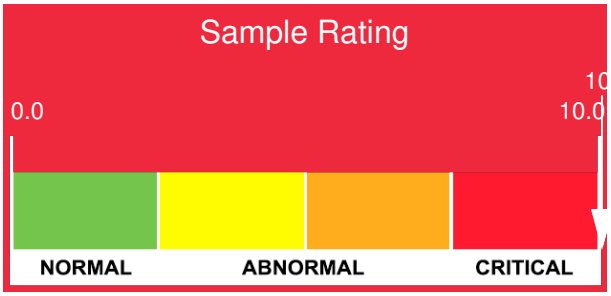
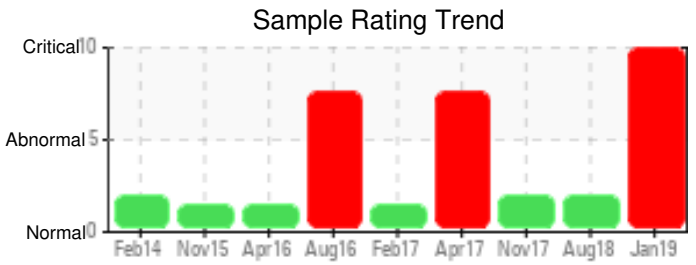
PETRO-CANADA LUBRICANTS





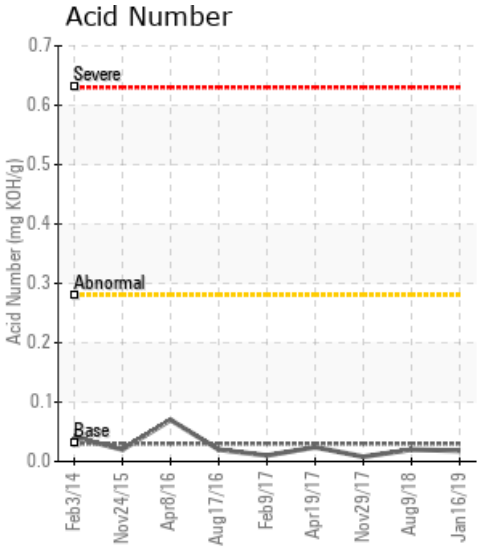
PM #1 STACK HOT OIL SYSTEM

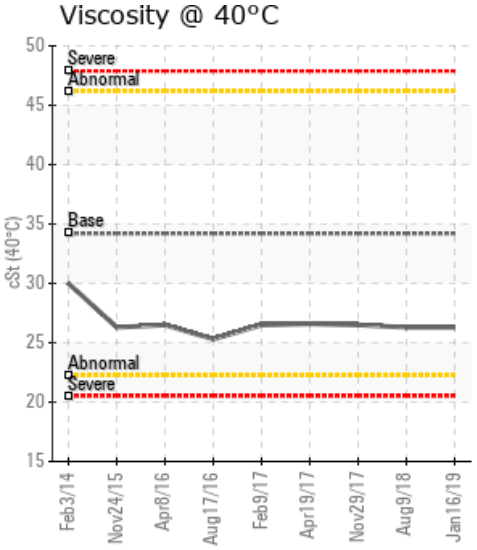
Customer: PTRHTF30073	System Information	Sample Information
IRVING PAPER LTD 435 BAYSIDE DRIVE SAINT JOHN, NB E2L 4K9 Canada Attn: Terry Tomney Tel: (506)650-8435 E-Mail: tomney.terry@irvingpaper.com	System Volume: 3500 ltr Bulk Operating Temp: 536F / 280C Heating Source: Blanket: Fluid: PETRO CANADA PETRO-THERM Make: METSO	Lab No: 02263828 Analyst: Claude Bureau Sample Date: 01/16/19 Received Date: 01/22/19 Completed: 02/28/19

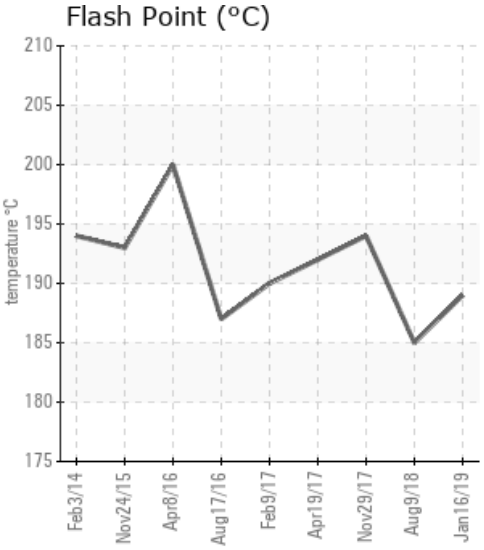
Recommendation: The (GCD) % < 335°C is extremely high at 35.56%. COC Flash Point is marginally low at 189C. There is a small presence of water (18.1ppm). Their was an increase in the insoluble to pentane compared to the previous oil analysis. As reported before, this system previously had Therminol 66 and is still present in the system which has affected some of the distillation results. Compared to the previous samples, this oil seems to have generated light ends since the last oil analysis. All indicate the fluid is undergoing thermal cracking. The system should be vented and I would suggest that another sample be obtained in 3 months to monitor the condition of this oil. All distillation variances comes from the presence of residual Therminol 66 in the system. The COC Flash Point is marginally low but not alarming. A complete drain of the load is required to eliminate residual Therminol 66 affects.

