

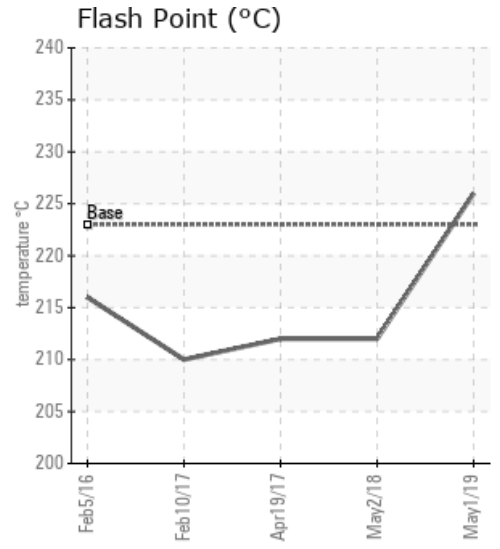
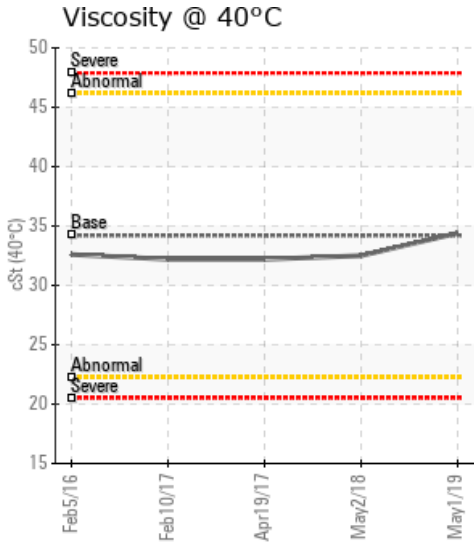
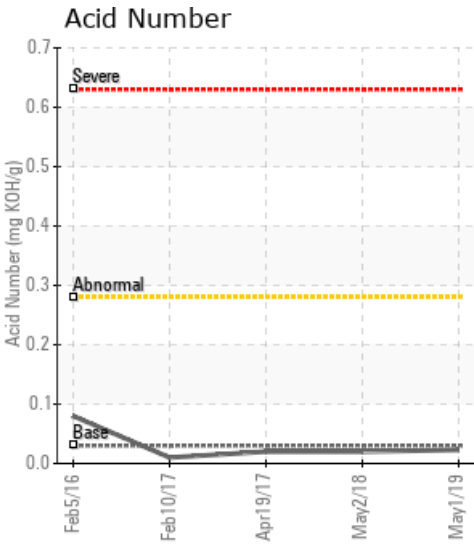
[TOURMALINE / 06-03-78-07W6M] HEAT TRANSFER

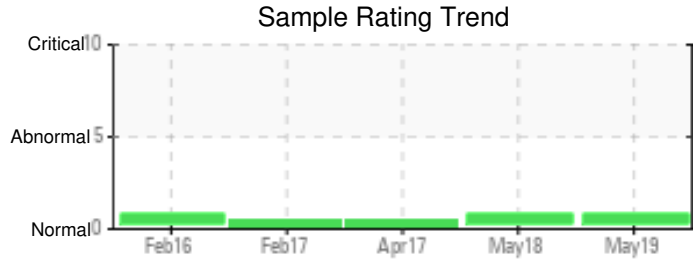
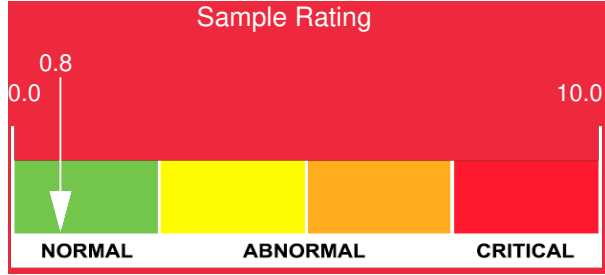
| Customer: PTRHTF20155 | System Information | Sample Information |
|---|--|--|
| TOURMALINE OIL 6-3-78-7-W6 BOX 748 SPIRIT RIVER, AB T0H 3G0 Canada Attn: Derek Yurchyshyn Tel: (780)864-1995 E-Mail: Yurchyshyn@tourmalineoil.com | System Volume: 4000 ltr Bulk Operating Temp: 248F / 120C Heating Source: Blanket: Fluid: PETRO CANADA PETRO-THERM Make: HEAT TECH | Lab No: 02284496 Analyst: Clinton Buhler Sample Date: 05/01/19 Received Date: 05/10/19 Completed: 05/13/19 |

Recommendation: Sample results indicate that the fluid is suitable for continued service. Please re-sample in 12 months

Comments: (GCD) 90% Distillation Point is marginally high.

