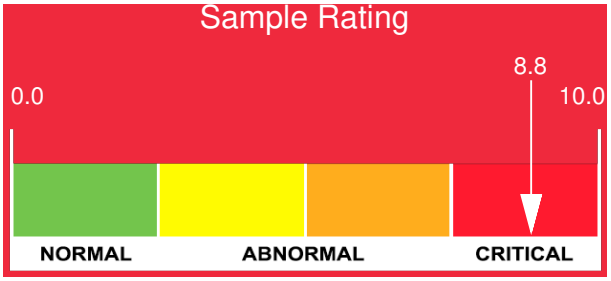
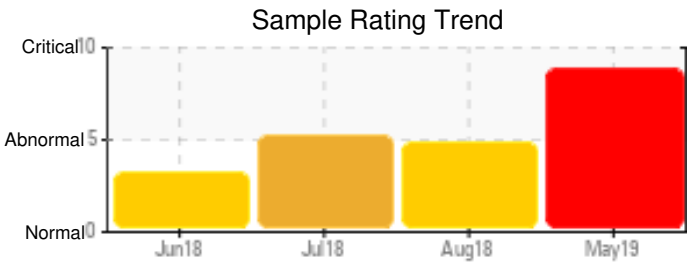




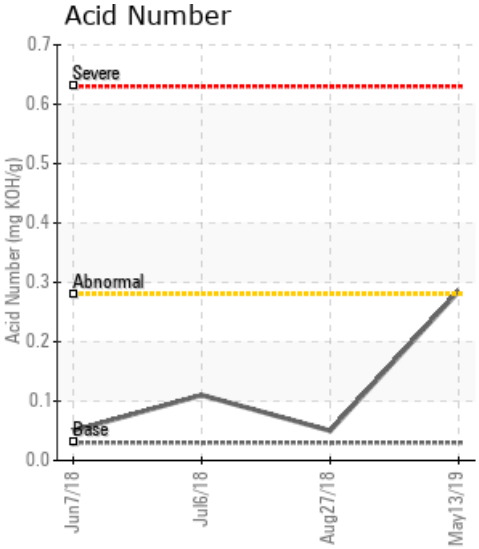
[CNRL / 13-26-67-5W6] STABILIZER #2

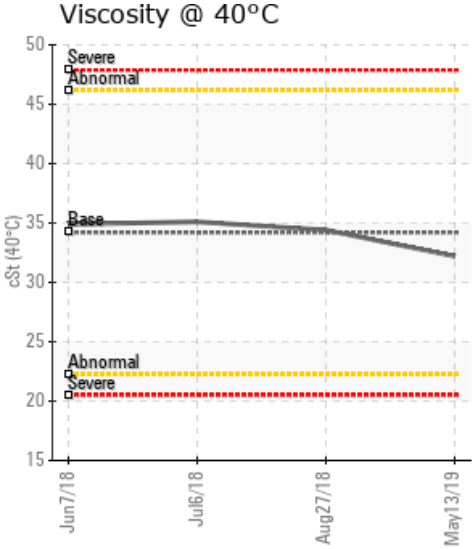
Customer: PTRHTF20197	System Information	Sample Information
CNRL GOLD CREEK 13-26-67-05W6 GRANDE PRAIRIE, AB Canada Attn: Joe Beamish Tel: (780)512-7015 E-Mail: joe.beamish@cnrl.com	System Volume: 15000 ltr Bulk Operating Temp: 428F / 220C Heating Source: Blanket: Fluid: PETRO CANADA PETRO-THERM Make: PETRO-TECH	Lab No: 02286216 Analyst: Clinton Buhler Sample Date: 05/13/19 Received Date: 05/21/19 Completed: 05/23/19

