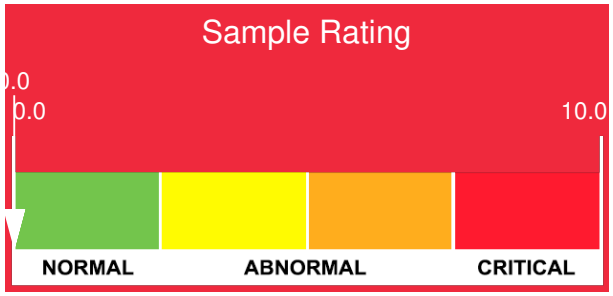
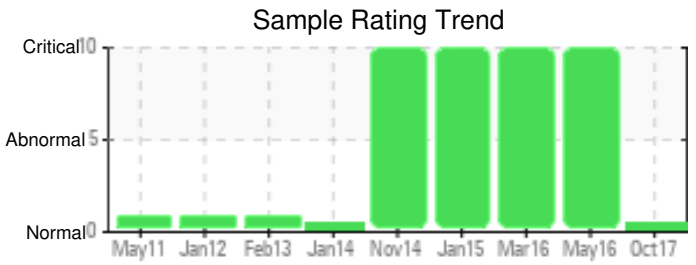




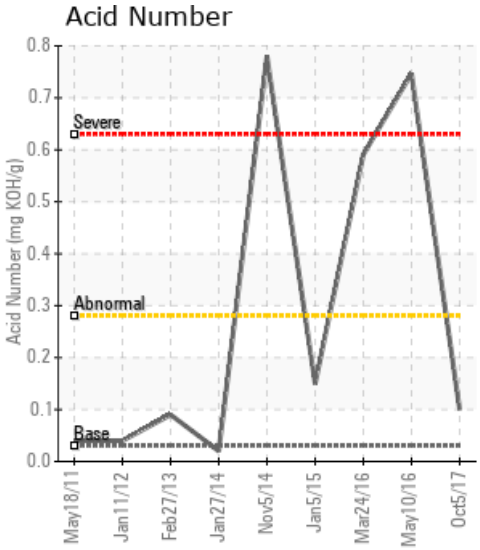
STORAGE SYSTEM (ACHESON PHASE I)

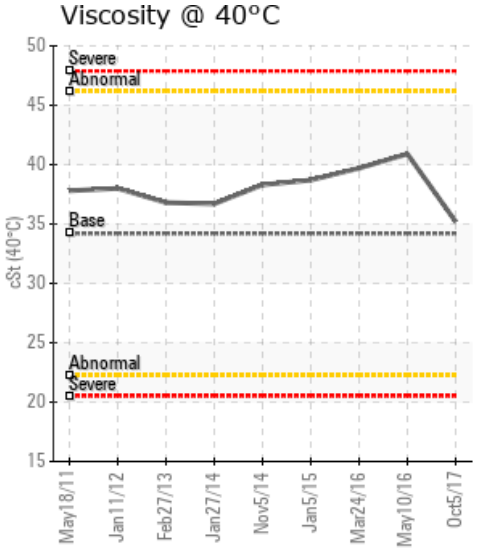
Customer: PTRHTF20056	System Information	Sample Information
COLASPHALT 26222 TOWNSHIP ROAD 530A ACHESON, AB T7X 5A7 Canada Attn: Luis Salinas Tel: (780)699-2447 E-Mail: luis.salinas@colasphalt.ca	System Volume: 20000 ltr Bulk Operating Temp: 410F / 210C Heating Source: Blanket: Fluid: PETRO CANADA PETRO-THERM Make: HEATEC	Lab No: 02181915 Analyst: Gordon Susinski Sample Date: 10/05/17 Received Date: 11/14/17 Completed: 11/17/17 To discuss this report contact Gordon Susinski at (587)582-4118

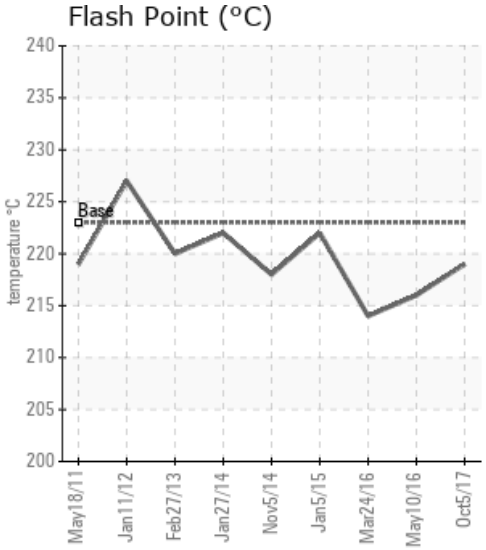
Recommendation: Results are normal.

