

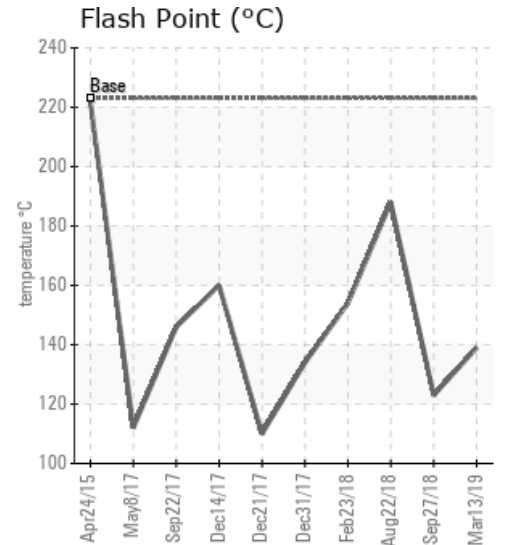
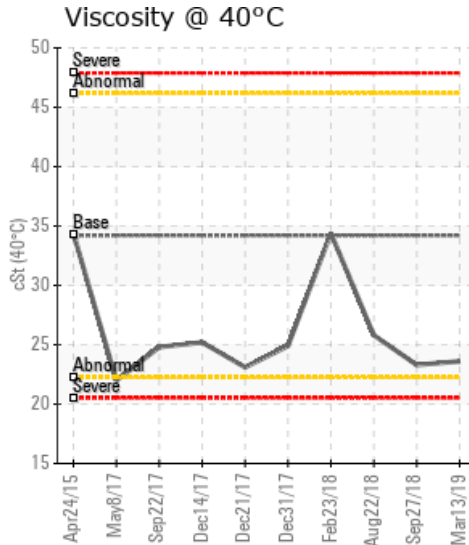
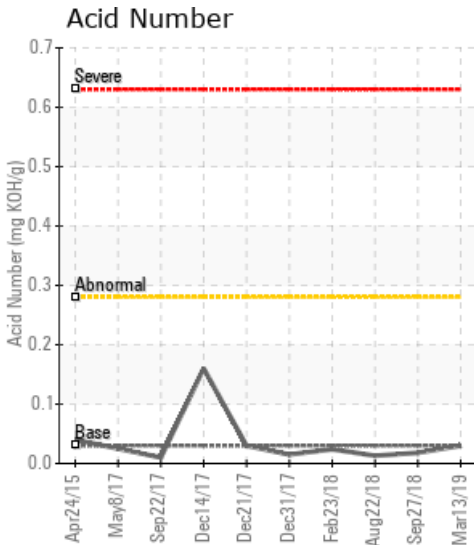
[16-11-54-15W5] BONAVIDA

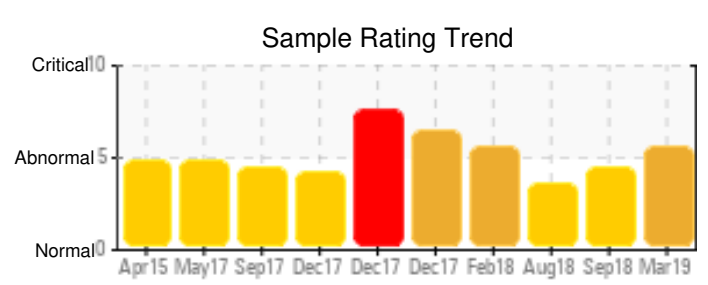
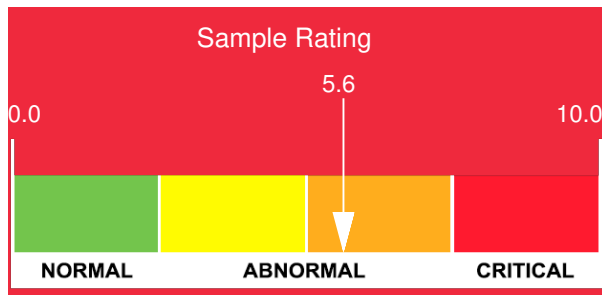
Customer: PTRHTF20158	System Information	Sample Information
BONAVIDA ENERGY 16-11-54-15-W5 PEERS, AB T0E 1W0 Canada Attn: Dan Duriez Tel: (780)728-3552 E-Mail: dan.duriez@bonavistaenergy.com	System Volume: 14000 ltr Bulk Operating Temp: 392F / 200C Heating Source: Blanket: Fluid: PETRO CANADA PETRO-THERM Make:	Lab No: 02275344 Analyst: Peter Harteveld Sample Date: 03/13/19 Received Date: 03/26/19 Completed: 04/01/19

