

## [LSD / C-46-C/94-H-4] Black Swan Utility Heat Medium

**Customer: PTRHTF20046**  
 QUADRA CHEMICALS  
 12925 146TH STREET  
 EDMONTON, AB T5L 2H6 CANADA  
 Attn: Quadra Samples  
 Tel:  
 E-Mail: quadra\_samples@quadra.ca

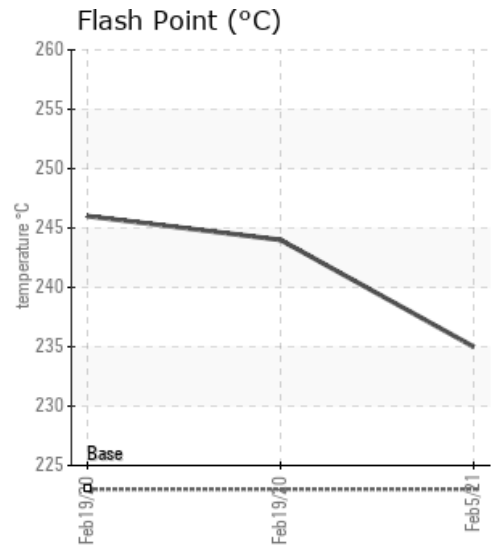
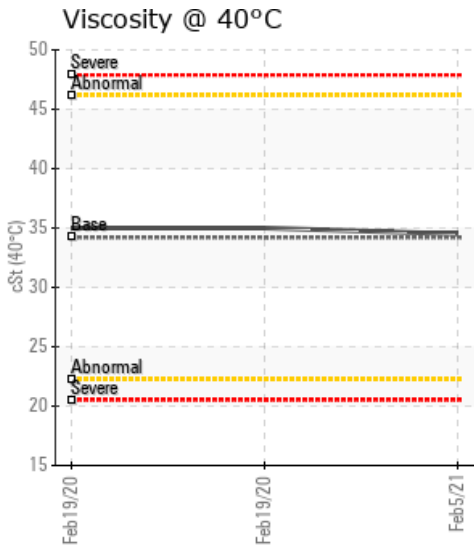
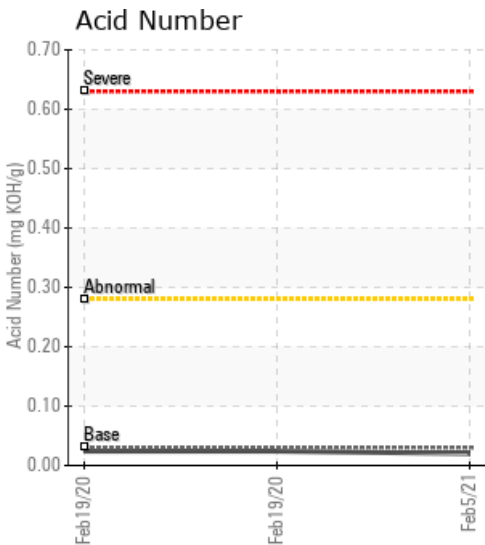
**System Information**  
 System Volume: 180000 ltr  
 Bulk Operating Temp: 401F / 205C  
 Heating Source:  
 Blanket:  
 Fluid: PETRO CANADA PETRO-THERM  
 Make: HEATECH

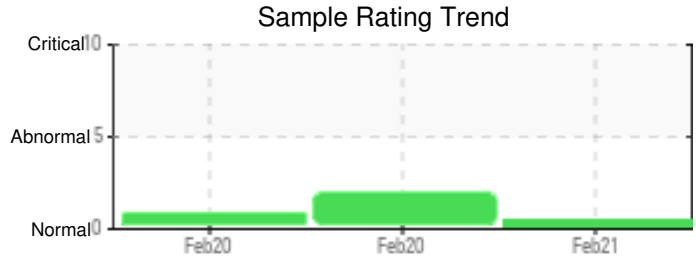
**Sample Information**  
 Lab No: 02405479  
 Analyst: Clinton Buhler  
 Sample Date: 02/05/21  
 Received Date: 02/23/21  
 Completed: 02/25/21  
 Clinton Buhler  
 Clinton.Buhler@hollyfrontier.com

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

Comments:

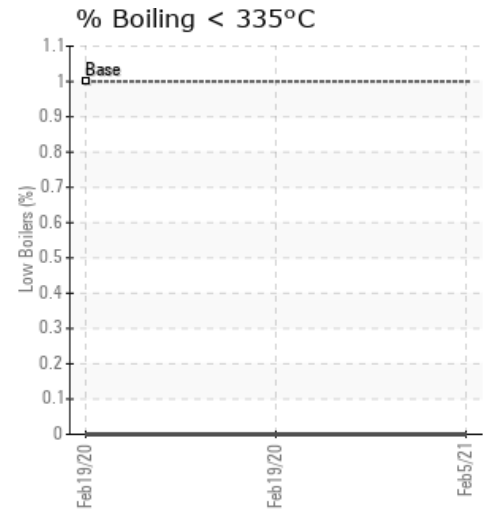
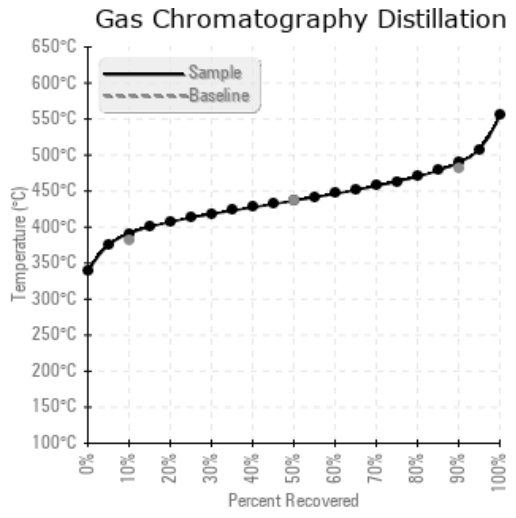
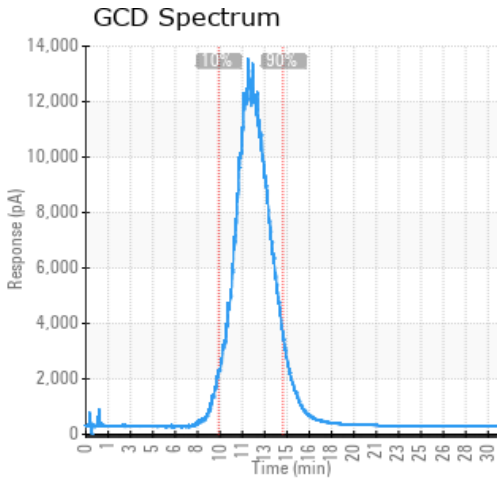
| Sample Date   | Received Date | Fluid Age | Sample Location | Flash Point (COC) | Water (KF) | Viscosity (40°C) | Acid Number | Solids | GCD 10%   | GCD 50%   | GCD 90%   | GCD % < 335°C |
|---------------|---------------|-----------|-----------------|-------------------|------------|------------------|-------------|--------|-----------|-----------|-----------|---------------|
|               | mm/dd/yy      |           |                 | °F/°C             | ppm        | cSt              | mg/KOH/g    | %wt    | °F/°C     | °F/°C     | °F/°C     | %             |
| 02/05/21      | 02/23/21      | 14.0m     | Pump Suction    | 455 / 235         | 14.2       | 34.5             | 0.02        | 0.056  | 736 / 391 | 818 / 437 | 913 / 489 | 0.00          |
| 02/19/20      | 03/03/20      | 5.0m      | PHM             | 471 / 244         | 0.003      | 35.0             | 0.024       | 0.123  | 740 / 394 | 838 / 448 | 936 / 502 | 0.00          |
| 02/19/20      | 03/03/20      | 5.0m      | UHM             | 475 / 246         | 0.001      | 35.0             | 0.024       | 0.102  | 739 / 393 | 837 / 447 | 936 / 502 | 0.00          |
| 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 |
|---------------|------|----------|--------|----------|--------|------|-----|---------|--------|----------|---------|--------|-----------|----------|------------|----------|-----------|---------|-------|-----------|---------|--------|------------|------|
| 02/05/21      | 1    | 0        | 0      | 0        | 0      | 0    | 0   | 0       | 0      | 0        | 0       | 0      | 0         | 0        | 0          | 0        | 0         | 0       | 0     | 0         | 1       | 0      | 0          | 0    |
| 02/19/20      | 2    | 0        | 0      | 0        | 0      | 0    | 0   | 0       | 0      | 0        | 0       | 0      | 0         | 0        | 0          | 0        | 0         | 0       | 0     | 0         | 0       | 0      | 0          | 0    |
| 02/19/20      | 2    | 0        | 0      | 0        | 0      | 0    | 0   | 0       | 0      | 0        | 0       | 0      | 0         | 0        | 0          | 0        | 0         | 0       | 0     | 0         | 1       | 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 |  |
|---------------------|--|
| 02/19/20            | The fluid is in a good condition and suitable for further use. 90% GCD temperature is high and so is the distillation curve as a whole. Flash Point is high as well. This is no problem but is either an indication of the presence of a heavier fluid (which is not supported by viscosity) or the onset of fluid oxidation (which is not supported by AN). More trending data is required to make a better evaluation of fluid condition. Please re-sample in 3 months and in the mean time check proper operation of the blanket gas system. (GCD) 90% Distillation Point is severely high.   |
| 02/19/20            | The fluid is in a good condition and suitable for further use. 90% GCD temperature is high and so is the distillation curve as a whole. Flash Point is high as well. This is no problem but is either an indication of the presence of a heavier fluid (which is not supported by viscosity) or the onset of fluid oxidation (which is not supported by AN). More trending data is required to make a better evaluation of fluid condition. Please re-sample in 3 months and in the mean time check proper operation of the blanket gas system. (GCD) 90% Distillation Point is abnormally high. |

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