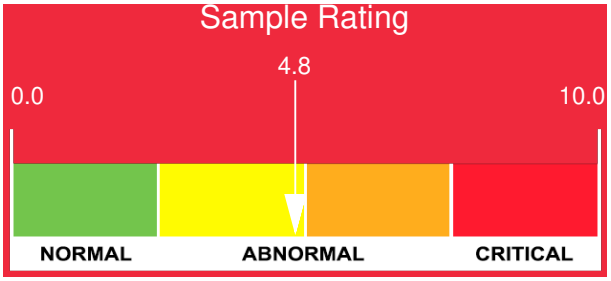
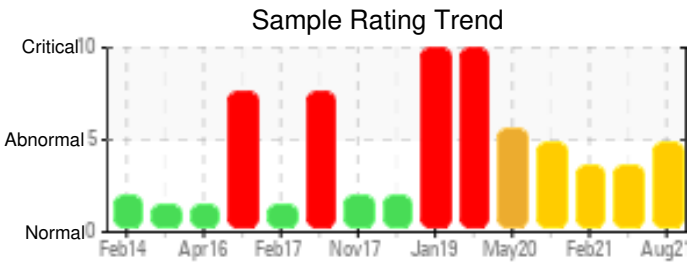




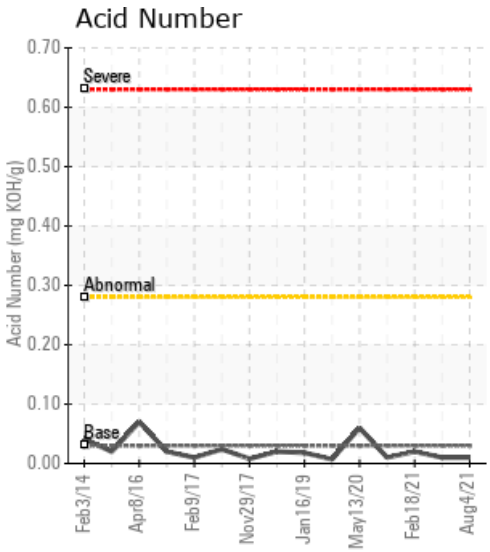
PM #1 STACK HOT OIL SYSTEM

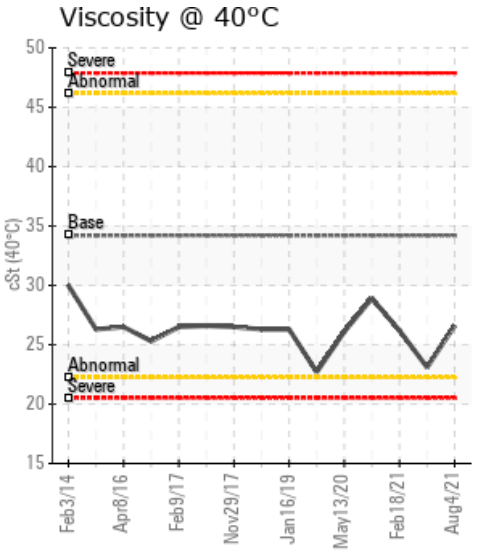
Customer: PTRHTF30073	System Information	Sample Information
IRVING PAPER LTD 435 BAYSIDE DRIVE SAINT JOHN, NB E2L 4K9 Canada Attn: Anthony Bass Tel: (506)650-8435 E-Mail: bass.anthony@irvingpaper.com	System Volume: 3500 ltr Bulk Operating Temp: 536F / 280C Heating Source: Blanket: Fluid: PETRO CANADA PETRO-THERM Make: METSO	Lab No: 02437747 Analyst: Pierre Castagne Sample Date: 08/04/21 Received Date: 08/10/21 Completed: 08/31/21 Pierre Castagne pierre.castagne@hollyfrontier.com

