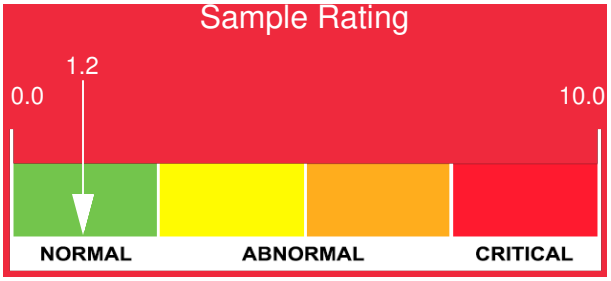
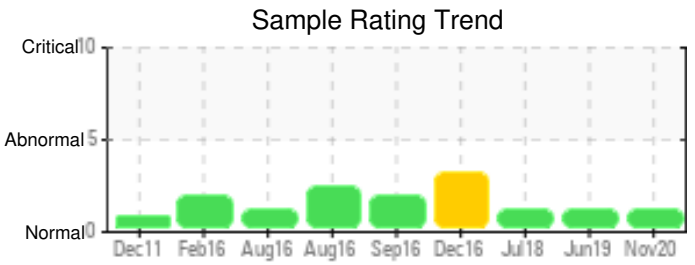




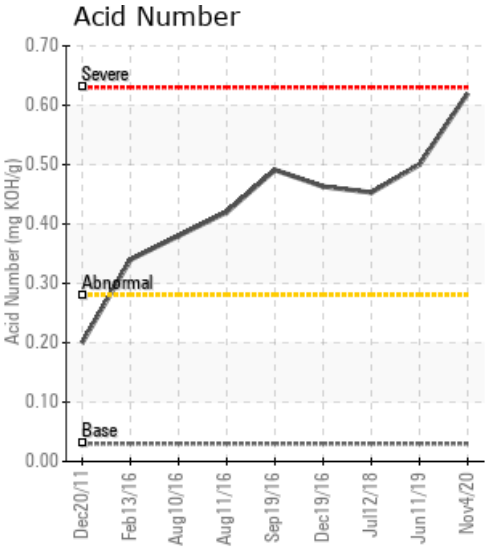
[BLUE RIDGE LUMBER WEST FRASER / LSD ENERGY PLANT 5W1/4-36-59-10-W5]

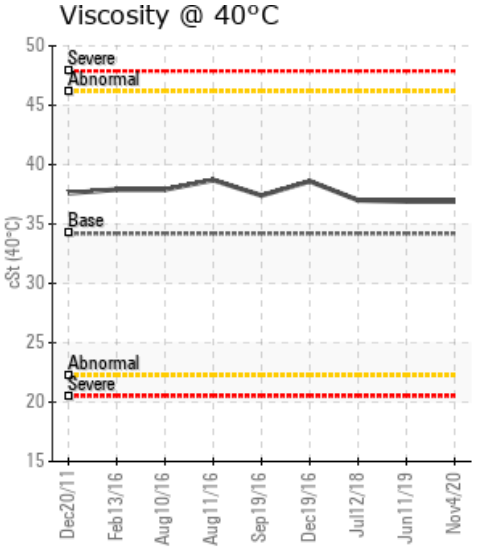
Customer: PTRHTF20093	System Information	Sample Information
BLUE RIDGE LUMBER INC PO BOX 87 PO BOX 87 BLUE RIDGE, AB T0E 0B0 CANADA Attn: Jason Pudlo Tel: E-Mail: jason.pudlo@westfraser.com	System Volume: 200000 ltr Bulk Operating Temp: 482F / 250C Heating Source: Blanket: Fluid: PETRO CANADA PETRO-THERM Make: CLASSEN WIESLOCH	Lab No: 02387522 Analyst: Gordon Susinski Sample Date: 11/04/20 Received Date: 11/16/20 Completed: 12/02/20 Gordon Susinski gord.susinski@hollyfrontier.com

