

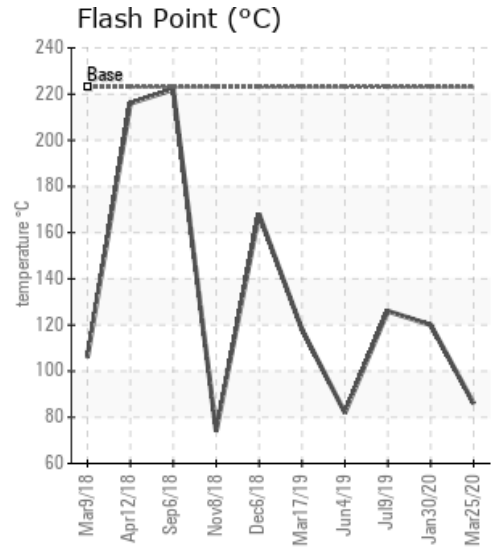
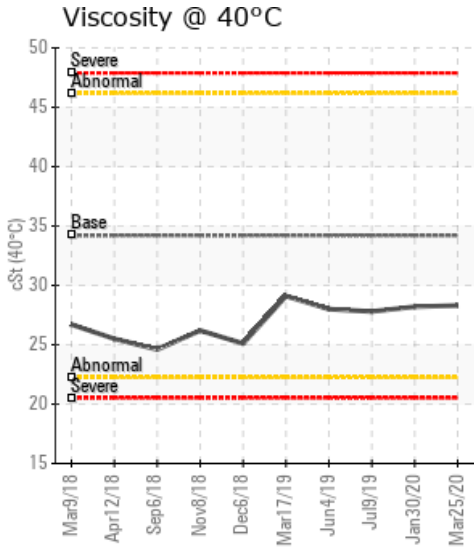
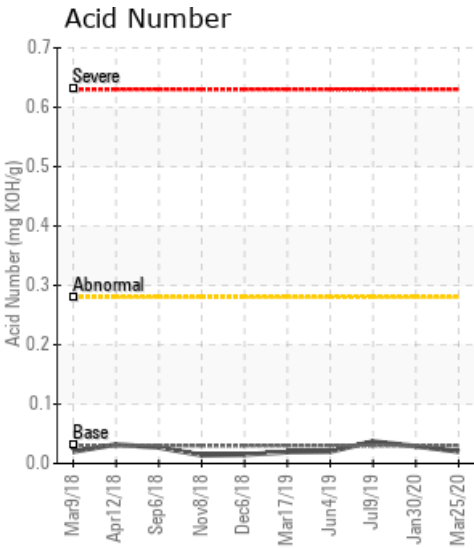
[14-23-58-26W45] H-3700/H-3750

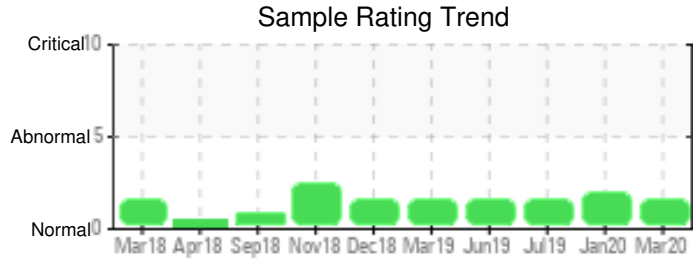
| Customer: PTRHTF20103 | System Information | Sample Information |
|--|--|--|
| CNRL P.O. BOX 6808 EDSON, AB T7E 1L5 Canada Attn: Rodney Marcichiw Tel: (780)517-3542 E-Mail: rodney.marcichiw@cnrl.com | System Volume: 10000 ltr Bulk Operating Temp: 365F / 185C Heating Source: Blanket: Fluid: PETRO CANADA PETRO-THERM Make: PETRO TECH HEATERS | Lab No: 02347197 Analyst: Peter Harteveld Sample Date: 03/25/20 Received Date: 04/02/20 Completed: 04/27/20 Peter Harteveld peter.harteveld@petrocanadalsp.com |

Recommendation: This is the re-run of the sample taken on March 25th when a low boiler vapor content of 15.8% was reported due to a GC fault. After GC repair the low boiler vapor content is 2.39%. The other parameters remain the same. The fluid is in a reasonable condition and suitable for further use. Venting is still important to try and increase the Flash Point of the fluid.

Comments: COC Flash Point is severely low.

