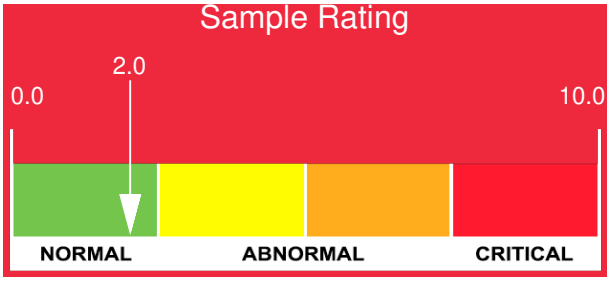
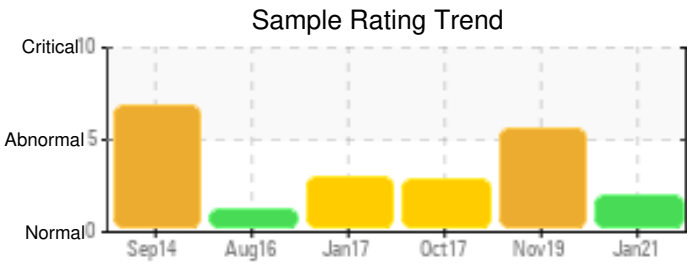




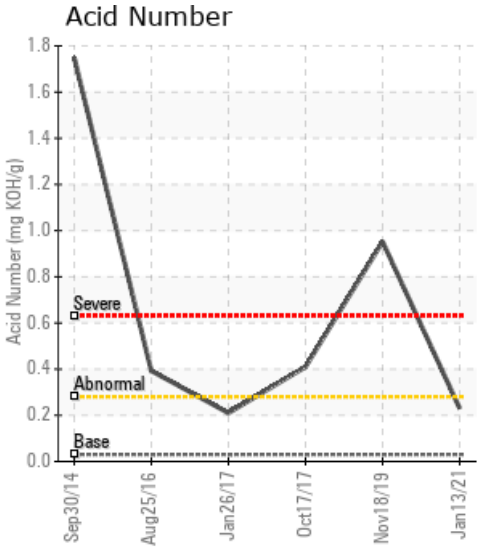
[MOOSEJAW REFINERY] HEATTRANSFER- SUCTION PIPING

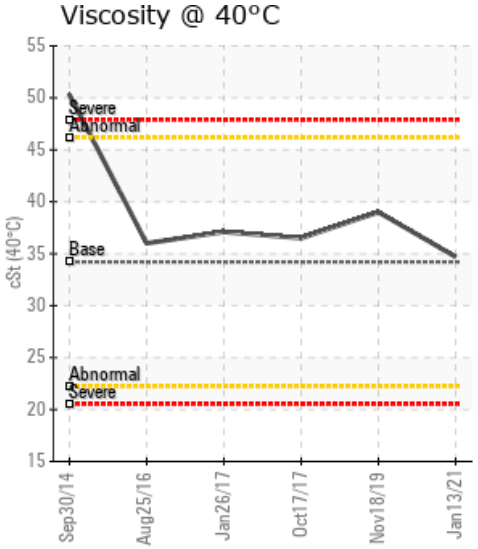
Customer: PTRHTF20033	System Information	Sample Information
Moose Jaw Refinery 641 Manitoba St. E, Box 2000 Moose Jaw, SK S6H 6E3 Canada Attn: GILBERT GRIFFIN Tel: (603)691-7823 E-Mail: ggriffin@mjrefinery.com	System Volume: 1308 gal Bulk Operating Temp: 320F / 160C Heating Source: Blanket: Fluid: PETRO CANADA PETRO-THERM Make: CHILDERS	Lab No: 02398830 Analyst: Kevin McDermott Sample Date: 01/13/21 Received Date: 01/20/21 Completed: 01/26/21 Kevin McDermott kevin.mcdermott@petrocanadalsp.com

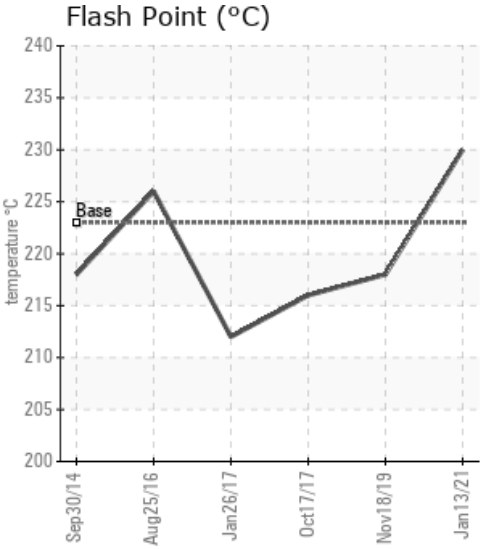
Recommendation: The fluid condition is overall very good, but the solids content is higher than expected. This could be from an insufficient purge while sampling or if the solids content is truly high, consider installing a slipstream filter.

Comments: Pentane Insolubles 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	%
01/13/21	01/20/21	12m	DISCHARGE OF PUMP	446 / 230	5.1	34.7	0.23	0.453	737 / 392	821 / 438	914 / 490	1.11
11/18/19	11/25/19	0m	DISCHARGE	424 / 218	11.6	39.0	0.952	0.978	676 / 358	767 / 408	878 / 470	2.04
10/17/17	10/24/17	0m	PUMP DISCHARGE LINE	421 / 216	9.0	36.5	0.410	0.486	706 / 375	805 / 430	923 / 495	1.22
01/26/17	02/03/17	32m	SUCTION PIPING	414 / 212	18.4	37.1	0.21	0.763	710 / 376	807 / 431	911 / 488	1.26
08/25/16	08/29/16	28m	DISCHARGE OF PUMP	439 / 226	98.4	36.0	0.393	0.263	710 / 376	806 / 430	908 / 487	1.01
Baseline Data				433 / 223		34.2	0.03		720 / 382	817 / 436	900 / 482	1.00







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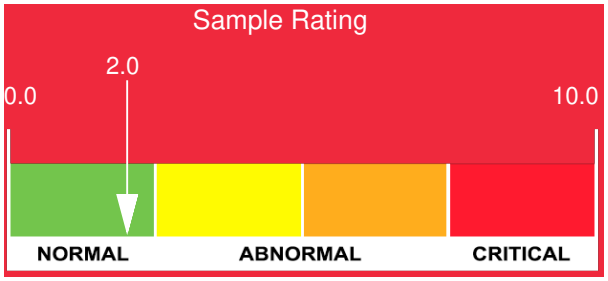
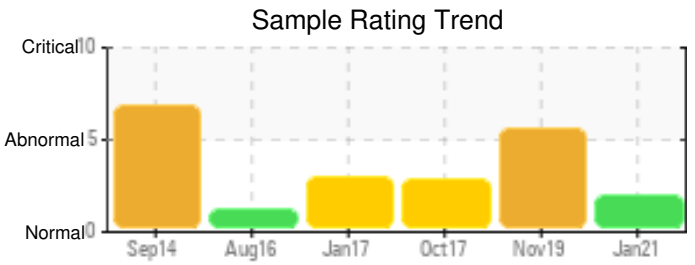
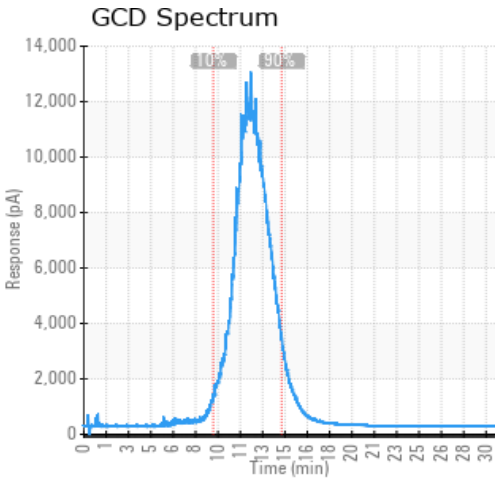
PETRO-CANADA LUBRICANTS

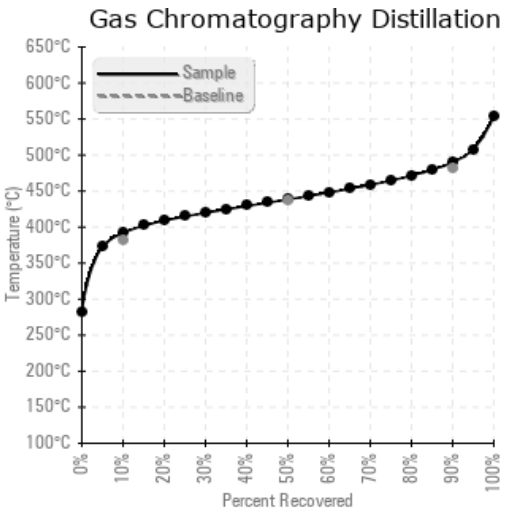


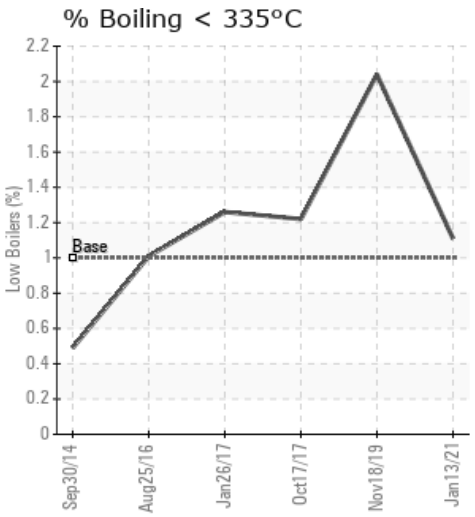


Sample Date	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorus	Zinc
01/13/21	4	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	2	0	0	0	0	0
11/18/19	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/17/17	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01/26/17	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08/25/16	0	0	0	0	0	0	0	0	0	0	0	1	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

11/18/19	The Acid Number (AN) is very high. This combined with gradual viscosity increase and solids content indicate fluid degradation due to oxidation. Consideration should be given to a full or partial changeout of the fluid. Once oxidation begins it can worsen exponentially resulting in system fouling with deposits. Suggest submitting another sample soon to see if degradation is progressing.
10/17/17	The current fluid has normal viscosity, flash point, and GCD distillation points. The TAN reading and the solids content are higher than normal because of the minor oxidation. However, the fluid is still suitable for use. Please take one sample in 8 months to monitor the conditions.
01/26/17	The current fluid has normal viscosity, flash point, TAN and GCD distillation points. The solids content is high because of the minor oxidation. Please continue to run the fluid and take one sample in 8 months to monitor the conditions.
08/25/16	The current fluid has adequate viscosity, distillation points and the flash point. The water level and the solid content are all low. TAN is higher than the fresh fluid, meaning the fluid has minor oxidation, but still suitable for further use. Please take one sample in one year to monitor the conditions.

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