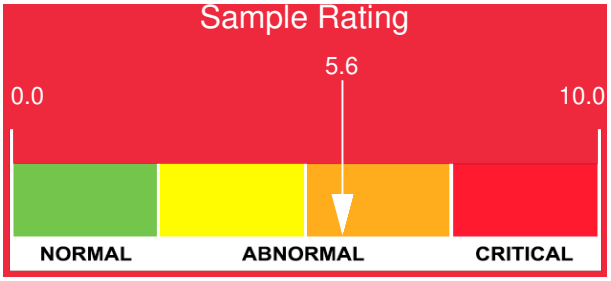
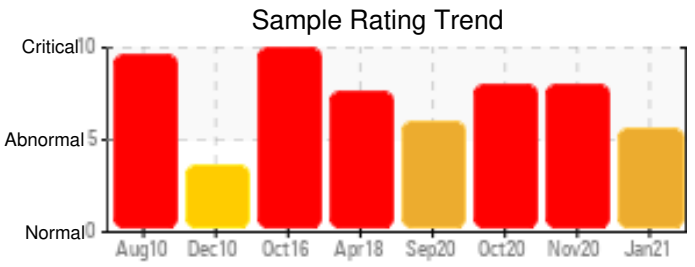




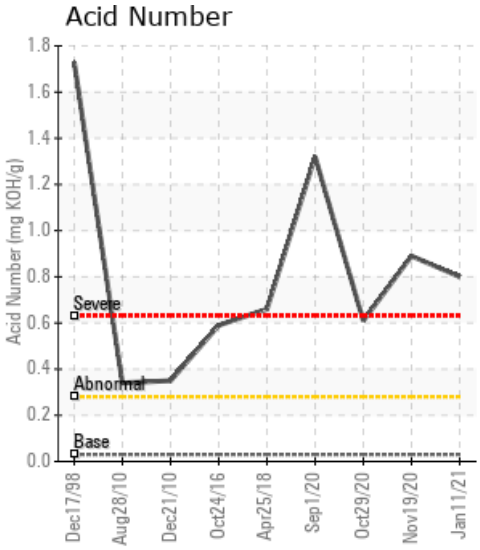
KONUS #1, 2 & 3

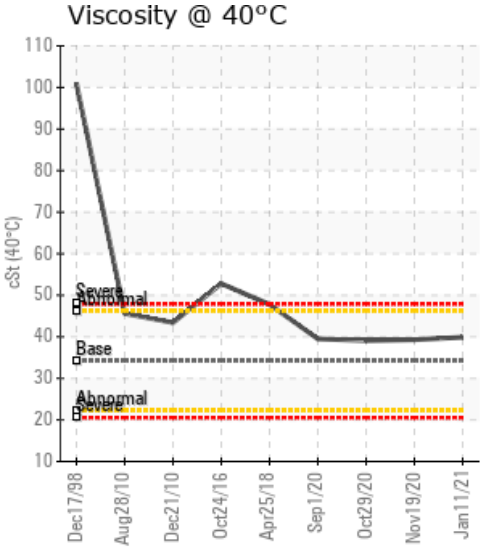
Customer: PTRHTF20179	System Information	Sample Information
Canfor - Polar 36654 Hart Highway General Delivery Bear Lake, BC V0J 3G0 Canada Attn: Kevin Meise Tel: (250)552-5028 E-Mail: kevin.meise@canfor.com	System Volume: 170000 ltr Bulk Operating Temp: 446F / 230C Heating Source: Blanket: Fluid: PETRO CANADA PETRO-THERM Make: KONUS	Lab No: 02398419 Analyst: Ray Rolston Sample Date: 01/11/21 Received Date: 01/19/21 Completed: 01/20/21 Ray Rolston Ray.Rolston@petrocanadalsp.com

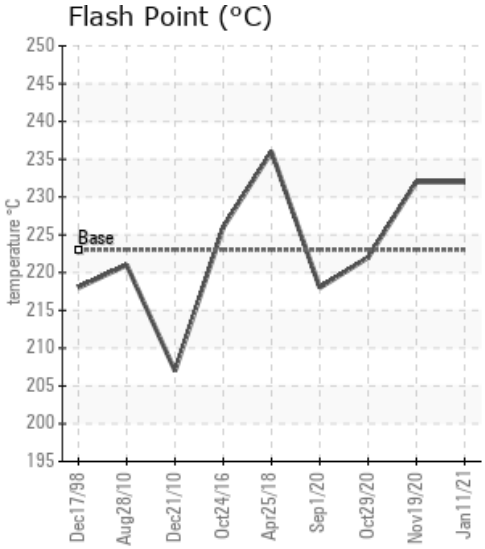
Recommendation: This January 11, 2021 sample appears to be similar to the last sample dated November 19, 2020. The Acid Number (AN) is 0.80 mg KOH/g which is essentially unchanged since the last sample which was 0.89 mg KOH/g. The Pentane Insolubles (solids) content has increased from 1.85% on the previous sample to 2.46%. Both test results are beyond condemning guidelines. All other test results are normal and typical for the age of this fluid.