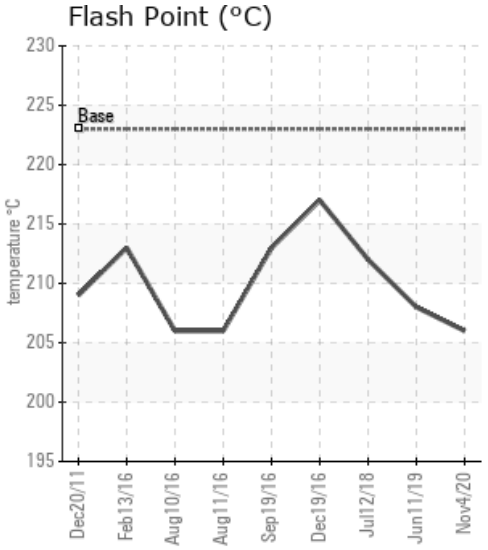
Recommendation: The acid number remains above normal. The acid number is a measure of the acidic compounds in the oil. Increases in the acid number are likely due to the formation of oxidation by products in the oil. This value will increase exponentially once the process begins. Tendencies are for sludge and deposits to increase and corrosion to occur if the fluid continues to be utilized beyond its limits.Although they are within normal limits, we would like to point out reducing trends in the flash point & increasing solids.

Comments:

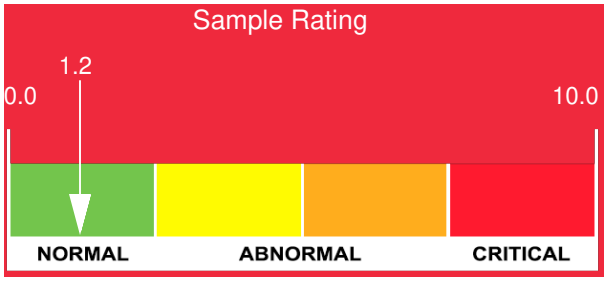
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
11/04/20	11/16/20	14.0y	SAMPLING STATION	403 / 206	80.4	36.9	0.62	0.137	716 / 380	813 / 434	920 / 493	1.99
06/11/19	06/18/19	0.0y		406 / 208	26.0	36.9	0.500	0.043	707 / 375	807 / 431	918 / 492	1.41
07/12/18	07/17/18	12.0y	OIL COLLECTION ROOT1	414 / 212	139.9	37.0	0.453	0.065	724 / 384	789 / 421	897 / 481	0.00
12/19/16	12/22/16	10.0y	SUCTION PUMP #5	423 / 217	20.2	38.6	0.463	0.100	714 / 379	820 / 438	939 / 504	1.47
09/19/16	09/23/16	10.0y	OIL PUMP #5 SUCTION	415 / 213	185.7	37.4	0.491	0.090	716 / 380	817 / 436	933 / 501	1.25
Baseline Data				433 / 223		34.2	0.03		720 / 382	817 / 436	900 / 482	1.00

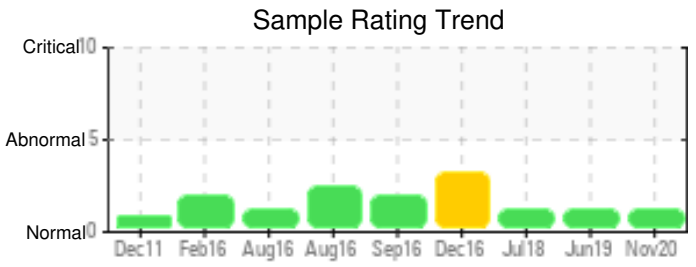






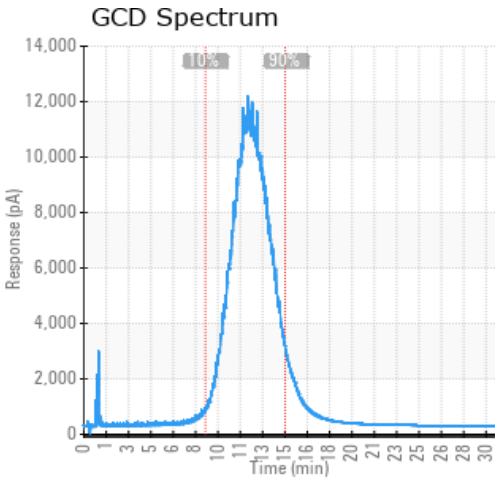
PETRO-CANADA LUBRICANTS

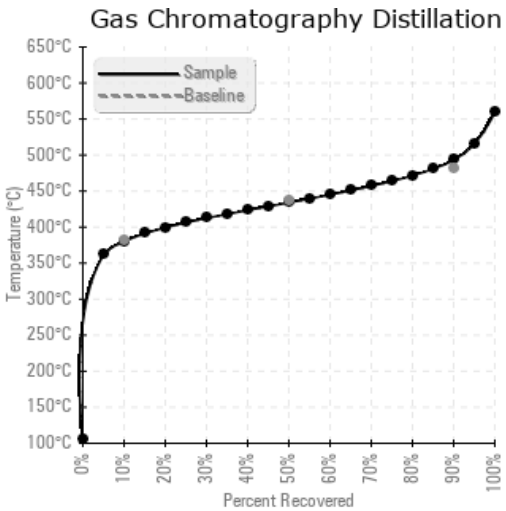


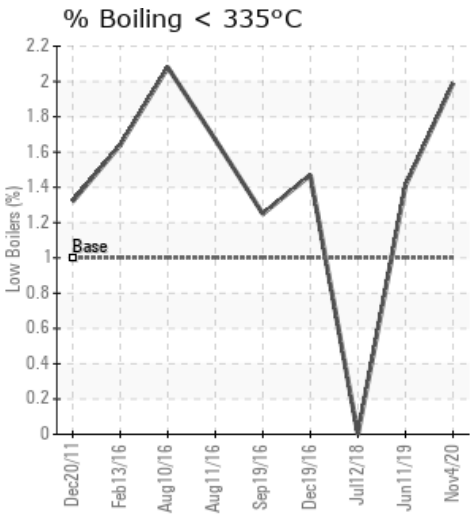


Sample Date	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorus	Zinc
11/04/20	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06/11/19	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07/12/18	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/19/16	12	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	6	0	0	23
09/19/16	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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

06/11/19	Based on the analysis results, it appears that the oil may have experienced acid number deterioration conditions. This may be due in part to the length of service on the oil (13 years indicated).The acid number is a measure of the acidic compounds in the oil. Increases in the acid number are likely due to the formation of oxidation by products in the oil. This value will increase exponentially once the process begins. Tendencies are for sludge and deposits to increase and corrosion to occur if the fluid continues to be utilized beyond its limits. None of the other oil degradation products are indicated. Acid Number (AN) is abnormally high.
07/12/18	Based on the analysis results, it appears that the oil may continue to experience oxidation. This may be due in part to the length of service on the oil (12 years indicated)The acid number continues to be above normal. The acid number, is a measure of the acidic compounds in the oil. Increases in the acid number are likely due to the formation of oxidation by products in the oil. This value will increase exponentially once the process begins. Tendencies are for sludge and deposits to increase and corrosion to occur if the fluid continues to be utilized beyond its limits. The oxidation level in the sample remains well above normal, however, it is remaining stable. Acid Number (AN) is abnormally high.
12/19/16	Based on the analysis results, it appears that the oil may have experienced some oxidation or possibly thermal cracking.The acid number increase is likely due to the formation of oxidation by products. Oxidation is a chemical reaction between oxygen and the components of the oil whereby the hydrocarbon in the oil turns into weak carboxylic acids and other carbon-oxygen containing species. The higher the temperature, the worse the oxidation becomes and it will feed off of itself becoming exponentially worse over time when the additives are depleted. In a closed heat transfer system, the most probable place for fluid oxidation to occur is in the expansion tank (without an inert gas blanket). In an open system, the fluid oxidizes rapidly at its operating temperature. Different oils vary considerably in their resistance to oxidation largely due to the base oil used and the antioxidant additives used in the oil. Also note increasing calcium and zinc levels. These elements at these levels are typically not associated with the product and are likely present as contaminants. (GCD) 90% Distillation Point is severely high. Acid Number (AN) is abnormally high.
09/19/16	Based on the analysis results, it appears that the oil may have experienced the following deteriorating conditions - Oxidation. This may be due in part to the length of service on the oil (10 of years indicated). Oxidation is a reaction of hydrocarbons in the oil with oxygen from air, forming various species including weak organic acids. Oxidation is accelerated by contaminants such as wear debris, dust, water, metals, and high temperatures. Changes in the fluid will be seen as discoloration, increased viscosity, formation of varnish, increase in acidity and finally the formation of heavy insoluble compounds. Depending on the volume of the system, the AN is above normal. The acid number is a measure of the acidic compounds in the oil. Increases in the acid number are likely due to the formation of oxidation by products in the oil. This value will increase exponentially once the process begins. Tendencies are for sludge and deposits to increase and corrosion to occur if the fluid continues to be utilized beyond its limits. The final boiling point (FBP) is above normal. High boilers are normally associated with carbonaceous deposits in the system that can foul heat exchanger surfaces or plug small lines and can be the result of the oxidation process and the increase in the AN. Note the sulphur increase. Although below limits, the increase is significant. Note water increase. Although within limits, the increase is note worthy. Acid Number (AN) is abnormally high. (GCD) 90% Distillation Point is abnormally high.