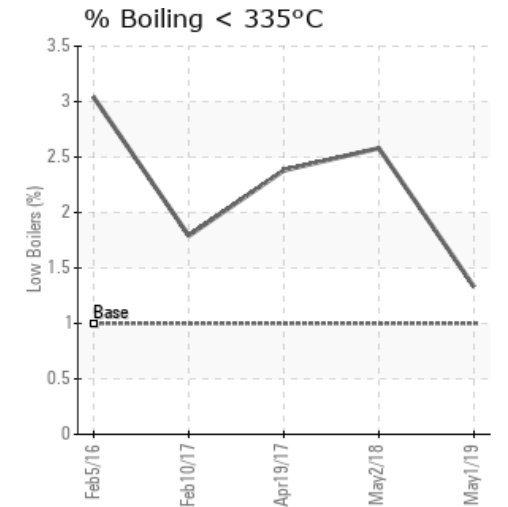
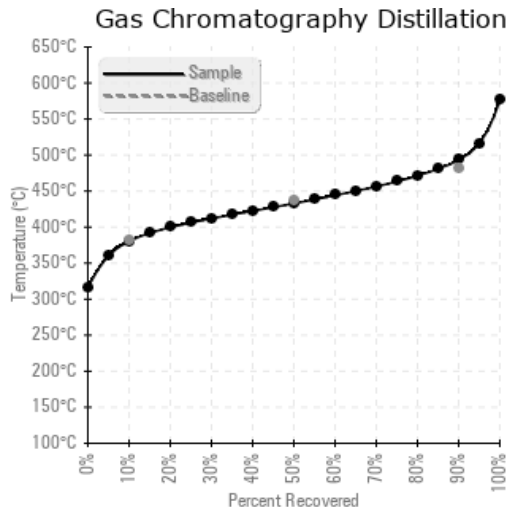
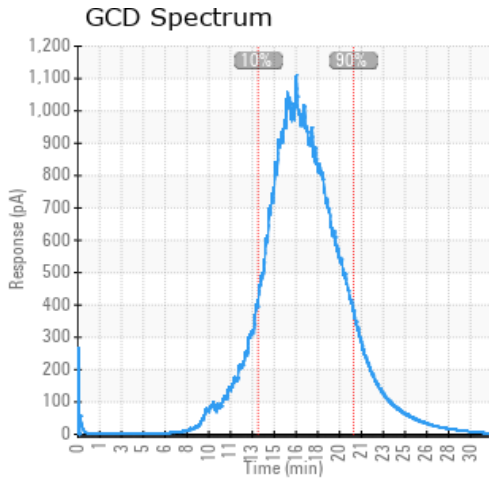
| Sample Date | Received Date | Fluid Age | Sample Location | Flash Point (COC) | Water (KF) | Viscosity (40°C) | Acid Number | Solids | GCD 10% | GCD 50% | GCD 90% | GCD % < 335°C |
|---------------|---------------|-----------|-----------------|-------------------|------------|------------------|-------------|--------|-----------|-----------|-----------|---------------|
| | mm/dd/yy | | | °F/°C | ppm | cSt | mg/KOH/g | %wt | °F/°C | °F/°C | °F/°C | % |
| 05/01/19 | 05/10/19 | 5y | | 439 / 226 | 2.4 | 34.4 | 0.023 | 0.028 | 717 / 380 | 811 / 433 | 920 / 493 | 1.33 |
| 05/02/18 | 05/09/18 | 4y | PUMP OUTLET | 414 / 212 | 7.6 | 32.5 | 0.02 | 0.023 | 706 / 374 | 812 / 434 | 925 / 496 | 2.58 |
| 04/19/17 | 04/27/17 | 0y | | 414 / 212 | 2.4 | 32.2 | 0.02 | 0.038 | 709 / 376 | 811 / 433 | 915 / 491 | 2.38 |
| 02/10/17 | 02/16/17 | 30y | PUMP OUTLET | 410 / 210 | 9.0 | 32.2 | 0.01 | 0.058 | 710 / 377 | 807 / 431 | 914 / 490 | 1.79 |
| 02/05/16 | 02/11/16 | 0y | PUMP OUTLET | 421 / 216 | 111.6 | 32.6 | 0.08 | 0.103 | 705 / 374 | 811 / 433 | 921 / 494 | 3.04 |
| 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 |
|---------------|------|----------|--------|----------|--------|------|-----|---------|--------|----------|---------|--------|-----------|----------|------------|----------|-----------|---------|-------|-----------|---------|--------|------------|------|
| 05/01/19 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 |
| 05/02/18 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 |
| 04/19/17 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 |
| 02/10/17 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 |
| 02/05/16 | 24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 4 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 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 | |
|---------------------|--|
| 05/02/18 | Sample results indicate that the fluid is suitable for continued service. % boil off <335°C can be an indication of thermal degradation . Perform venting of expansion tank to release low boiling vapors. Slightly increased 90% Distillation point can be an indication of oxidation. Ensure blanket gas is operational in expansion tank. Re-sample within 12 months (please ensure venting has been completed before obtaining next sample) (GCD) 90% Distillation Point is marginally high. |
| 04/19/17 | results indicate that fluid is suitable for continued use. % GCD <335C and 10% distillation point indicate that thermal degradation may be beginning. Consider venting expansion tank of low boiling vapors. Re-sample within 12 months (please ensure venting has been completed before obtaining next sample)For future analysis, please include time on oil, component age and blanket gas type |
| 02/10/17 | Sample indicates that fluid is in good condition and is suitable for continued use. Resample in 12 months. |
| 02/05/16 | Sample is marginally high in the GCD 90% indicating some heavier ends in the oil. Otherwise the oil is good for continued use. Resample in 12 months. (GCD) 90% Distillation Point is marginally high. |

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