Comments: Pentane Insolubles levels are severely high. Acid Number (AN) is severely high. (GCD) 90% Distillation Point is marginally 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	%
01/11/21	01/19/21	0y		450 / 232	83.3	39.9	0.80	2.46	728 / 387	815 / 435	919 / 493	0.48
11/19/20	11/26/20	0y	Drain	450 / 232	238.0	39.3	0.89	1.85	708 / 375	793 / 423	911 / 489	2.33
10/29/20	11/05/20	0y	Pump Gauge	432 / 222	341.9	39.1	0.61	1.92	728 / 387	816 / 435	920 / 493	0.70
09/01/20	09/10/20	0y	Pump 1	424 / 218	107.8	39.5	1.32	2.49	727 / 386	815 / 435	919 / 493	0.85
04/25/18	05/02/18	0y		457 / 236	315.9	47.8	0.66	4.88	695 / 368	800 / 427	915 / 490	3.24
Baseline Data				433 / 223		34.2	0.03		720 / 382	817 / 436	900 / 482	1.00







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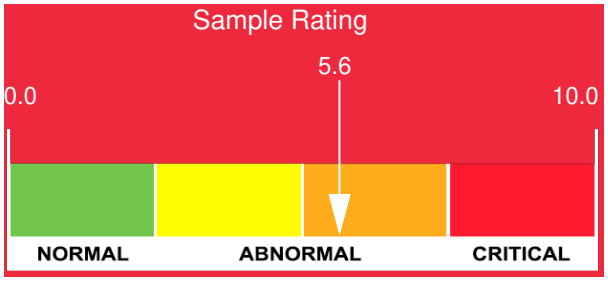
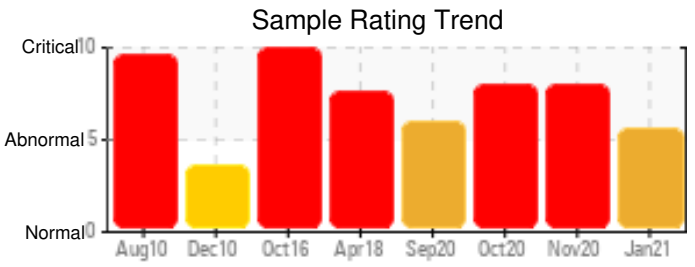
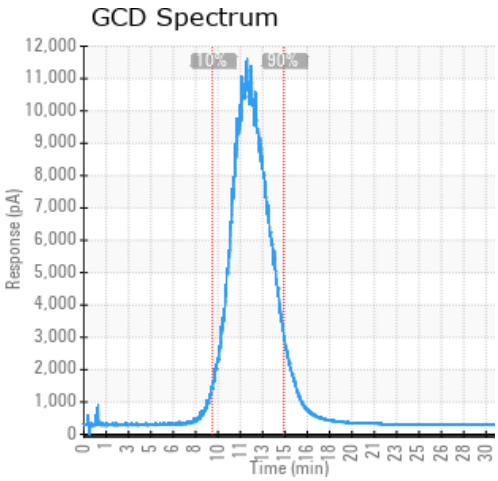
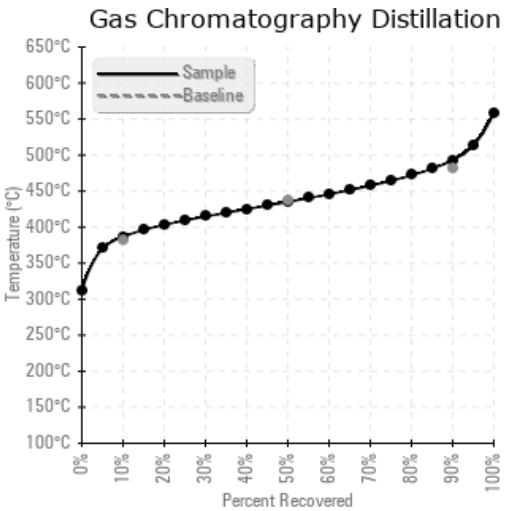


