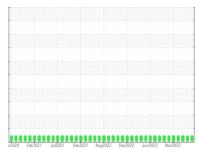


OIL ANALYSIS REPORT

Kentucky [Kentucky] Oil - Starboard Main Engine

Starboard Main Engine

DIESEL ENGINE OIL SAE 15W40 (216 GAL)



Sample Rating Trend



DIAGNOSIS

Recommendation

Resample at the next service interval to monitor. (Customer Sample Comment: Top Up Amount: 37 GAL. Tyson Bias)

All component wear rates are normal.

Contamination

There is no indication of any contamination in the

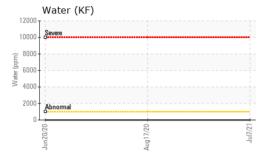
Fluid Condition

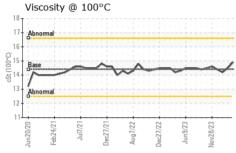
The BN result indicates that there is suitable alkalinity remaining in the oil. The condition of the oil is suitable for further service.

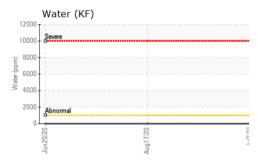
67070 Feb.7021 Jul2021 Dec2021 Aug2022 Dec2022 Jun2023 Hev2023						
SAMPLE INFORM	MATION	method	limit/base	current	history1	history2
Sample Number		Client Info		WC0874821	WC0859931	WC0859934
Sample Date		Client Info		16 Mar 2024	16 Feb 2024	20 Jan 2024
Machine Age	hrs	Client Info		13554	12937	12452
Oil Age	hrs	Client Info		2010	1393	908
Oil Changed		Client Info		Oil Added	N/A	Not Changd
Sample Status				NORMAL	NORMAL	NORMAL
CONTAMINATIO	V	method	limit/base	current	history1	history2
Fuel		WC Method	>4.0	<1.0	<1.0	<1.0
Glycol		WC Method		NEG	NEG	NEG
WEAR METALS		method	limit/base	current	history1	history2
Iron	ppm	ASTM D5185m	>75	7	4	3
Chromium	ppm	ASTM D5185m	>8	<1	0	<1
Nickel	ppm	ASTM D5185m	>2	<1	0	<1
Titanium	ppm	ASTM D5185m	>3	<1	0	0
Silver	ppm	ASTM D5185m	>2	<1	0	<1
Aluminum	ppm	ASTM D5185m	>15	2	<1	2
Lead	ppm	ASTM D5185m	>18	4	1	3
Copper	ppm	ASTM D5185m	>80	6	2	4
Tin	ppm	ASTM D5185m	>14	1	0	1
Vanadium	ppm	ASTM D5185m		<1	0	<1
Cadmium	ppm	ASTM D5185m		<1	0	<1
ADDITIVES		method	limit/base	current	history1	history2
7.5525		method	IIIIII/Dasc	Current	Thistory	111010172
Boron	ppm	ASTM D5185m	250	15	17	18
	ppm		250			
Boron		ASTM D5185m	250	15	17	18
Boron Barium	ppm	ASTM D5185m ASTM D5185m	250 10	15 0	17 0	18 0
Boron Barium Molybdenum	ppm	ASTM D5185m ASTM D5185m ASTM D5185m	250 10	15 0 62	17 0 57	18 0 57
Boron Barium Molybdenum Manganese	ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	250 10 100	15 0 62 <1	17 0 57 <1	18 0 57 2
Boron Barium Molybdenum Manganese Magnesium	ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	250 10 100 450	15 0 62 <1 1344	17 0 57 <1 1273	18 0 57 2 1186
Boron Barium Molybdenum Manganese Magnesium Calcium	ppm ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	250 10 100 450 3000	15 0 62 <1 1344 1350	17 0 57 <1 1273 1339	18 0 57 2 1186 1198
Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus	ppm ppm ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	250 10 100 450 3000 1150	15 0 62 <1 1344 1350 1183	17 0 57 <1 1273 1339 1022	18 0 57 2 1186 1198 1005
Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc	ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	250 10 100 450 3000 1150	15 0 62 <1 1344 1350 1183	17 0 57 <1 1273 1339 1022 1308	18 0 57 2 1186 1198 1005 1258
Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur	ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	250 10 100 450 3000 1150 1350 4250	15 0 62 <1 1344 1350 1183 1377 3617	17 0 57 <1 1273 1339 1022 1308 3313	18 0 57 2 1186 1198 1005 1258 3098
Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS	ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m	250 10 100 450 3000 1150 1350 4250 limit/base >20	15 0 62 <1 1344 1350 1183 1377 3617	17 0 57 <1 1273 1339 1022 1308 3313 history1	18 0 57 2 1186 1198 1005 1258 3098 history2
Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS	ppm ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m	250 10 100 450 3000 1150 1350 4250 limit/base >20	15 0 62 <1 1344 1350 1183 1377 3617 current	17 0 57 <1 1273 1339 1022 1308 3313 history1	18 0 57 2 1186 1198 1005 1258 3098 history2
Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium	ppm ppm ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m	250 10 100 450 3000 1150 1350 4250 limit/base >20 >158 >20	15 0 62 <1 1344 1350 1183 1377 3617 current 4	17 0 57 <1 1273 1339 1022 1308 3313 history1 2	18 0 57 2 1186 1198 1005 1258 3098 history2 4
Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m	250 10 100 450 3000 1150 1350 4250 limit/base >20 >158 >20	15 0 62 <1 1344 1350 1183 1377 3617 current 4 2	17 0 57 <1 1273 1339 1022 1308 3313 history1 2 0	18 0 57 2 1186 1198 1005 1258 3098 history2 4 4
Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium Water	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m	250 10 100 450 3000 1150 1350 4250 limit/base >20 >158 >20 >0.1	15 0 62 <1 1344 1350 1183 1377 3617 current 4 2 2 NEG	17 0 57 <1 1273 1339 1022 1308 3313 history1 2 2 0 NEG	18 0 57 2 1186 1198 1005 1258 3098 history2 4 4 4 NEG
Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium Water INFRA-RED	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m	250 10 100 450 3000 1150 1350 4250 limit/base >20 >158 >20 >0.1 limit/base	15 0 62 <1 1344 1350 1183 1377 3617 current 4 2 2 NEG	17 0 57 <1 1273 1339 1022 1308 3313 history1 2 0 NEG history1	18 0 57 2 1186 1198 1005 1258 3098 history2 4 4 NEG
Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium Water INFRA-RED Soot %	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m ASTM D6304	250 10 100 450 3000 1150 1350 4250 limit/base >20 >158 >20 >0.1 limit/base	15 0 62 <1 1344 1350 1183 1377 3617 current 4 2 2 NEG current 0.1	17 0 57 <1 1273 1339 1022 1308 3313 history1 2 2 0 NEG history1 0.1	18 0 57 2 1186 1198 1005 1258 3098 history2 4 4 NEG history2 0.1
Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium Water INFRA-RED Soot % Nitration	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m ASTM D6304 method *ASTM D7844 *ASTM D7624	250 10 100 450 3000 1150 1350 4250 limit/base >20 >158 >20 >0.1 limit/base	15 0 62 <1 1344 1350 1183 1377 3617 current 4 2 2 NEG current 0.1 10.6	17 0 57 <1 1273 1339 1022 1308 3313 history1 2 2 0 NEG history1 0.1 9.4	18 0 57 2 1186 1198 1005 1258 3098 history2 4 4 4 NEG history2 0.1 8.4
Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium Water INFRA-RED Soot % Nitration Sulfation	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m ASTM D6304 method *ASTM D7844 *ASTM D7624 *ASTM D7624	250 10 100 450 3000 1150 1350 4250 limit/base >20 >158 >20 >0.1 limit/base	15 0 62 <1 1344 1350 1183 1377 3617 current 4 2 2 NEG current 0.1 10.6 23.1	17 0 57 <1 1273 1339 1022 1308 3313 history1 2 2 0 NEG history1 0.1 9.4 22.0	18 0 57 2 1186 1198 1005 1258 3098 history2 4 4 NEG history2 0.1 8.4 21.0
Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium Water INFRA-RED Soot % Nitration Sulfation FLUID DEGRADA	ppm	ASTM D5185m ASTM D6304 method *ASTM D7844 *ASTM D7624 *ASTM D7415 method	250 10 100 450 3000 1150 1350 4250 limit/base >20 >158 >20 >0.1 limit/base >20 >30 limit/base	15 0 62 <1 1344 1350 1183 1377 3617 current 4 2 2 NEG current 0.1 10.6 23.1 current	17 0 57 <1 1273 1339 1022 1308 3313 history1 2 2 0 NEG history1 0.1 9.4 22.0 history1	18 0 57 2 1186 1198 1005 1258 3098 history2 4 4 NEG history2 0.1 8.4 21.0 history2



