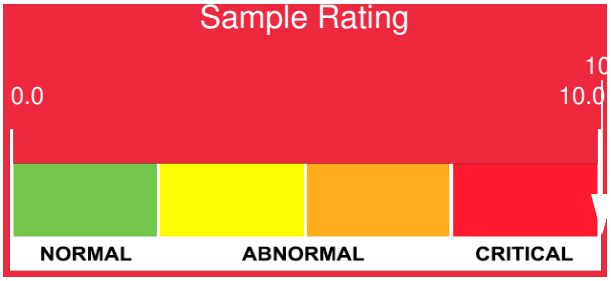
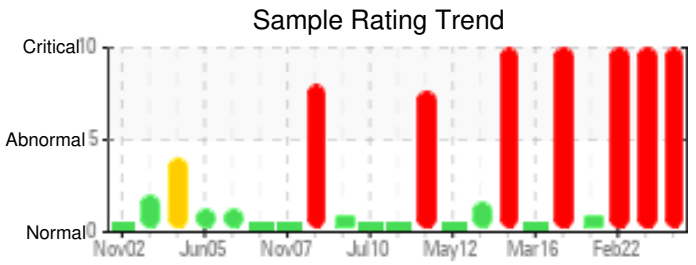




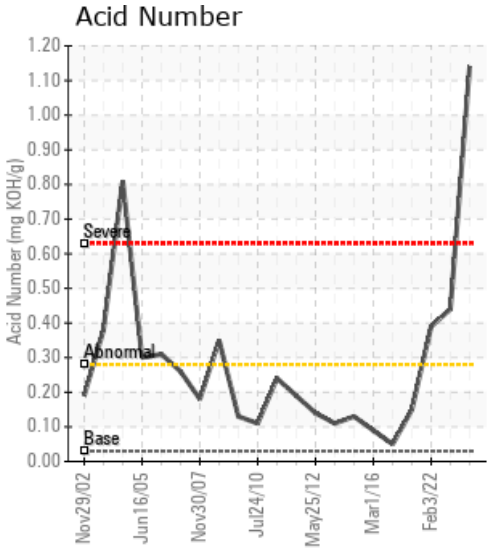
[#3 Reactor Vessel Jackets] #3 REACTOR

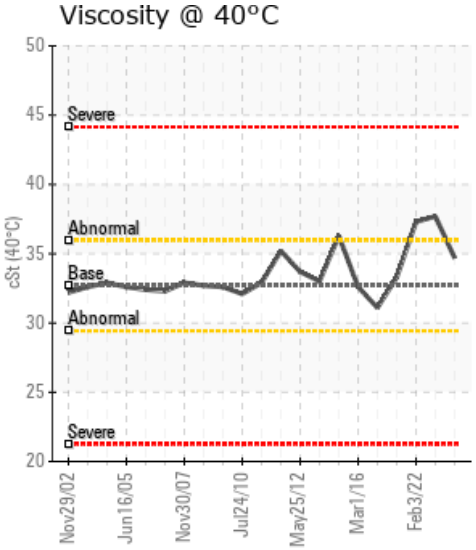
Customer: PTRHTF20087	System Information	Sample Information
Celanese Eva Performance Poly 4405-101 AVE. P.O. 428 EDMONTON, AB T5J 2K1 CA Attn: Greg Hein Tel: E-Mail: greg.hein@celanese.com	System Volume: 0 ltr Bulk Operating Temp: 212F / 100C Heating Source: Blanket: Fluid: PETRO CANADA CALFLO AF Make:	Lab No: 02562411 Analyst: Peter Harteveld Sample Date: 05/31/23 Received Date: 06/06/23 Completed: 06/08/23 Peter Harteveld peter.harteveld@HFSinclair.com

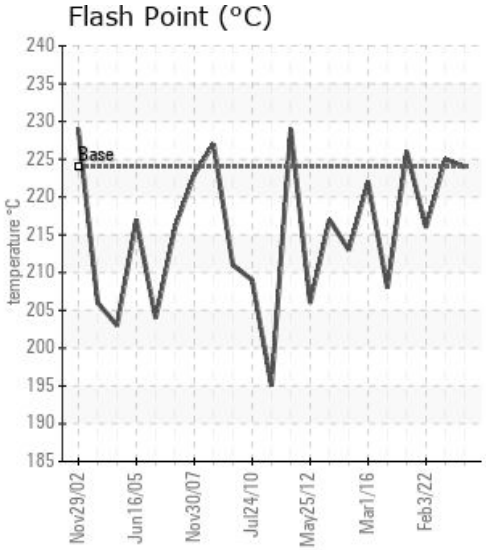
Recommendation: Since the last analysis dated Feb.2023 the fluid has degraded rapidly. The fluid is not suitable for use anymore and has to be changed. The AN has exceeded the condemning limit. The fluid has become acidic and is causing corrosion hence the high Fe content. A potential cause of this high AN is fluid oxidation. This is however unlikely to take place at 100C unless the system is open to atmosphere. The distillation curve shows a high boiler peak but this isn't supported by the 90%GCD temperature which is only slightly elevated. Like the previous sample there is Manganese present in the fluid. The Pentane Insolubles (solids) content is very high with 1.36%. This means that prior to changing out the fluid, the system has to be cleaned and flushed. For support with cleaning/flushing and fluid change-out please contact Petro-Canada Technical Service.

Comments: Iron ppm levels are severe. PQ levels are severe. Pentane Insolubles levels are severely high. Acid Number (AN) is severely high. Manganese ppm levels are abnormally high.

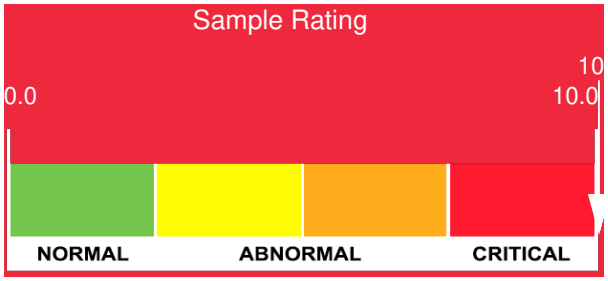
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
05/31/23	06/06/23	9.0m	TANK	435 / 224	106.0	34.7	1.14	1.36	707 / 375	801 / 427	903 / 484	1.30
02/09/23	02/16/23	5.0m	reactor vessel jckts	437 / 225	97.7	37.7	0.44	1.37	708 / 375	800 / 427	907 / 486	0.81
02/03/22	02/14/22	0.0m	RV heating jackets	421 / 216	42.3	37.3	0.39	1.41	704 / 374	800 / 427	913 / 489	1.14
06/22/20	07/15/20	0.0m		439 / 226	18.4	33.3	0.15	0.069	705 / 374	798 / 426	911 / 488	0.76
08/21/17	08/28/17	0.0m	REACTOR	406 / 208	13.9	31.1	0.05	0.573	700 / 371	799 / 426	897 / 481	1.09
Baseline Data				435 / 224		32.7	0.03		693 / 367	790 / 421	887 / 475	2.5