Comments:

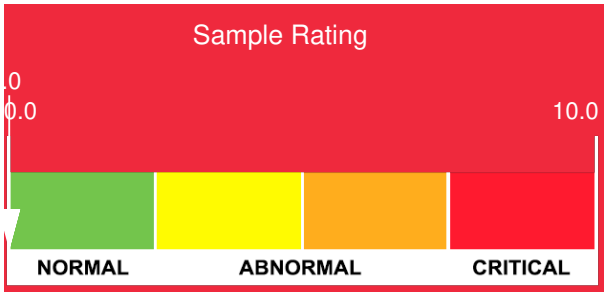
Sample Date	Received Date	Fluid Age	Sample Location	Flash Point (COC)	Water (KF)	Viscosity (40°C)	Acid Number	Solids	GCD 10%	GCD 50%	GCD 90%	GCD % < 335°C
	mm/dd/yy			°F/°C	ppm	cSt	mg/KOH/g	%wt	°F/°C	°F/°C	°F/°C	%
10/05/17	11/14/17	11m		426 / 219	37.1	35.2	0.10	0.247	737 / 392	803 / 428	888 / 475	0.00
05/10/16	07/28/16	8m		421 / 216	212.6	40.9	0.747	1.91	723 / 384	816 / 436	917 / 492	0.00
03/24/16	07/28/16	8m	AFTER STRAINER	417 / 214	133.6	39.7	0.591	1.40	726 / 385	808 / 431	909 / 487	0.00
01/05/15	01/12/15	7m	PUMP DISCHARGE	432 / 222	100.1	38.7	0.15	0.871	720 / 382	829 / 443	924 / 496	1.15
11/05/14	12/01/14	5m	PONT AT PUMP	424 / 218	53.2	38.3	0.780	0.690	712 / 378	810 / 432	909 / 487	0.83
01/27/14	02/03/14	5m		432 / 222	30.4	36.7	0.02	0.223	710 / 377	810 / 432	905 / 485	1.26
Baseline Data				433 / 223		34.2	0.03		720 / 382	817 / 436	900 / 482	1.00

