

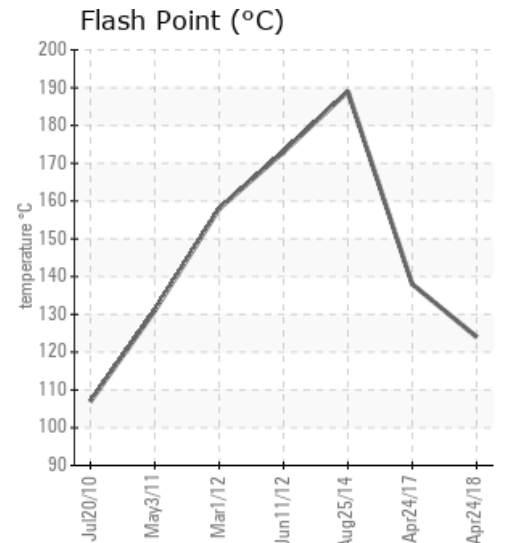
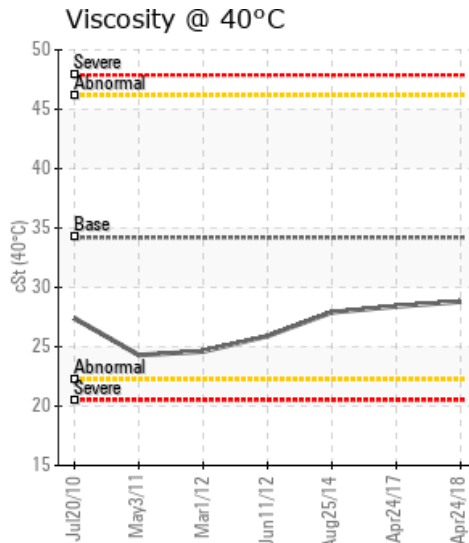
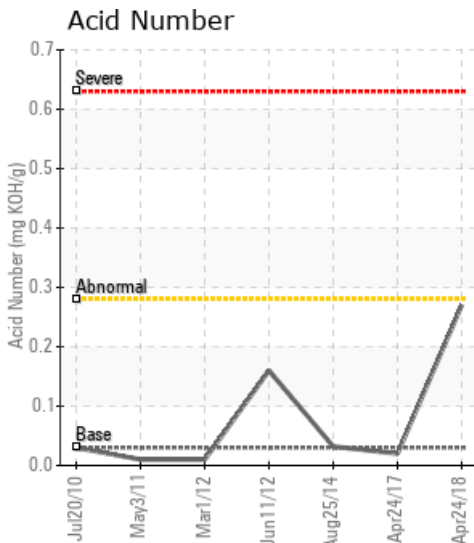
CNRL PUSKWA 3-3-72-26W5

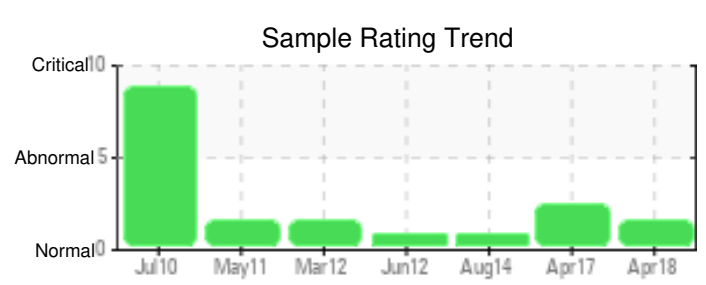
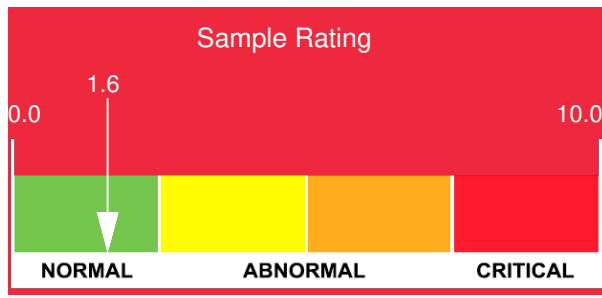
Customer: PTRHTF20051	System Information	Sample Information
CNRL 3-3-72-26W5 DEBOLT, AB T0H 1B0 Canada Attn: Trevor Sather Tel: (780)552-4206 E-Mail: trevor.sather@cnrl.com	System Volume: 3962.58 gal Bulk Operating Temp: 313F / 156C Heating Source: Blanket: Fluid: PETRO CANADA PETRO-THERM Make:	Lab No: 02213407 Analyst: Clinton Buhler Sample Date: 04/24/18 Received Date: 05/01/18 Completed: 05/04/18 To discuss this report contact Clinton Buhler at 780-516-9920

Recommendation: Sample results indicate thermal degradation is ongoing, shown by reduced viscosity, flash point and 10% GCD temperature and an increase in % boil off <335C (3.33). Immediate and thorough venting of expansion tank is required to vent off low boiling vapors. Turn off blanket gas during venting, but be sure to turn back on after. Ensure blanket gas pressure does not exceed 3 psi as this can negatively affect flash point and viscosity. Increase in AN indicates oxidation. Ensure blanket gas is operational. Re-sample in 12 months after thorough venting has been completed.

Comments: COC Flash Point is severely low.