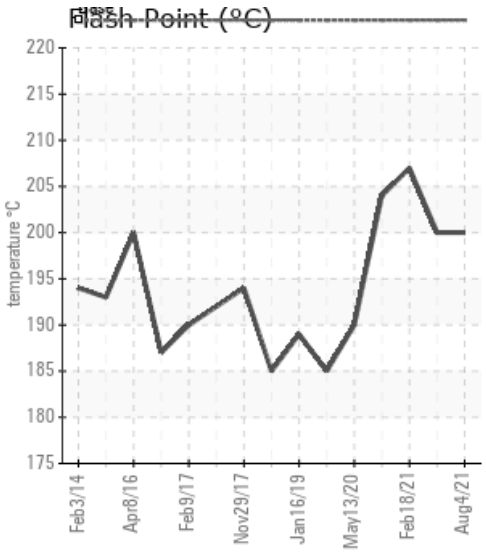
Recommendation: Recommendation: No Iron Presence. Sulphur content still present at 226 ppm. COC Flash point at 200°C is OK. Pentane Insoluble are under the limit of 0.30. GCD Distillation Point at 10% is abnormally low 341.9/382 = +10% difference. GCD Distillation Point at 50% are severely low 382.8/436 = +12%. GCD Distillation point are abnormally low 462.6/482 = +4% difference. Heat transfer fluid viscosity is ISO VG 22, it should be an ISO VG 32.According to WearCheck there is approximately 25% of the previous oil in the heat transfer system.The Heat Transfer Fluid is heavily cracked (low boiler presence level is high, High boilers are present) the viscosity of the HTF is lower than it should be. I recommend cleaning and flushing of the heat transfer system and replacing the fluid with fresh Petro-Therm.

Comments: (GCD) 50% Distillation Point is severely low. (GCD) 90% Distillation Point is severely low. (GCD) 10% Distillation Point is abnormally low.

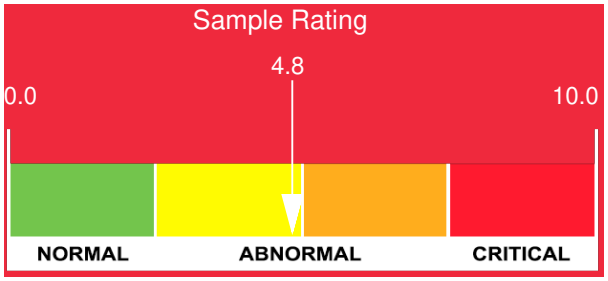
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
08/04/21	08/10/21	8.0y	system was sweetened	392 / 200	65.3	26.6	0.01	0.026	647 / 342	721 / 383	863 / 462	4.96
08/04/21	08/10/21	8.0y	manifold from sys.	392 / 200	64.6	23.1	0.01	0.029	648 / 342	718 / 381	865 / 463	4.96
02/18/21	02/23/21	8.0y	Manifold from sys.	405 / 207	0.6	26.2	0.02	0.041	647 / 342	724 / 385	870 / 466	5.01
10/08/20	10/14/20	7.0y	MANIFOLD FROM SYSTEM	399 / 204	38.8	28.9	0.01	0.025	648 / 342	680 / 360	862 / 461	5.88
05/13/20	05/20/20	7.0y	MANIFOLD	374 / 190	31.1	26.1	0.06	0.117	646 / 341	677 / 358	845 / 452	6.07
Baseline Data				433 / 223		34.2	0.03		720 / 382	817 / 436	900 / 482	1.00