OIL ANALYSIS REPORT

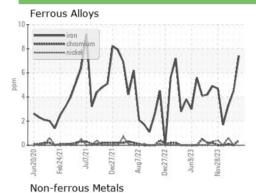


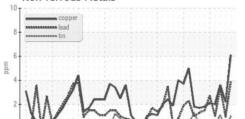


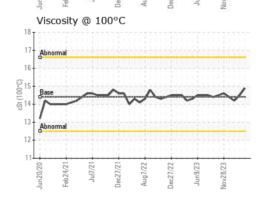


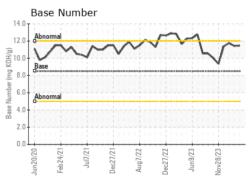
VISUAL		method				history2
White Metal	scalar	*Visual	NONE	NONE	NONE	NONE
Yellow Metal	scalar	*Visual	NONE	NONE	NONE	NONE
Precipitate	scalar	*Visual	NONE	NONE	NONE	NONE
Silt	scalar	*Visual	NONE	NONE	NONE	NONE
Debris	scalar	*Visual	NONE	NONE	NONE	NONE
Sand/Dirt	scalar	*Visual	NONE	NONE	NONE	NONE
Appearance	scalar	*Visual	NORML	NORML	NORML	NORML
Odor	scalar	*Visual	NORML	NORML	NORML	NORML
Emulsified Water	scalar	*Visual	>0.1	NEG	NEG	NEG
Free Water	scalar	*Visual		NEG	NEG	NEG

FLUID PROPER	TIES	method				history2
Visc @ 100°C	cSt	ASTM D445	14.4	14.9	14.5	14.2













Laboratory Sample No.

: WC0874821 Lab Number : 06130859 Unique Number: 10950324

: WearCheck USA - 501 Madison Ave., Cary, NC 27513 Received **Tested**

Diagnosed Test Package : IND 2 (Additional Tests: KF)

: 27 Mar 2024 : 01 Apr 2024 : 01 Apr 2024 - Jonathan Hester MARATHON PETROLEUM CO. 101 12TH ST

CATLETTSBURG, KY US 41169

T: (606)585-3950

Contact: CORY GUMBERT cagumbert@marathonpetroleum.com

To discuss this sample report, contact Customer Service at 1-800-237-1369. * - Denotes test methods that are outside of the ISO 17025 scope of accreditation.

Statements of conformity to specifications are based on the simple acceptance decision rule (JCGM 106:2012)

F: x: