

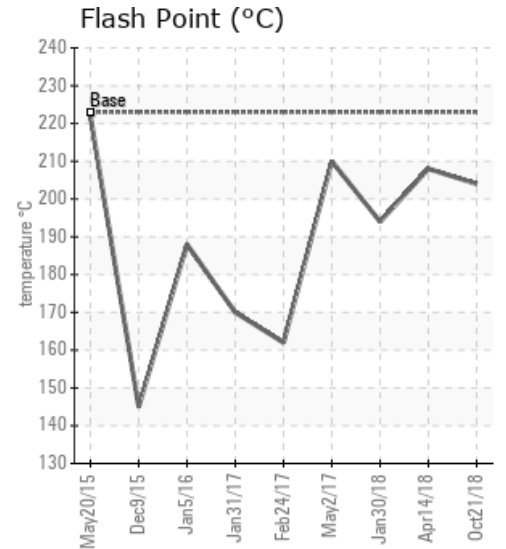
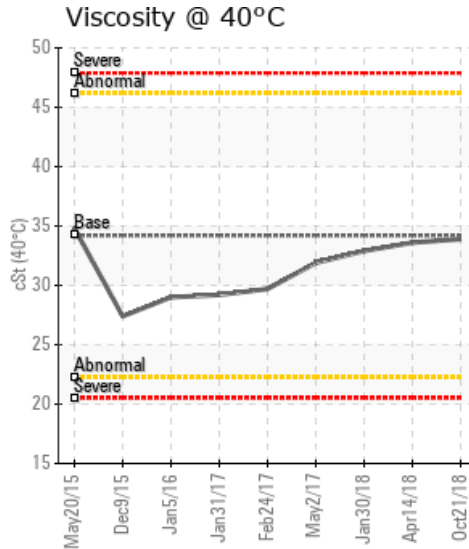
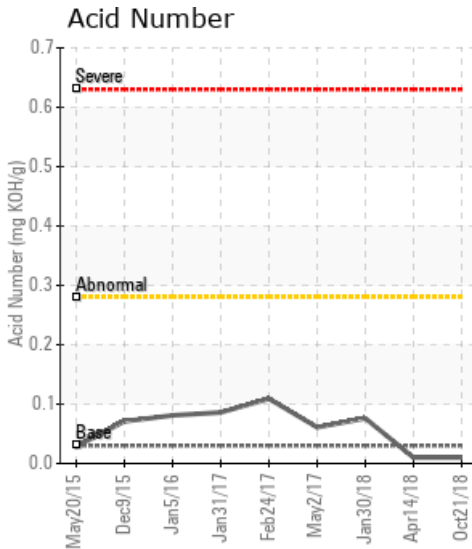
NUVISTA ENERGY BILBO 03-36-65-06W6 CL1804-0348-01

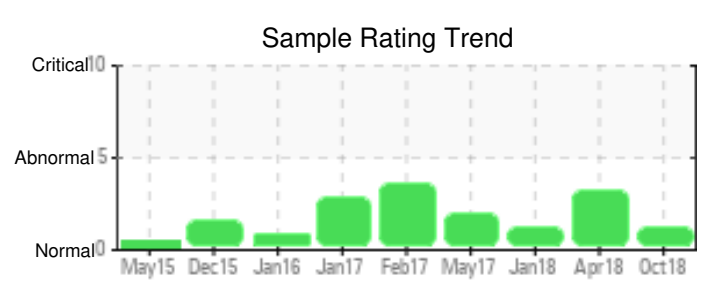
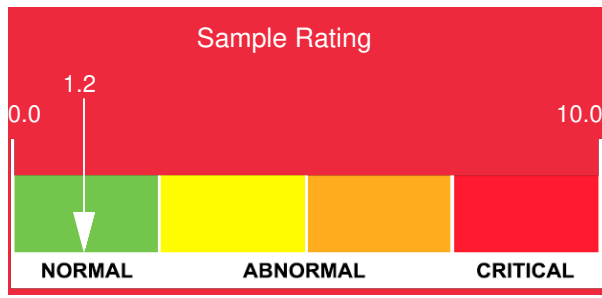
| Customer: PTRHTF20039 | System Information | Sample Information |
|---|---|--|
| BRENNTAG CANADA INC 3124-54TH AVENUE SE CALGARY, AB T2A 0A8 CANADA Attn: Toader Georgiana Tel: E-Mail: gtoader@brenntag.ca | System Volume: 40000 ltr Bulk Operating Temp: 446F / 230C Heating Source: Blanket: Fluid: PETRO CANADA PETRO-THERM Make: ALCOE | Lab No: 02249322 Analyst: Clinton Buhler Sample Date: 10/21/18 Received Date: 11/05/18 Completed: 11/09/18 |

Recommendation: Sample results indicate that the fluid is suitable for continued service. Please note Potassium which is a contaminant in this case, however it remains fairly steady over multiple samples so ongoing contamination doesn't seem to be occurring. Please re-sample in 12 months

Comments: Potassium ppm levels are abnormally high.

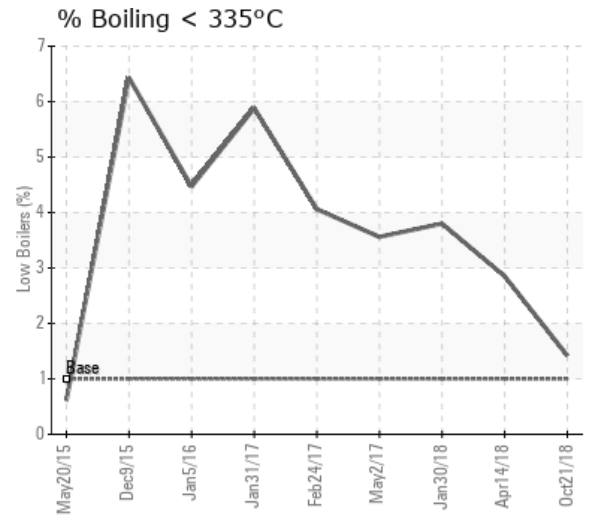
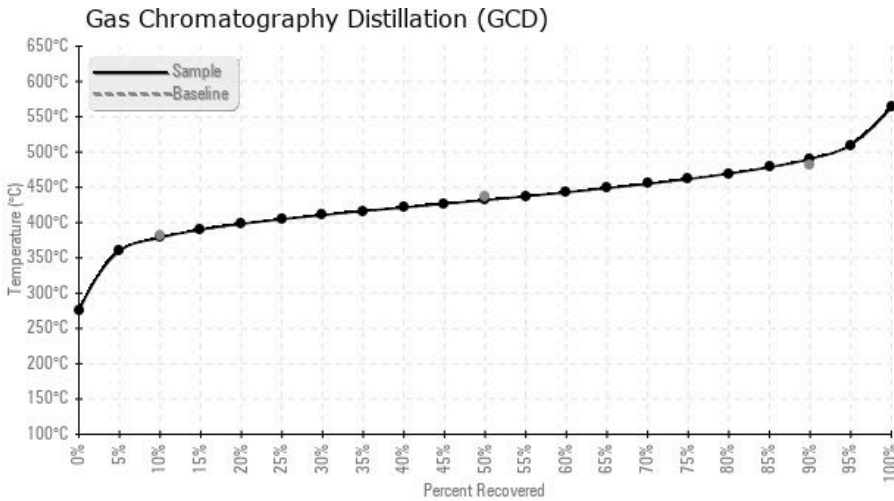
| Sample Date | Received Date | Fluid Age | Sample Location | Flash Point (COC) | Water (KF) | Viscosity (40°C) | Acid Number | Solids | GCD 10% | GCD 50% | GCD 90% | GCD % < 335°C |
|---------------|---------------|-----------|-----------------|-------------------|------------|------------------|-------------|--------|-----------|-----------|-----------|---------------|
| | mm/dd/yy | | | °F/°C | ppm | cSt | mg/KOH/g | %wt | °F/°C | °F/°C | °F/°C | % |
| 10/21/18 | 11/05/18 | 5y | | 399 / 204 | 137.8 | 33.9 | 0.01 | 0.289 | 713 / 379 | 809 / 432 | 914 / 490 | 1.42 |
| 04/14/18 | 04/24/18 | 0y | | 406 / 208 | 19.5 | 33.6 | 0.01 | 0.283 | 713 / 379 | 821 / 438 | 951 / 511 | 2.85 |
| 01/30/18 | 02/28/18 | 36y | | 381 / 194 | 6.9 | 32.9 | 0.076 | 0.173 | 700 / 371 | 805 / 429 | 915 / 490 | 3.80 |
| 05/02/17 | 05/26/17 | 0y | | 410 / 210 | 113.8 | 31.9 | 0.061 | 0.198 | 703 / 373 | 813 / 434 | 924 / 496 | 3.56 |
| 02/24/17 | 03/10/17 | 0y | | 324 / 162 | 208.1 | 29.7 | 0.109 | 0.127 | 700 / 371 | 809 / 432 | 937 / 503 | 4.06 |
| 01/31/17 | 03/10/17 | 0y | | 338 / 170 | 13.0 | 29.2 | 0.086 | 0.097 | 685 / 363 | 806 / 430 | 940 / 504 | 5.88 |
| 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 |
|----------------------|------|----------|--------|----------|--------|------|-----|---------|--------|----------|---------|--------|-----------|----------|------------|----------|-----------|---------|-------|-----------|---------|--------|------------|------|
| 10/21/18 | 10 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 9 | 28 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 4 | 0 | 0 | 0 |
| 04/14/18 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 12 | 30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 |
| 01/30/18 | 14 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 1 | 10 | 29 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 |
| 05/02/17 | 31 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 26 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 |
| 02/24/17 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 01/31/17 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 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