Comments: No wear metals detected. Small presence of water (18.1ppm). Insoluble to pentane at 0.028% (GCD) % < 335°C is severely high. (GCD) 10% Distillation Point is severely low. (GCD) 50% Distillation Point is severely low. (GCD) 90% Distillation Point is severely low. COC Flash Point is marginally 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	%
01/16/19	01/22/19	0y		372 / 189	18.1	26.3	0.018	0.028	613 / 323	645 / 340	812 / 434	35.56
08/09/18	08/15/18	5y	MANIFOLD FROM SYS	365 / 185	49.7	26.3	0.020	0.009	634 / 334	662 / 350	830 / 443	10.49
11/29/17	12/05/17	584y		381 / 194	56.4	26.5	0.008	0.035	634 / 334	667 / 353	869 / 465	10.47
04/19/17	04/21/17	4y	MANIFOLD FROM SYSTEM	378 / 192	45.2	26.6	0.024	0.071	633 / 334	668 / 354	831 / 444	10.70
02/09/17	02/16/17	4y	MANIFOLD FROM SYSTEM	374 / 190	40.4	26.5	0.01	0.061	633 / 334	665 / 352	838 / 448	10.84
08/17/16	08/22/16	3y	MANIFOLD FROM SYSTEM	369 / 187	74.4	25.3	0.02	0.043	632 / 334	663 / 350	816 / 435	11.36
Baseline Data				433 / 223		34.2	0.03		720 / 382	817 / 436	900 / 482	1.00







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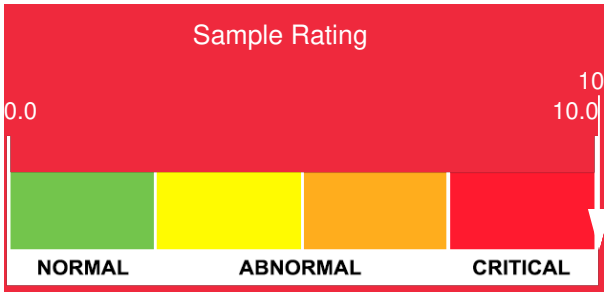
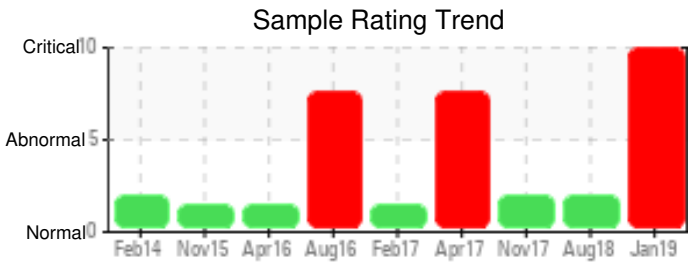
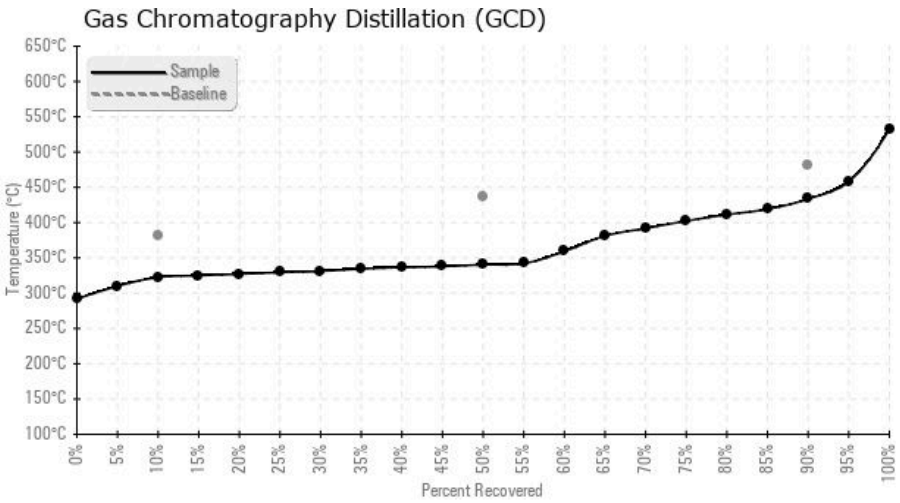
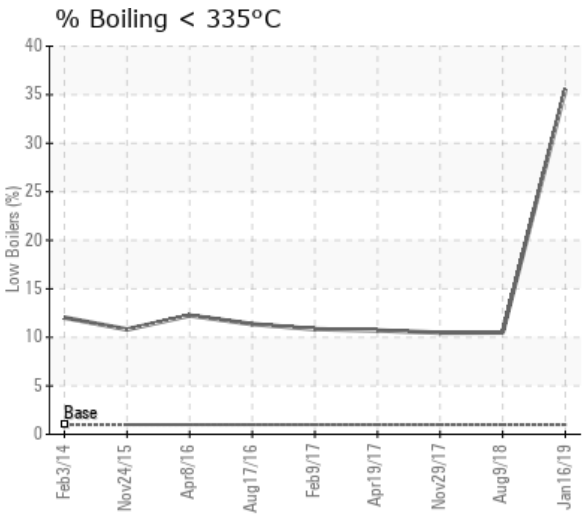