Recommendation: The condition of the fluid is similar to what it was in September of 2018. Low boiler vapor content is high, Flash Point low, 10% GCD temperature is low. All of these indicate the fluid is not degassing properly. The fluid is suitable for further use but to prevent pump cavitation or flow stagnation problems from happening it would be good to do a thorough venting of vapor. Perhaps this can take place prior to a facility maintenance turnaround. Please re-sample after venting.

Comments: (GCD) 10% Distillation Point is severely low. COC Flash Point is severely low. (GCD) % < 335°C is marginally high.

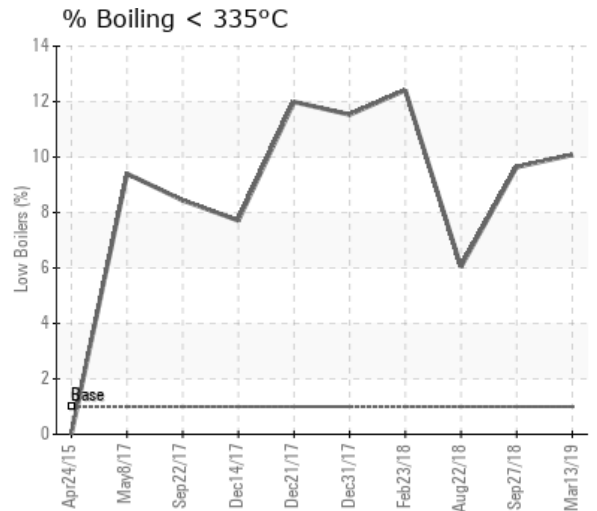
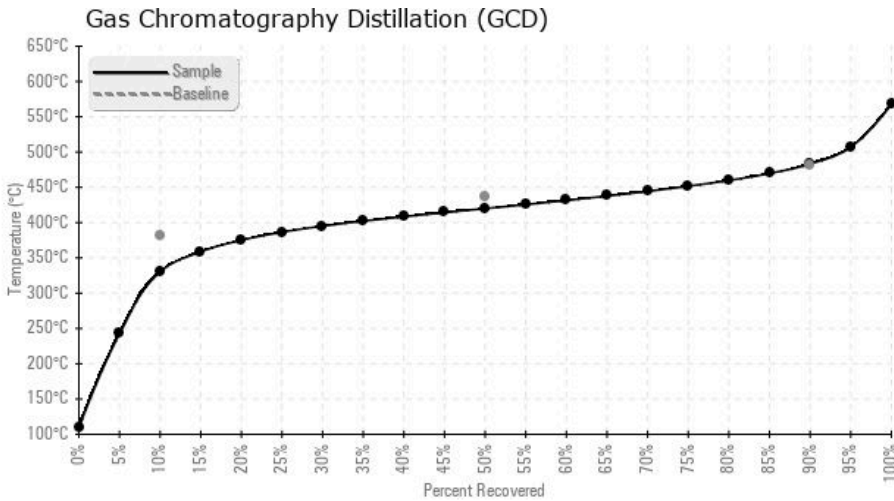
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
03/13/19	03/26/19	6y	FILTERS	282 / 139	52.5	23.6	0.030	0.032	627 / 330	788 / 420	902 / 483	10.08
09/27/18	10/02/18	5y		253 / 123	39.0	23.3	0.018	0.033	633 / 334	785 / 418	892 / 478	9.64
08/22/18	08/27/18	0y	FILTER	370 / 188	9.6	25.8	0.013	0.036	662 / 350	773 / 412	859 / 460	6.04
02/23/18	02/27/18	0y		309 / 154	2.3	34.4	0.024	0.039	564 / 296	795 / 424	910 / 488	12.41
12/31/17	01/05/18	0y		273 / 134	9.9	24.9	0.015	0.006	610 / 321	764 / 407	875 / 469	11.53
12/21/17	01/16/18	0y		230 / 110	54.3	23.1	0.030	0.021	600 / 316	765 / 407	862 / 461	11.99
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
03/13/19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09/27/18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08/22/18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02/23/18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/31/17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/21/17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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