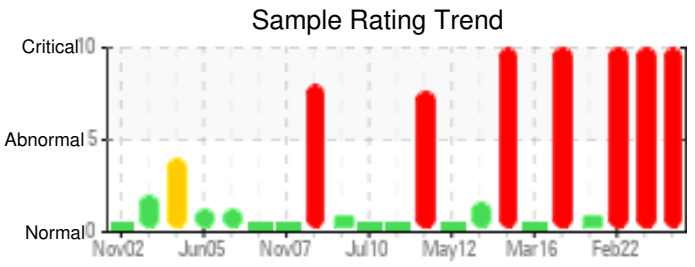






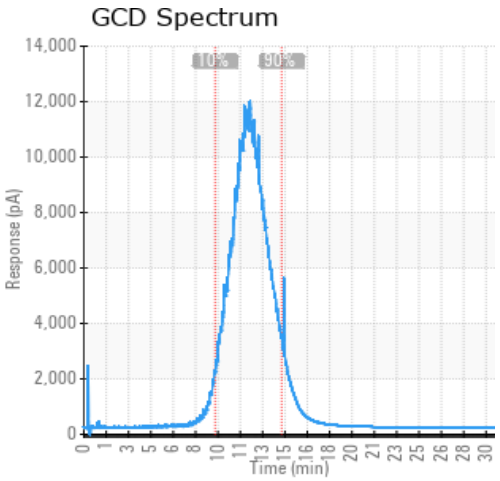
PETRO-CANADA LUBRICANTS

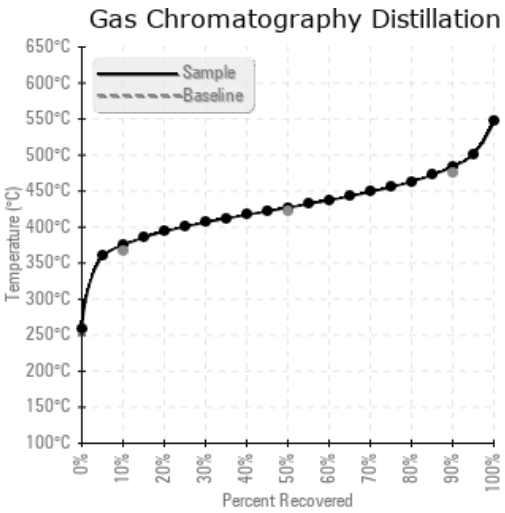


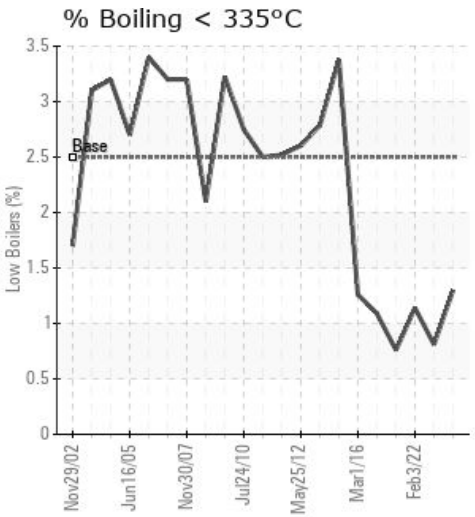


Sample Date	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorus	Zinc
05/31/23	1329	0	0	0	1	0	0	0	0	0	4	0	0	0	0	0	22	0	1	0	0	0	277	0
02/09/23	1855	1	0	0	1	0	0	0	0	0	5	0	0	0	0	0	25	0	2	0	0	0	272	1
02/03/22	2109	2	0	0	1	0	0	0	0	0	5	0	0	0	0	0	30	0	2	0	1	0	257	0
06/22/20	192	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	3	0	0	0	0	0	247	0
08/21/17	1033	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	12	0	0	0	2	0	246	0
Baseline Data			0	0						0			0	0					0				270	

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







Historical Comments

02/09/23	A combination of slightly elevated AN, viscosity and 90% GCD temperature indicates fluid degradation by oxidation. The Fe content is high. This is corrosive wear resulting from increased fluid acidity. Please ensure the blanket gas system (if present) is in good working order. The fluid temperature is listed as 212 degrees F (100C.) Is this correct ? Oxidation at this operating temperature after only 5 months of service is unusual. There is Manganese present in the fluid. This is either contamination or corrosive wear if system internals contain Mn. The Pentane Insoluble (solids) content of the fluid is very high with 1.37%. (reportable limit is 0.5%) It is recommended to start fluid filtration. Please re-sample in 6 months. (list system volume)For now the fluid is suitable for further use but it is imperative to lower the solids content in order to continue the use of this fill.Iron ppm levels are severe. PQ levels are severe. Pentane Insolubles levels are severely high. Acid Number (AN) is abnormally high. Visc @ 40°C is abnormally high. Manganese ppm levels are abnormally high. (GCD) 90% Distillation Point is marginally high.
02/03/22	The current fluid has severe third party contaminations. The iron level is extremely high, which elevates the fluid viscosity and solid content reading. The fluid also has moderate oxidation, but is still OK to continue to use. It is better to find a way to filter the metals out ASAP. If the system volume is not huge, then it make sense to do a drain and fill.Iron ppm levels are severe. PQ levels are severe. Pentane Insolubles levels are severely high. Acid Number (AN) is abnormally high. Manganese ppm levels are abnormally high. (GCD) 90% Distillation Point is marginally high.
06/22/20	The current fluid has normail viscosity, flash point and solid content. The Acid Number is low, meaning there is minimum oxidation. the 192 ppm Fe indicates that there is minor contamination, which need to be monitored in the future. Please continue to run the current fluid, pay attention to the system contamination control and take one sample in 12 months to compare the fluid conditions.
08/21/17	Based on the analysis results, it appears the oil is experiencing some contamination. Please note the wear element iron (Fe). Iron typically comes from the system components. The pentane insolubles analysis result is the determination of contaminants in used heat transfer oils, and is used to determine the amount of insoluble materials such as oxidation by products, dirt, carbonaceous material, and system wear components in the fluid. These contaminants as a group are called pentane insolubles and the result is supported by the PQ result. It also appears that the sample results are not consistent with previous samples. Improper sampling techniques could result in unreliable test results.Iron ppm levels are severe. PQ levels are severe. Pentane Insolubles levels are severely high.