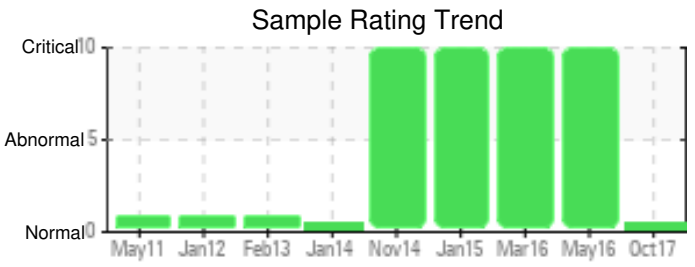






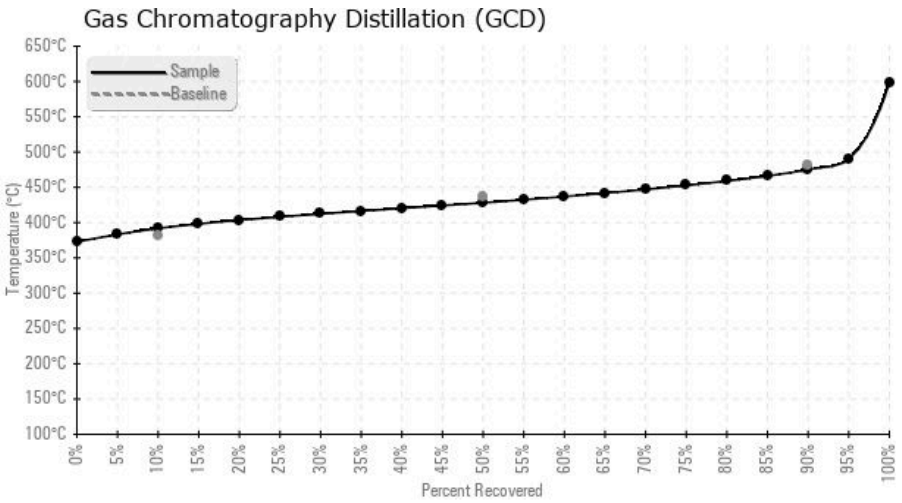
PETRO-CANADA

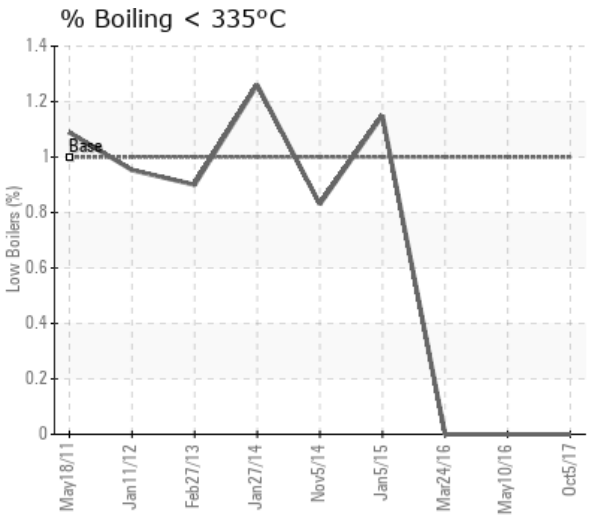




Sample Date	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorus	Zinc
10/05/17	118	0	0	0	0	0	1	2	0	0	0	1	0	0	0	0	1	0	0	0	2	0	0	0
05/10/16	650	1	0	0	1	0	1	0	0	0	1	0	0	0	0	0	8	0	1	0	0	0	0	1
03/24/16	507	1	0	0	1	0	1	0	0	0	1	1	0	0	0	0	6	0	1	0	0	0	1	1
01/05/15	449	1	1	0	1	0	0	0	0	0	1	0	2	0	0	0	5	0	0	1	0	0	1	1
11/05/14	255	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	3	0	1	0	1	0	2	1
01/27/14	10	0	0	0	0	0	0	3	0	0	0	0	1	0	0	0	0	0	0	0	3	0	2	2
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

05/10/16	Fe level is severe. Continue to monitor the system and resample. Iron is a system generated element typically sourced from the tubes or the pump. The Pentane Insolubles analysis is for the determination of contaminants in used heat transfer oils, is to determine the amount of insoluble materials such as oxidation by products, dirt, carbonaceous material, and system wear components. These contaminants as a group are called pentane insolubles. Acid number increase is likely due to the formation of oxidation by products. Oxidation is a chemical reaction between oxygen and the components of the oil whereby the hydrocarbon in the oil turns into weak carboxylic acids and other carbon-oxygen containing species. The higher the temperature, the worse the oxidation becomes and it will feed off of itself becoming exponentially worse over time when the additives are depleted. In a closed heat transfer system, the most probable place for fluid oxidation to occur is in the expansion tank (without an inert gas blanket). In an open system, the fluid oxidizes rapidly at its operating temperature. Different oils vary considerably in their resistance to oxidation largely due to the base oil used and the antioxidant additives used in the oil. Viscosity increase in and heat transfer system is normally attributed to the oxidation process. This process increase the size of the molecules and increases the oils viscosity.All of these results together indicate that the system is in need of a change. Please inspect the system.Iron ppm levels are severe. PQ levels are severe. Pentane Insolubles levels are severely high. Acid Number (AN) is severely high. Visc @ 40°C is abnormally high.
03/24/16	Fe level is severe. Continue to monitor the system and resample. Iron is a system generated element typically sourced from the tubes or the pump. The Pentane Insolubles analysis is for the determination of contaminants in used heat transfer oils, is to determine the amount of insoluble materials such as oxidation by products, dirt, carbonaceous material, and system wear components. These contaminants as a group are called pentane insolubles. Acid number increase is likely due to the formation of oxidation by products. Oxidation is a chemical reaction between oxygen and the components of the oil whereby the hydrocarbon in the oil turns into weak carboxylic acids and other carbon-oxygen containing species. The higher the temperature, the worse the oxidation becomes and it will feed off of itself becoming exponentially worse over time when the additives are depleted. In a closed heat transfer system, the most probable place for fluid oxidation to occur is in the expansion tank (without an inert gas blanket). In an open system, the fluid oxidizes rapidly at its operating temperature. Different oils vary considerably in their resistance to oxidation largely due to the base oil used and the antioxidant additives used in the oil. Viscosity increase in and heat transfer system is normally attributed to the oxidation process. This process increase the size of the molecules and increases the oils viscosity.All of these results together indicate that the system is in need of a change and continue to increase from a year ago. Please inspect the system.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.
01/05/15	There is very heavy oxidation in this sample as well as sludge development. There is also a large amount of wear metal present in the sample and the source of this should be determined. It would be recommended to change this oil out for new oil or at the very least, remove some of the current oil and 'sweeten' with fresh oil.Iron ppm levels are severe. PQ levels are severe. Pentane Insolubles levels are severely high. Visc @ 40°C is abnormally high. (GCD) 90% Distillation Point is marginally high.
11/05/14	The severely high Acid Number indicates that there is heavy oxidation of the fluid occurring. As well there is in an increase in the iron (FE) content in the system which indicates some wear occurring. A full change out of the heat transfer fluid would be advisable as oxidation increases exponentially at these Acid Number levels.PQ levels are severe. Iron ppm levels are abnormal. Pentane Insolubles levels are severely high. Acid Number (AN) is severely high. Visc @ 40°C is abnormally high.
01/27/14	All test parameters are normal and trending very well with the previous results a year ago. No concerns are seen at this time. Resample again in one year.