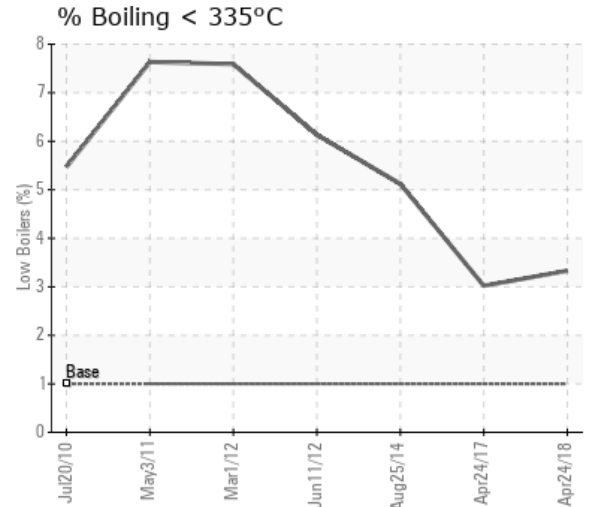
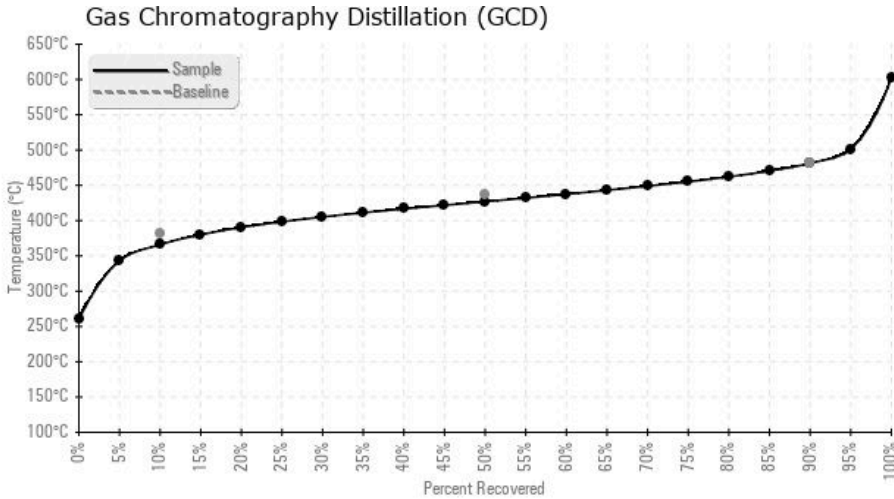
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
04/24/18	05/01/18	10y		255 / 124	6.0	28.8	0.27	0.027	691 / 366	800 / 427	899 / 481	3.33
04/24/17	05/01/17	9y	PUMPS	280 / 138	54.9	28.4	0.02	0.039	697 / 369	808 / 431	924 / 495	3.02
08/25/14	09/08/14	48000y	OIL PUMP DISCHARGE	372 / 189	48.1	27.9	0.032	0.089	679 / 360	802 / 428	903 / 484	5.12
06/11/12	06/12/12		ASTER PUMP	343 / 173	31	25.9	0.16	0.042	677 / 358	798 / 425	899 / 481	6.134
03/01/12	03/22/12			316 / 158	43	24.6	0.01	0.014	661 / 350	797 / 425	898 / 481	7.589
05/03/11	05/05/11			268 / 131	33	24.3	0.01	0.024	662 / 350	798 / 426	899 / 482	7.633
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	
04/24/18	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0
04/24/17	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0
08/25/14	4	0	0	0	0	0	0	1	0	0	0	6	0	0	0	0	0	0	1	0	1	0	1	0	0
06/11/12	13	0	0	1	0	0	1	7	0	0	1	3	4	0	0	0	0	0	1	0	7	0	0	0	0
03/01/12	7	0	0	0	3	0	0	0	0	0	1	1	0	0	0	0	0	0	2	0	0	0	5	0	0
05/03/11	8	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	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	
04/24/17	The fluid is undergoing thermal degradation. Indications of this are: Decrease of viscosity, low Flash Point, elevated low boiler vapor content (3% boil-off below 335 degrees C.) and decrease of 10% GCD temperature. At the same time 90% GCD temperature is slightly high which is an indication of oxidation taking place. It is recommended to vent-off the low boiler vapors to atmosphere in order to bring the Flash Point up to a more acceptable level. Please re-sample in 12 months time. COC Flash Point is severely low. (GCD) 90% Distillation Point is marginally high.
08/25/14	The fluid is in good condition considering a service life of more than 5 years. There are signs of thermal degradation (cracking). Viscosity has reduced, Flash Point is slightly low at 189 degrees C. The GCD 10% temperature is getting low at 359.6 degrees C. The thermal degradation of the fluid produces low boiler vapors. It is recommended to vent off the low boiler vapors to atmosphere. The fluid is suitable for further use. Please re-sample in 6 months time. COC Flash Point is marginally low.
06/11/12	Although the TAN is still very low, the sudden rise from 0 to 0.16 is something we should keep watching. The lower viscosity and flash point are due to what we assume is the use of natural gas to blanket the expansion tank. Please re-sample in about 6 months so we can monitor the TAN (oxidation) level of the oil.
03/01/12	Based on the Closed Cup flash point we have no reason to be concerned more than we were at the last sample. The system is probably blanketed with natural gas which infiltrates the hydrocarbon based heat transfer oil very easily, hence it carries a low flash point and a certain amount of low boilers.
05/03/11	

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