

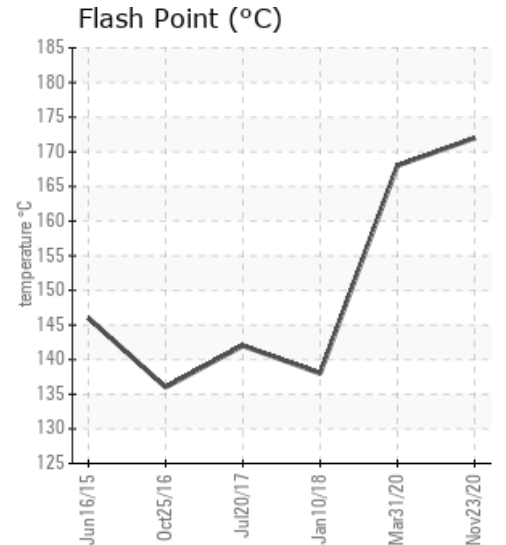
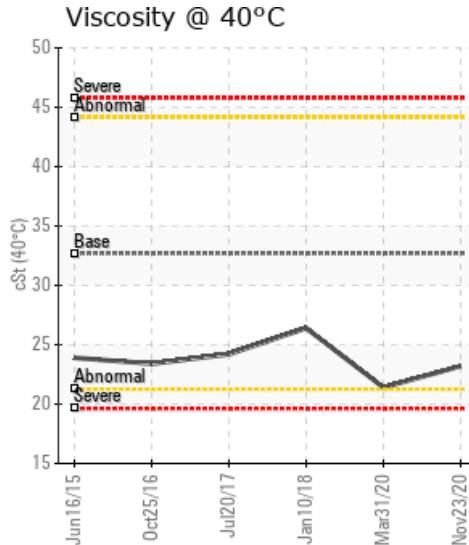
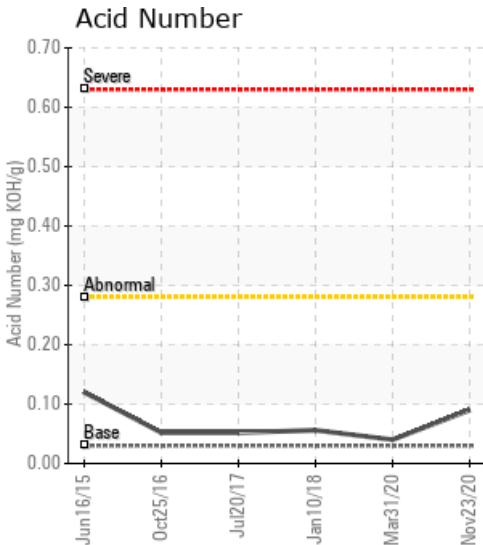
LINE 1/2

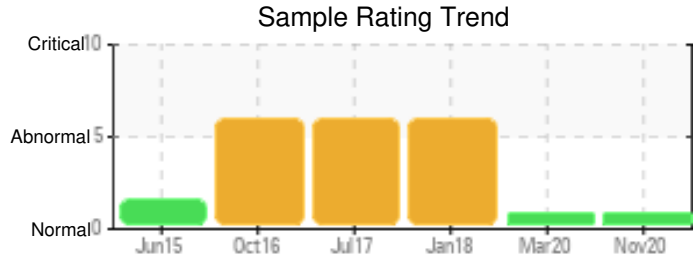
Customer: PTRHTF60002	System Information	Sample Information
BOYNE SMELTERS LTD-RIO TINTO HANDLEY DRIVE QUEENSLAND BOYNE ISLAND, QUE 4680 AUSTRALIA Attn: Heath Mitchell Tel:	System Volume: 20000 ltr Bulk Operating Temp: 514F / 268C Heating Source: Blanket: Fluid: PETRO CANADA CALFLO AF Make:	Lab No: 02393493 Analyst: Philip Riley Sample Date: 11/23/20 Received Date: 12/17/20 Completed: 01/13/21 Philip Riley philip.riley@hollyfrontier.com

Recommendation: COC Flash Point is very low and in line with the viscosity drop showing evidence of thermal cracking of the fluid. This is further supported by the GCD curve which shows clear cracking of the fluid. If the system can be safely vented then there is the possibility to recover the flash point and remove the light ends. If it cannot be safely vented then you need to look towards a potential oil change with clean and flush. The fluid will only deteriorate further without action. The flash point has been lower and recovered and the insolubles and acid number remain low.

Comments: COC Flash Point is abnormally low.