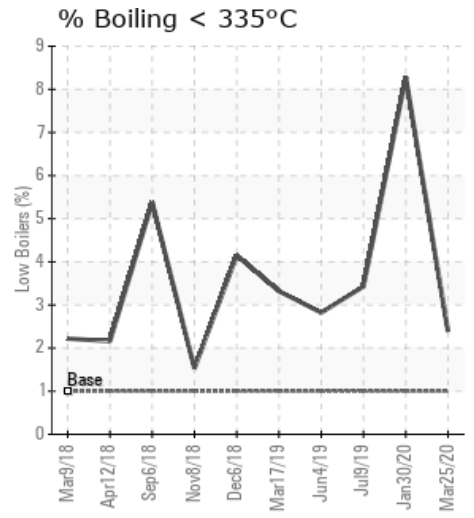
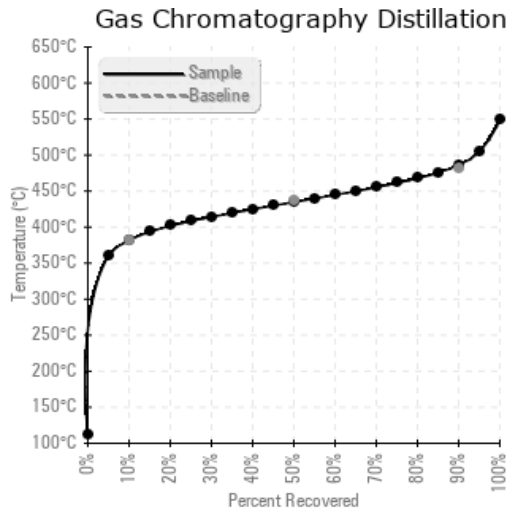
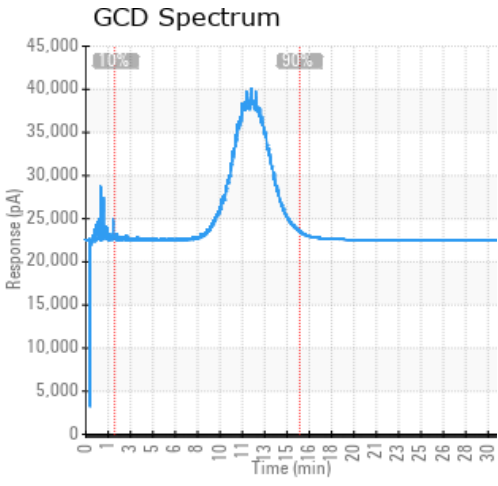
| Sample Date | Received Date | Fluid Age | Sample Location | Flash Point (COC) | Water (KF) | Viscosity (40°C) | Acid Number | Solids | GCD 10% | GCD 50% | GCD 90% | GCD % < 335°C |
|---------------|---------------|-----------|-----------------|-------------------|------------|------------------|-------------|--------|-----------|-----------|-----------|---------------|
| | mm/dd/yy | | | °F/°C | ppm | cSt | mg/KOH/g | %wt | °F/°C | °F/°C | °F/°C | % |
| 03/25/20 | 04/02/20 | 0y | PUMP DISCHARGE | 187 / 86 | 31.1 | 28.3 | 0.02 | 0.118 | 719 / 382 | 815 / 435 | 907 / 486 | 2.39 |
| 01/30/20 | 02/06/20 | 0y | PUMP SEAL | 248 / 120 | 25.7 | 28.2 | 0.029 | 0.057 | 736 / 391 | 808 / 431 | 888 / 475 | 8.28 |
| 07/09/19 | 07/12/19 | 0y | | 259 / 126 | 66.5 | 27.8 | 0.037 | 0.026 | 708 / 375 | 805 / 430 | 898 / 481 | 3.43 |
| 06/04/19 | 06/07/19 | 10y | PUMP SEAL | 180 / 82 | 97.8 | 28.0 | 0.020 | 0.081 | 710 / 377 | 811 / 433 | 907 / 486 | 2.82 |
| 03/17/19 | 03/27/19 | 5y | PUMP DISCHARGE | 244 / 118 | 25.2 | 29.1 | 0.019 | 0.040 | 705 / 374 | 808 / 431 | 901 / 483 | 3.32 |
| 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 |
|---------------|------|----------|--------|----------|--------|------|-----|---------|--------|----------|---------|--------|-----------|----------|------------|----------|-----------|---------|-------|-----------|---------|--------|------------|------|
| 03/25/20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 01/30/20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 07/09/19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 06/04/19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 03/17/19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 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 | |
|---------------------|---|
| 01/30/20 | The fluid is in reasonable condition and suitable for further use. Viscosity is slightly low. Flash Point is very low. This is the result of a low boiler vapor content of 8.28% which is considered high. A Flash Point below 150 degrees C is a safety concern and the low boiler vapor content at this level may result in pump cavitation, flow problems or pump seal leakage. Venting of low boiler vapor to atmosphere is recommended. Please re-sample in 6 months. COC Flash Point is severely low. (GCD) % < 335°C is marginally high. |
| 07/09/19 | The fluid is in the same condition as the sample taken on the 4th of June. Flash Point has improved with an increase from 82C to 126C. This is still low and we have to keep in mind that the test method for Flash Point has low repeatability/reproducibility. Flash Points below 150C are considered a safety concern. Please keep venting on a regular basis. Considering a switch to N2 blanket gas is strongly advised. COC Flash Point is severely low. |
| 06/04/19 | The fluid is in a reasonable condition but the Flash Point is a safety concern. Venting has resulted in a decrease of the low boiler vapor content (GCD% <335C.) but the 150 kPa fuel gas blanket is causing the Flash Point to be at 82C. As a result of the high blanket gas pressure the fuel gas is dissolved in the fluid and will not escape from the fluid easily while venting. This theory is confirmed by a normal distillation curve with the exception of the initial boiling point. It is recommended to change blanket gas to nitrogen as this inert gas will not affect the Flash Point of the fluid. Please re-sample after this change has been made. COC Flash Point is severely low. |
| 03/17/19 | The fluid is in a reasonable condition and suitable for further use. After venting off the low boiler vapor and ingressed blanket gas the % vapor in the fluid has decreased from 4.15% to 3.32%. The viscosity has increased slightly as a result of this. Flash Point has decreased. This does not correlate with the other parameters. The decrease in fluid vapor content is an improvement which shows the effect of venting. It is advised to repeat venting to bring Flash Point back to a more acceptable level (>150C). Re-sample after venting. COC Flash Point is severely low. |

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