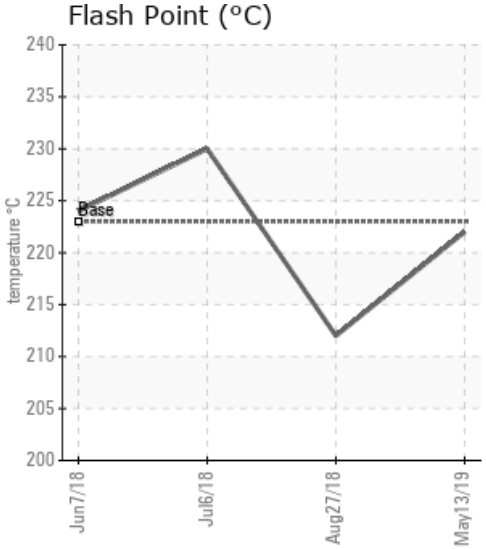
Recommendation: It is understood that there was a reboiler bundle failure, and the sample results indicate this as evidenced by excess amounts of water as well as the element sodium. The excess water can be a safety risk in the event of boil over.Acid Number has increased which can also be related to the water contamination. Increased acidity can lead to corrosion of metal surfaces.Water needs to be removed from system before heater is brought back to normal operating temperatures. Upon initial start-up, system needs to be safely vented to remove water via steam. Do not allow system to exceed 105°C during the venting of the steam. Vent system until steam has subsided while taking all necessary safety precautions. During venting, blanket gas cannot be active as this will impeded the steam from exiting the system. If blanket gas is required for proper pump head pressure, investigate other means of water removal. Please re-sample once water has been vented from system. Please ensure sample is taken from a hot, turbulent zone such as at the pump discharge, and only after a thorough purge of the valve and piping.

Comments: Water contamination levels are severely high. Water contamination levels are severely high.. ppm Water contamination levels are severely high. Acid Number (AN) is abnormally high. Sodium ppm levels are abnormally high. (GCD) 90% Distillation Point is abnormally high.

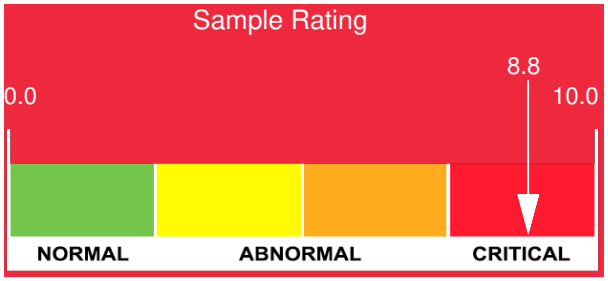
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
05/13/19	05/21/19	166w	150FT DOWNSTREAM	432 / 222	14959.5	32.2	0.285	0.303	719 / 382	813 / 434	930 / 499	0.88
08/27/18	08/30/18	1w	DISCHARGE OF PUMP	414 / 212	2156.2	34.4	0.05	0.492	727 / 386	816 / 435	919 / 493	0.00
07/06/18	07/10/18	3w	DISCHARGE CIRC PUMPS	446 / 230	2726.5	35.1	0.11	0.116	704 / 373	779 / 415	860 / 460	0.00
06/07/18	06/11/18	2w	POINT INLET	435 / 224	1753.6	34.9	0.050	0.093	698 / 370	781 / 416	899 / 482	0.00
Baseline Data				433 / 223		34.2	0.03		720 / 382	817 / 436	900 / 482	1.00