| | |
|----------|--|
| 04/14/18 | Sample results indicate that the thermal fluid is suitable for continued service. increased 90% distillation point can be an indication of fluid oxidation. Ensure blanket gas is operational. (GCD) % < 335°C value of 2.85% indicates thermal degradation of the fluid. Pentane Insolubles has increased supporting that thermal degradation has been ongoing. Please perform regular venting of thermal expansion tank to release low boiling vapors. Note that Potassium and Sodium are contaminants. Investigate source. It is understood that this sample was drawn after a re-boiler failure. Please call Petro-Canada Lubricants Technical Services to discuss next re-sample interval. Potassium ppm levels are abnormally high. (GCD) 90% Distillation Point is severely high. |
| 01/30/18 | Sample results indicate fluid is suitable for continued service. GCD % < 335°C value of 3.8 indicates low boiling vapors in the fluid. This can be an indication of thermal degradation or possible cross contamination with another fluid. Continue venting of system to release low boiling vapors after which time, ensure that blanket gas is in operation. Sodium and Potassium indicates possible contamination with glycol or similar product. Investigate and resolve source of ingress. Re-sample in 12 months Potassium ppm levels are abnormally high. |
| 05/02/17 | Please include system volume, bulk temperature and fluid service time with sample registration. 90% distillation point level can indicate oxidation of the fluid. Please ensure blanket gas is operational in expansion tank. GCD % < 335°C and 10% distillation point can indicate thermal degradation (cracking), which means low boiling vapors are present. Continue periodic yet thorough venting of expansion tank to release the low boilers. 26 ppm of Potassium may indicate contamination with outside sources. Please investigate possible sources of contamination (water/glycol, etc.). Re-sample fluid in 6 months. Potassium ppm levels are abnormally high. (GCD) 90% Distillation Point is marginally high. |
| 02/24/17 | Please list system volume, bulk oil temperature and fluid service life on the sample label. The blank areas are there for a reason! Low Flash Point, decreased viscosity and elevated low boiler vapor content (% boil-off below 335°C.) are indications of thermal degradation. At the same time oxidation is taking place. (90% GCD temp is high). Please vent off low boiler vapors to atmosphere but make sure that the fluid is not exposed to outside air (oxygen) for too long when the fluid temp is high. After venting please ensure that blanket gas is applied. (GCD) 90% Distillation Point is severely high. COC Flash Point is severely low. |
| 01/31/17 | Please ensure sample label is completely filled out including system volume, service life and bulk oil temperature. Increased 90% GCD can indicate oxidation. Please check for functioning gas blanket. Reduced COC flash point and increased % < 335°C indicates thermal degradation. Please ensure system is thoroughly vented to release the low boiling vapors (GCD) 90% Distillation Point is severely high. COC Flash Point is abnormally low. |