

# [KAKWA PLANT LSD / 16-7-63-5W6] 1350 SOLIDS

**Customer: PTRHTF20175**  
 QUADRA CHEMICALS  
 7802 98 STREET  
 CLAIRMONT, AB T0H 0W0 Canada  
 Attn: Quadra Samples  
 Tel:  
 E-Mail: quadra\_samples@quadra.ca

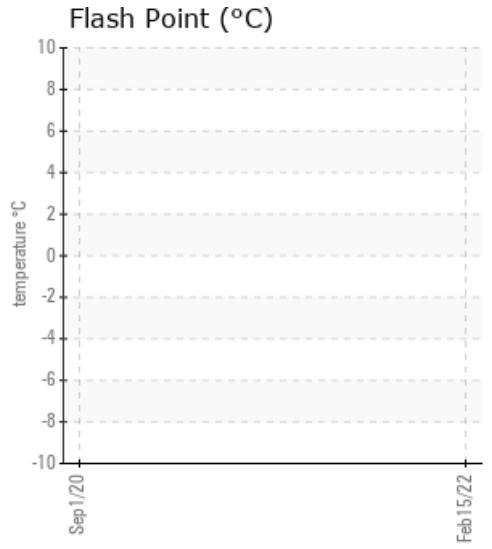
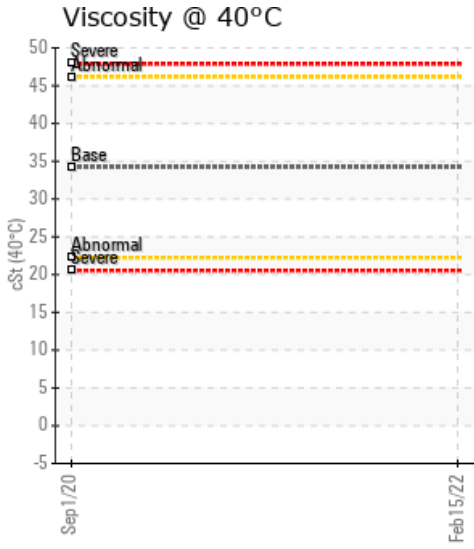
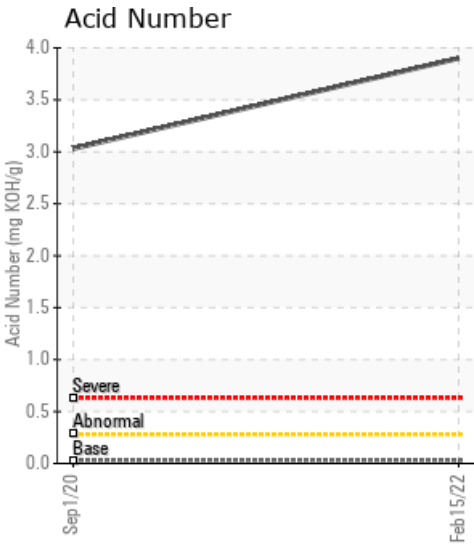
**System Information**  
 System Volume: 15000 ltr  
 Bulk Operating Temp: 365F / 185C  
 Heating Source:  
 Blanket:  
 Fluid: PETRO CANADA PETRO-THERM  
 Make:

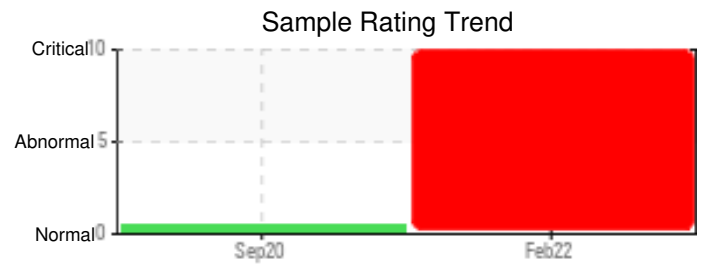
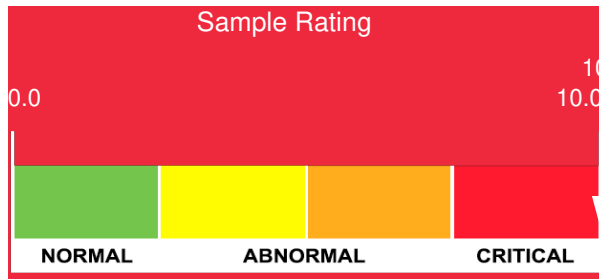
**Sample Information**  
 Lab No: 02474433  
 Analyst: Clinton Buhler  
 Sample Date: 02/15/22  
 Received Date: 02/28/22  
 Completed: 03/08/22  
 Clinton Buhler  
 Clinton.Buhler@hollyfrontier.com

Recommendation: \*Sludge sample taken at time of burner tube failure\* Please note that this is not a complete fluid analysis representative of the system fill but rather reflects the sample of sludge. Iron level is high and may be reflective of corrosion. Note the Acid Number of 3.9 which supports corrosion. AN may be due to localized oxidation or exposure to process fluid that becomes corrosive with heat. Please note Silicon, Sodium, Manganese, Magnesium, Calcium, Phosphorus and Zinc are foreign to the heating fluid in use. Calcium, Zinc and Phosphorus are typically found in engine oils. The bulk fluid analysis from Dec 12, 2021 indicated the fluid was in good condition. To understand the current bulk fluid condition, a fluid sample should be submitted. Please ensure that a very gentle start-up procedure is followed; do not increase fluid temperature more than 10°C/ hour and ensure system heat flux is not exceeding fluid capability. The addition of forced fluid circulation would be beneficial to fluid health. Please ensure expansion tank gas blanket is functional.

Comments: Iron ppm levels are severe. Aluminum ppm levels are abnormal. Silicon ppm levels are abnormally high. Acid Number (AN) is severely high. Zinc ppm levels are severely high. Calcium ppm levels are severely high. Manganese ppm levels are 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	%
02/15/22	02/28/22	0.5y	Surge Tank				3.90					
09/01/20	09/08/20	0.0y					3.03					
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
02/15/22	1930	0	0	40	0	0	0	0	0	0	30	40	0	0	0	0	30	0	10	20	750	0	210	170
09/01/20	4210	3	5	28	7	7	3	6	2	2	19	96	12	1	1	0	47	0	15	13	52	0		49
Baseline Data			0	0						0			0	0					0				0	

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

GCD Spectrum

Historical Comments	
09/01/20	This is a baseline read-out on the submitted sample. Diagnostician's Note: This was a sludge sample sent to us from a heat transfer fluid system. We performed digestion and ICP analysis and an Acid Number test. The results indicate that the sludge is comprised of insolubles, likely from past charges of heating transfer fluid, and rust that have accumulated over many years. {not applicable} {not applicable} {not applicable}

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