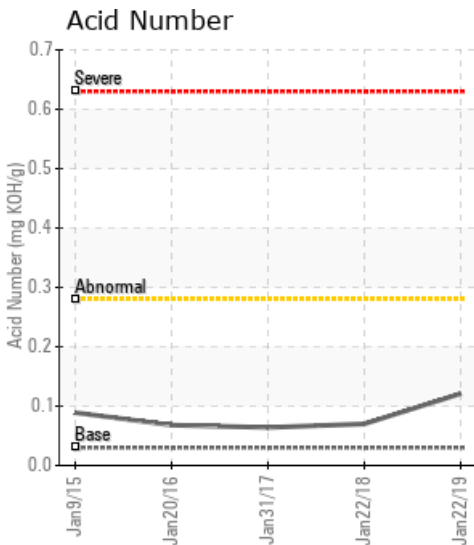
[Pembina Kakwa 8-13-63-5W6] Phase 1 Heat Medium

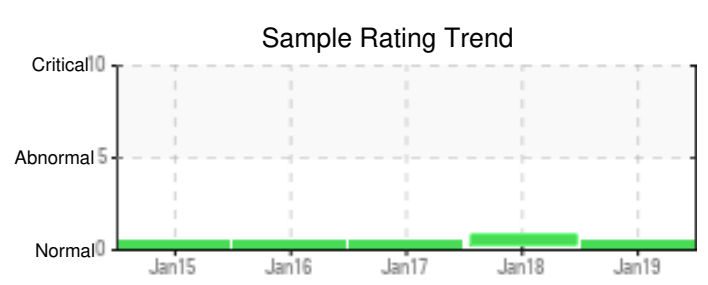
Customer: PTRHTF20062	System Information	Sample Information
Pembina Gas Services	System Volume: 0 gal	Lab No: 02265959
GRANDE PRAIRIE, AB T8V 7K2 Canada	Bulk Operating Temp: 400F / 204C	Analyst: Clinton Buhler
Attn: Nicolas Brooks	Heating Source:	Sample Date: 01/22/19
Tel: (403)874-8047	Blanket:	Received Date: 02/04/19
E-Mail: nbrooks@pembina.com	Fluid: PETRO CANADA CALFLO AF	Completed: 02/05/19
	Make: PETRO-TECH	

Recommendation: Sample results indicate the fluid is suitable for continued service. Water content and acid number has increased- this can be associated with not fully purging sampling valves and related piping. Percent boil-off has increased from 1.47 to 4.73. This can be related to high blanket gas pressure or thermal degradation. Consider venting of expansion tank to reduce low boiling vapor molecules, but if high blanket gas pressure is required for positive pump suction head, venting may need to happen during an outage. Re-sample in 12 months

Comments:

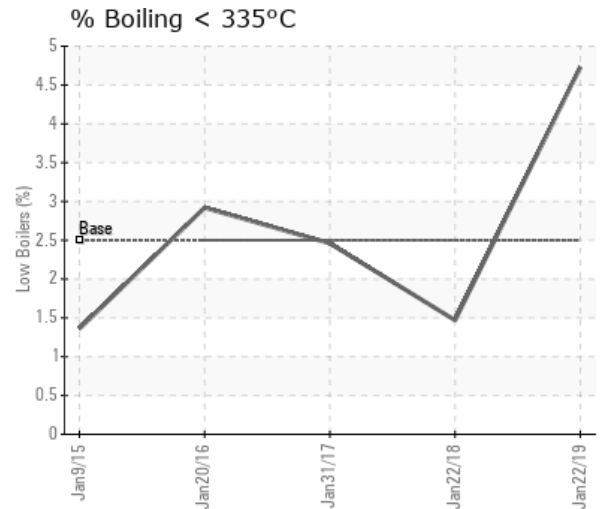
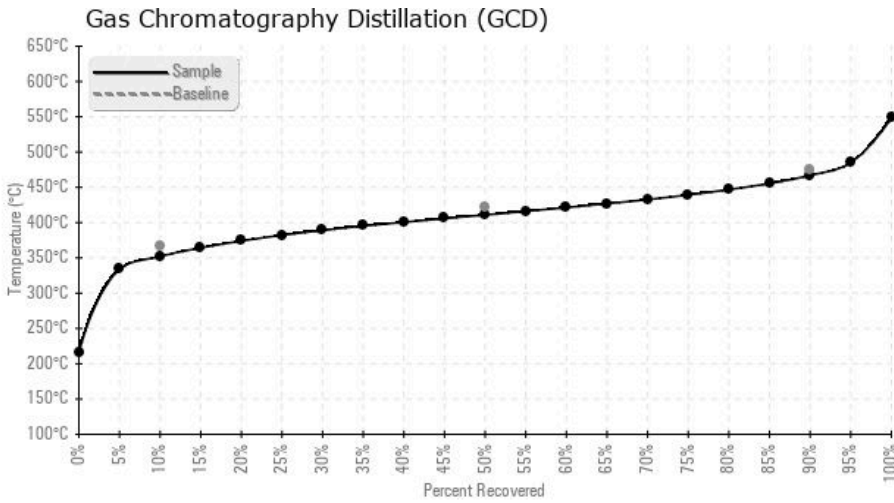
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
01/22/19	02/04/19	7y	PUMP SUCTION	435 / 224	340.8	29.7	0.121	0.095	666 / 352	772 / 411	873 / 467	4.73
01/22/18	01/29/18	6y		378 / 192	205.1	29.4	0.07	0.047	690 / 365	786 / 419	890 / 476	1.47
01/31/17	02/13/17	6y	PUMP SUCTION	396 / 202	13.0	29.4	0.064	0.035	689 / 365	793 / 423	896 / 480	2.46
01/20/16	01/28/16	4y	BEFORE FILTERS	385 / 196	57.6	29.5	0.068	0.088	688 / 364	795 / 424	896 / 480	2.92
01/09/15	01/20/15	3y	DISCHARGE OF PUMP	376 / 191	93.7	29.2	0.089	0.073	690 / 366	791 / 422	894 / 479	1.36
Baseline Data				435 / 224		32.7	0.03		693 / 367	790 / 421	887 / 475	2.5





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
01/22/19	2	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0	0	0	14	0
01/22/18	1	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	15	0
01/31/17	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	25	0
01/20/16	2	0	0	0	0	0	0	0	0	0	9	1	0	0	0	0	0	0	0	0	0	0	25	0
01/09/15	2	0	0	0	0	0	0	0	0	0	13	1	0	0	0	0	0	0	1	0	0	0	21	0
Baseline Data			0	0						0			0	0					0				270	

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



Historical Comments	
01/22/18	Flash point is marginally low. Otherwise, sample results indicate that fluid is suitable for continued service. Please re-sample in 12 months. COC Flash Point is marginally low.
01/31/17	This sample indicates the oil is in good condition and is suitable for continued use. Resample in 6 months.
01/20/16	Oil looks fine and suitable for continued use.
01/09/15	Oil condition is good an ok for continued use. Resample in 6 - 12 months COC Flash Point is marginally low.

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