Sample Date	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorus	Zinc
01/16/19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08/09/18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/29/17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04/19/17	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
02/09/17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08/17/16	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

08/09/18	Small amount of water detected. All distillation variances comes from the presence of residual Therminol 66 in the system. A complete drain of the load is required to eliminate residual Therminol 66 affects. The COC Flash Point is marginally low but not alarming. This results is clearly a sign of a presence of light ends in the oil. The oil must be vented in order to remove these light ends. As reported before, this system previously had Therminol 66 and is still present in the system, which has affected some of the distillation results. Compared to the previous samples, this oil is in good condition and suitable for further service. In order to follow the venting process please submit another sample after the venting cycle to re-evaluate the condition of the oil.No wear metals detected. Small amount of water detected at 49.7PPM. (GCD) 50% Distillation Point is severely low. (GCD) 90% Distillation Point is severely low. (GCD) 10% Distillation Point is abnormally low. (GCD) % < 335°C is marginally high. COC Flash Point is marginally low (185°C). All distillation variances comes from the presence of residual Therminol 66 in the system.
11/29/17	As reported before, this system previously had Therminol 66 and is still present in the system which has affected some of the distillation results. Compared to the previous samples, this oil is in good condition and suitable for further service. I would suggest that another sample be obtained in 6-9 months to monitor the condition of this oil. All distillation variances comes from the presence of residual Therminol 66 in the system. The COC Flash Point is marginally low but not alarming. A complete drain of the load is required to eliminate residual Therminol 66 affects.Nothing to report concerning wear The heat transfer system seems to still contain a certain amount of Therminol 66 HTF which affects the GCD (gas chromatography distillation) results. (GCD) 50% Distillation Point is lower than typical. (GCD) 90% Distillation Point is severely lower than typical. (GCD) 10% Distillation Point is lower than typical. (GCD) % < 335°C is high than typical. COC Flash Point is marginally low.
04/19/17	As reported before, this system previously had Therminol 66 and is still present in the system which has affected some of the distillation results. Compared to the previous samples, this oil is in good condition and suitable for further service. I would suggest that another sample be obtained in 6-9 months to monitor the condition of this oil. GCD 10% Distillation Point is abnormally low, GCD 50% Distillation Point is severely low. GCD 90% Distillation Point is severely low. GCD % < 335°C is abnormally high. . COC Flash Point is marginally low. All distillation variances come from presence of residual Therminol 66 in the system. A complete drain of the load is required to eliminate residual Therminol 66. If Therminol 66 does not affect the performance of the heat transfer then no drain is required. (GCD) 50% Distillation Point is severely low. (GCD) 90% Distillation Point is severely low. (GCD) 10% Distillation Point is abnormally low. (GCD) % < 335°C is marginally high. COC Flash Point is marginally low.
02/09/17	This system previously had Therminol 66 and is still present in the system which has affected some the various GCD distillation results. This HTF mixture has not changed much since last samples. All other parameters are normal. The oïl is in good condition and suitable for further service. We recommend a new sample be taken in 6 months to monitor condition. (GCD) 50% Distillation Point is severely low. (GCD) 90% Distillation Point is severely low. (GCD) 10% Distillation Point is abnormally low. (GCD) % < 335°C is marginally high. COC Flash Point is marginally low.
08/17/16	This system previously had Therminol 66 and is still present in the system which has affected some the distillation results. Compared to the previous samples, this oil is in good condition and suitable for further service. I would suggest that another sample be obtained in at the beginning of February to monitor the condition of this oil. (GCD) 50% Distillation Point is severely low. (GCD) 90% Distillation Point is severely low. (GCD) % < 335°C is abnormally high. (GCD) 10% Distillation Point is abnormally low. COC Flash Point is marginally low.