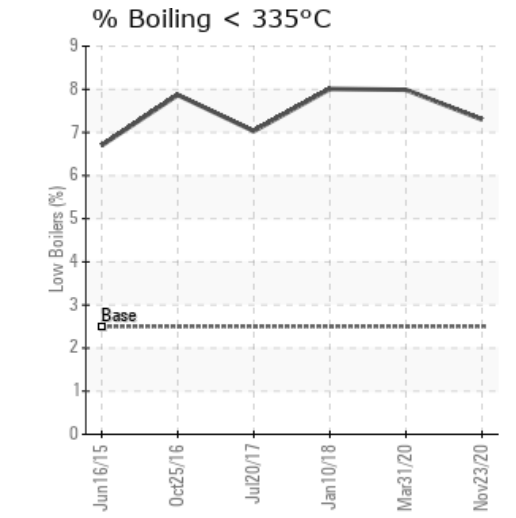
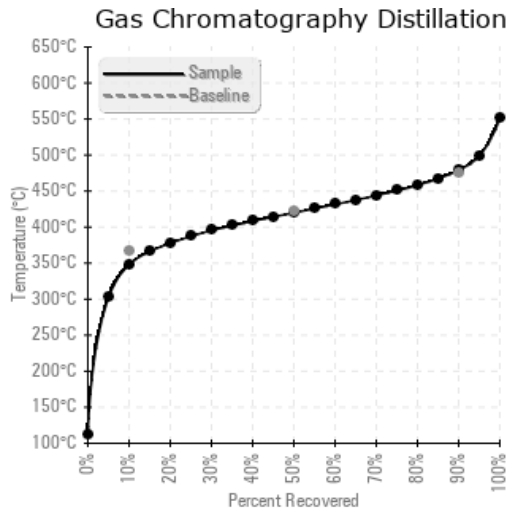
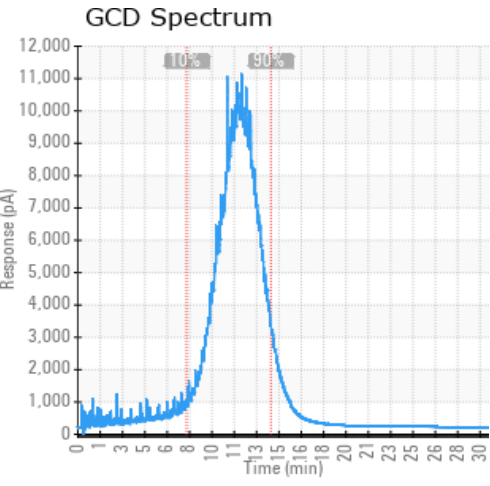
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
11/23/20	12/17/20	30.0y	rtrn near gas burner	342 / 172	20.9	23.2	0.09	0.067	659 / 348	788 / 420	894 / 479	7.30
03/31/20	07/07/20	20.0y	NEAR RETURN	334 / 168	15.3	21.4	0.04	0.062	652 / 345	788 / 420	893 / 479	7.99
01/10/18	01/23/18	10.0y		280 / 138	2.0	26.4	0.056	0.031	645 / 341	766 / 408	873 / 467	8.01
07/20/17	09/06/17	20.0y	NEAR RETURN TO GAS B	288 / 142	30.9	24.2	0.052	0.035	659 / 348	790 / 421	895 / 480	7.03
10/25/16	11/04/16	10.0y	NEAR RTRN TO GAS BRN	277 / 136	39.4	23.4	0.052	0.054	651 / 344	790 / 421	895 / 479	7.87
Baseline Data				435 / 224		32.7	0.03		693 / 367	790 / 421	887 / 475	2.5





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	
11/23/20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	
03/31/20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0
01/10/18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0
07/20/17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0
10/25/16	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	7	0
Baseline Data			0	0						0		0	0					0						270	

Elemental analysis results (above) in parts per million (ppm). [10,000 ppm = 1.0%]



Historical Comments	
03/31/20	The Flash Pt has been recovered from previous samples, however remains in caution. The viscosity is very low indeed against the fresh oil. Looking at the GCD, the line shows a lot of peaks along the line, indicating thermal cracking. You must look to vent this system (safely) to remove the light end molecules. If a partial change has been done as per the last recommendation, it also indicates the fluid is heading towards end of life as the fluid seems to have a number of areas where it is deteriorating. Please conduct venting and send in another sample after 6 months max. COC Flash Point is abnormally low.
01/10/18	The current fluid has the similar conditions as the 2017 and 2016 samples. The fluid has been thermal cracked with some light boiler to reduce the flash point. Please conduct the effective system venting to release the oil vapor, or just do the 30% oil change to bring back the oil flash point and viscosity. Please take one sample in 6 months to monitor. COC Flash Point is severely low.
07/20/17	The fluid has a very similar condition as the sample in 2016. The fluid has normal acid number and solid content. However, the viscosity and flash point are all low because of the thermal cracking at 268C bulk working temperature. The effective system venting is required as soon as possible to release the light oil vapor. Please take one sample in one year to monitor the conditions.
10/25/16	The fluid flash point is severely low and the viscosity is abnormally low. The current fluid has a lot of low boiler (light end) due to the thermal cracking. The solid content, water ppm and TAN number are all normal. Please conduct the effective venting process as soon as possible to release the light end/oil vapor from the system. System venting is a recommended regular maintenance practice for any closed heat transfer system. If there is no way to vent the light end, please consider the complete fluid change or at least partial (i.e. 1/3 of the fluid) change to bring back the flash point and viscosity. Take one sample to verify the improvement after a longer and effective venting process or a partial fluid change.

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