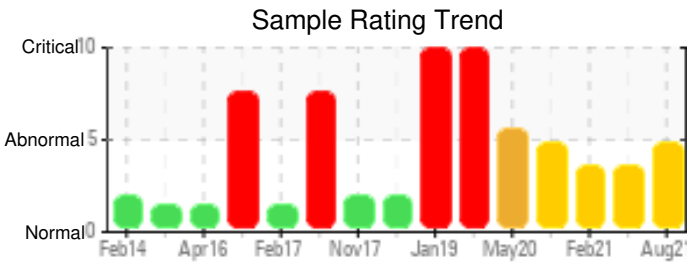






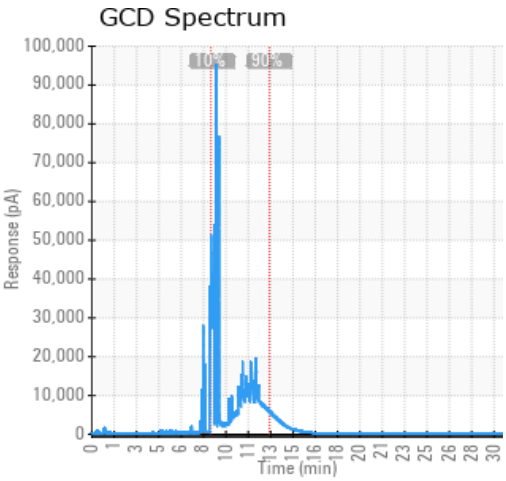
PETRO-CANADA LUBRICANTS

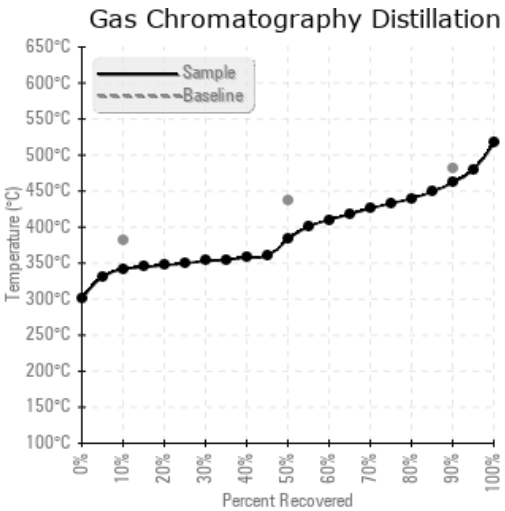


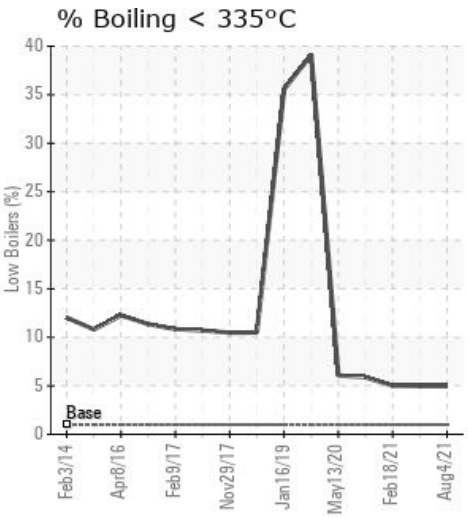


Sample Date	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorus	Zinc
08/04/21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08/04/21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02/18/21	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
10/08/20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05/13/20	0	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

08/04/21	Recommendation: No Iron Presence. Sulphur content still present at 215 ppm. COC Flash point at 207°C is OK. Pentane Insoluble are under the limit of 0.30. GCD Distillation Point at 10% is abnormally low 342.0/382 = +10% difference. GCD Distillation Point at 50% are severely low 381.2/436 = +13%. GCD Distillation point are abnormally low 462.6/482 = +4% difference. The Heat Transfer Fluid is heavily cracked (low boiler presence level is high, High boilers are present). I recommend cleaning and flushing of the heat transfer system and replacing the fluid with fresh Petro-Therm or Calflo AF. (GCD) 50% Distillation Point is severely low. (GCD) 90% Distillation Point is abnormally low. (GCD) 10% Distillation Point is marginally low.
02/18/21	no presence of iron. The Sulphur contain increased to 285 to 630. have you use cleaner or add another product in the system? COC Flash to 207 C Point is correct. The Pentane insoluble stay in limit under 0.30. the (GCD) 10% Distillation Point is abnormally low 341.7 /382 C = +10% difference. the GCD) 50% Distillation Point is severely low 384.5/436 C = +12% difference.the (GCD) 90% Distillation Point is abnormally low 465.6/482 C = +3.5% difference. Graphic 2/18/2021, heavily craking low boiler presence and level is high. High boilers are present, the Heat Transfer oil look to be heavily cracked. the graphic is not good i recommand to ventilate to remove cracked low boiler, remove 20-25% of the to remove cracked high boilers. refresh the old HTF with new heat transfer oil. have you only one product in the system? or you have a mixture of many products (GCD) 50% Distillation Point is severely low. (GCD) 90% Distillation Point is abnormally low. (GCD) 10% Distillation Point is abnormally low.
10/08/20	(GCD) 50% Distillation Point is severely low 359.9/436 C = +17.4% difference.(GCD) 90% Distillation Point is very low 461.3/482 C = +4.3% difference. (GCD) 10% Distillation Point is abnormally low 342 /382 C = +10% difference. COC Flash to 204 C Point is marginal. no presence of iron. Pentane insolubles stay in limit. Graphic 10/8/2020, heavily craking low boiler presence and level is high. High boilers are present, the Heat Transfer oil look to be heavily cracked.i recommand to ventilate to remove cracked low boiler, remove 20-25% of the to remove cracked high boilers. And refresh with new heat transfer oil. (GCD) 50% Distillation Point is severely low. (GCD) 90% Distillation Point is severely low. (GCD) 10% Distillation Point is marginally low.
05/13/20	(GCD) 50% Distillation Point is severely low. (GCD) 90% Distillation Point is severely low. (GCD) 10% Distillation Point is abnormally low. COC Flash Point is marginally low. no presence of iron. Pentane insolubles increase but stay in limit. Graphic 5/13/2020, low boiler are present and level is high, large boilers are present and level is high, the Heat Transfer oil look to be heavily cracked.i recommand to change it, restart with a new heat transfer oil. flush, clean with cleaner, rinse and restart with a new heat transfer oil. (GCD) 50% Distillation Point is severely low. (GCD) 90% Distillation Point is severely low. (GCD) 10% Distillation Point is abnormally low. COC Flash Point is marginally low.