09/27/18	The fluid is in a reasonable condition and suitable for further use but the analysis results reflect either increased thermal degradation of the fluid or ineffective degassing via system modification. The Flash Point is low and a safety concern in case an external leak occurs. The low boiler vapor content has increased and 10% GCD temperature has decreased. A vapor content of 9.6% may cause cavitation problems at the suction side of the heat medium pumps. The vapor has to be vented off. Also check if this condition can be caused by an internal leak of process fluid into the Petro-Therm. COC Flash Point is severely low. (GCD) 10% Distillation Point is abnormally low. (GCD) % < 335°C is marginally high.
08/22/18	The fluid is in good condition and suitable for further use. The modifications made to allow for continuous de-gassing of the fluid have resulted in improvements in Flash Point, low boiler vapor content (%<335C went from 12.41% to 6.04%) and 10% GCD temperature. The 90% GCD temperature and viscosity have decreased. This can be the result of low boiler vapor ingress. (low boiler vapor content of fresh Petro-Therm is 1% and is currently still elevated at 6.04%). The advise is to keep operating the system this way with close monitoring of the de-gassing vessel pressure and take a sample in 6 months. Please list the service life of the fluid on the analysis request form. (GCD) 90% Distillation Point is severely low. COC Flash Point is marginally low. (GCD) 10% Distillation Point is marginally low.
02/23/18	The fluid is in a reasonable condition and suitable for further use. There is a small improvement in Flash Point, viscosity and top-end of the distillation curve. The low boiler vapor content is still too high. Please keep venting on a regular basis and re-sample in 3 months time. (May/June) Please list the fluid age on the next analysis request form. (GCD) 10% Distillation Point is severely low. COC Flash Point is severely low. (GCD) % < 335°C is abnormally high.
12/31/17	This sample was taken two weeks after the previous one. The fluid shows an increase in thermal degradation. If the sample was taken from a different sample point or there is an internal leak of process fluid into the Petro-Therm it would explain the ongoing degradation. The combination of low viscosity, low Flash Point, high % boil-off below 335C and low 10% GCD temperature indicate thermal degradation but the same symptoms will show when there is an internal leak. Venting of low boiler vapors to atmosphere is still recommended to restore fluid condition. Currently the fluid is suitable for further use. (GCD) 10% Distillation Point is severely low. COC Flash Point is severely low. (GCD) % < 335°C is abnormally high. (GCD) 90% Distillation Point is marginally low.
12/21/17	This sample taken on Dec 21, 2017 came after the sample taken on Dec 31, 2017 (lab nr. 02191318) Comments were already made on the last sample and customer was contacted by phone. Since there is no value in taking weekly heat transfer fluid samples it was agreed with the customer to take the next sample one month after the last system modification which took place recently. Next sample has to be taken mid February. (GCD) 10% Distillation Point is severely low. (GCD) 90% Distillation Point is severely low. COC Flash Point is severely low. (GCD) % < 335°C is abnormally high.

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