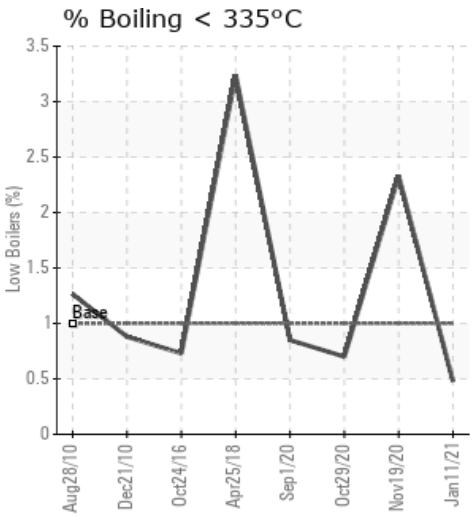


Sample Date	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorus	Zinc
01/11/21	69	0	0	0	0	0	0	0	0	0	2	13	0	0	0	0	2	0	0	0	24	0	3	6
11/19/20	63	0	0	0	0	0	0	0	0	0	1	12	0	0	0	0	1	0	0	0	22	0	2	3
10/29/20	62	0	0	0	0	0	0	0	0	0	1	12	0	0	0	0	2	0	0	0	22	0	2	4
09/01/20	62	0	0	0	0	0	0	0	0	0	0	13	0	0	0	0	2	0	2	0	25	0	2	6
04/25/18	57	0	0	0	0	0	0	0	0	0	1	33	0	0	0	0	1	0	0	0	65	0	6	9
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

11/19/20	This Nov 19, 2020 sample looks very similar to one submitted on Oct 29, 2020. The Acid Number (AN) test was run in triplicate to verify consistency; the results were 0.88, 0.89 and 0.90 mg KOH/g. This is a 45% increase since the previous sample of 0.61 mg KOH/g which indicates that the fluid`s condition is continuing to deteriorate. Pentane Insolubles levels are severely high. Acid Number (AN) is severely high.
10/29/20	Acid Number value on latest sample is 0.61 mg KOH/g which is more in line with previous trend, still above our condemning guideline. Note that Sep 1 2020 AN value reported as 1.32 was re-tested at 0.69 mg KOH/g (see lab comment below). Latest sample AN testing was run in triplicate to enhance accuracy. Pentane Insolubles (solids) value of 1.92 continues to be above the condemning limit (see lab comment below). These factors affirm Petro-Canada's position that the heat transfer system should be cleaned, flushed and refilled with fresh fluid when conditions are favourable. Additional sampling over the coming months is recommended, but sweetening the system should not be required at this point. Pentane Insolubles levels are severely high (results 1.89 and 1.94 averaged to 1.92). Acid Number (AN) is severely high. Acid Number result from 09/01/2020 was retested and result was more in-line with trend (0.69 mg KOH/g). (GCD) 90% Distillation Point is marginally high.
09/01/20	Sep 1, 2020 sample has 62 ppm iron wear; last 2 samples were 57 ppm. This may be a result of pump wear or corrosion. Initial Boiling Point of 288 deg C is low suggesting that some thermal cracking has occurred, though balance of distillation range is okay. Acid Number (AN) has doubled from 0.66 in Apr 2018 to 1.32 mgKOH/g which is beyond our condemning guideline of 0.6. Pentane Insolubles (solids) value of 2.49% also exceeds our condemning guideline of 0.5%.Based on the high AN and solids content, Petro-Canada recommends that the system be drained, flushed, cleaned and recharged with fresh fluid. Pentane Insolubles levels are severely high. Acid Number (AN) is severely high. Calcium ppm levels are abnormally high. (GCD) 90% Distillation Point is marginally high.
04/25/18	Iron wear has remained at 57 ppm, while other wear metals are at low levels. The presence of additive metals sodium and calcium are unexpected, but their concentration has dropped since the last sample in October 2016. The oil's viscosity and Gas Chromatography Distillation (GCD) results have also improved since the last sample.The Total Acid Number (TAN) has increased to 0.66 mg KOH/g, above the condemning limit of 0.60, and Pentane Insolubles value of 4.88 (previously 5.99) suggests that the oil has oxidized and a significant volume of sediment is present.Petro-Canada Lubricants recommends that the Petro-Therm heat transfer fluid be drained, flushed and replaced as soon as practical. Pentane Insolubles levels are severely high. Acid Number (AN) is severely high. Calcium ppm levels are severely high. Sodium ppm levels are abnormally high. Visc @ 40°C is abnormally high.

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