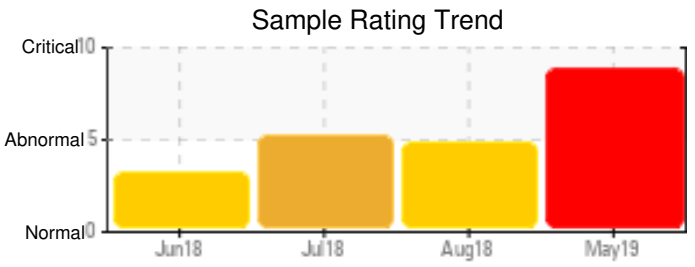






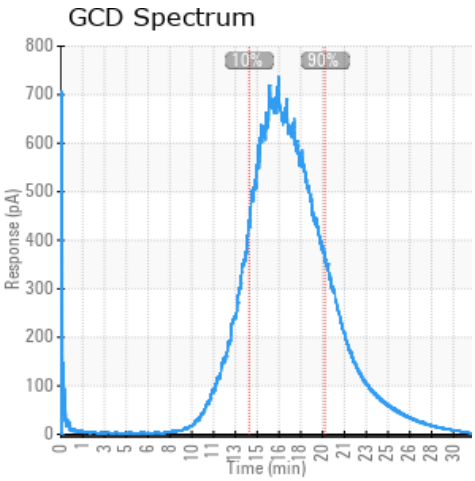
PETRO-CANADA LUBRICANTS

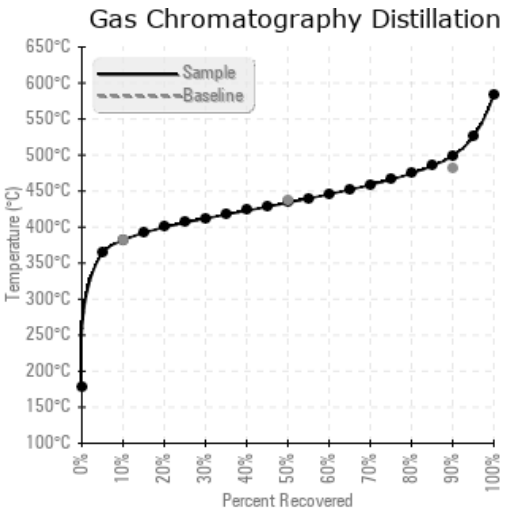


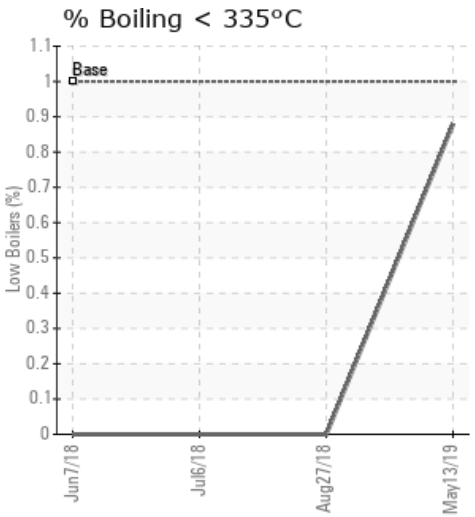


Sample Date	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorus	Zinc
05/13/19	0	0	0	0	0	0	0	0	0	0	0	25	1	0	0	0	0	0	0	0	2	0	0	0
08/27/18	6	0	0	0	0	0	0	0	0	0	0	19	2	0	0	0	0	0	0	1	5	0	2	0
07/06/18	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
06/07/18	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0	0
Baseline Data			0	0						0			0	0					0				0	

Elemental anaysis results (above) in parts per million (ppm). [10,000 ppm = 1.0%]







Historical Comments

08/27/18	Sample results indicate that there is excessive water in the system. It is understood that appropriate steps were taken to draw a representative sample (at pump discharge). 2,156ppm Water poses a safety risk of fluid boil over when the boiling point of the water is reached and also can contribute to oxidation of the fluid and corrosion if left in service. Water needs to be removed from system before heater is brought back to normal operating temperatures. Upon initial start-up, system needs to be safely vented to remove water via steam. Do not allow system to exceed 105°C during the venting of the steam. Vent system until steam has subsided while taking all necessary safety precautions. During venting, blanket gas cannot be active as this will impeded the steam from exiting the system. If blanket gas is required for proper pump head pressure, investigate other means of water removal. Pentane insoluble (solids) level is also abnormally high. It is understood that this fluid was replaced. Please investigate possible sources of continued water contamination. Please call Petro-Canada Technical Services for further support as required. Please re-sample once water has been removed. Please ensure a thorough purge of sample point before filling sample container. Water contamination levels are severely high. Water contamination levels are severely high.. ppm Water contamination levels are severely high. Pentane Insolubles levels are abnormally high. (GCD) 90% Distillation Point is marginally high.
07/06/18	Sample results indicate that there is excessive water in the system. Fluid lab re-tested water content and confirmed that there is 2,726 ppm water. This is nearly 1,000 ppm more water than initial sample drawn June 7, 2018. It is understood that appropriate steps were taken to draw a representative sample on July 6, 2018 (at pump discharge).2,726ppm Water poses a safety risk of fluid boil over when the boiling point of the water is reached and also can contribute to oxidation of the fluid and corrosion if left in service. Water needs to be removed from system before heater is brought back to normal operating temperatures.While system is down, this would be a good opportunity to drain any free water from low lying spots in the heat transfer system.Upon initial start-up, system needs to be safely vented to remove water via steam. Do not allow system to exceed 105°C during the venting of the steam. Vent system until steam has subsided while taking all necessary safety precautions. During venting, blanket gas cannot be active as this will impeded the steam from exiting the system. If blanket gas is required for proper pump head pressure, investigate other means of water removal.Please re-sample once system is safely back on-line under normal conditions (after water has been removed)Please call Petro-Canada Technical Services for further support as required Water contamination levels are severely high. Water contamination levels are severely high.. ppm Water contamination levels are severely high.
06/07/18	Heat transfer fluid is contaminated with water: 1753 ppm. This is considered excessive and poses a safety risk of fluid boil over when the boiling point of the water is reached.Consider vacuum dehydration of the fluid to remove the water. Water needs to be released from the fluid before system is brought to normal operating temperatures. Careful start-up is critical.All other parameters indicate the fluid is suitable for service.Re-sample in 6 months Water contamination levels are severely high. ppm Water contamination levels are severely high.