

OIL ANALYSIS REPORT

Mt. Vernon [Mt. Vernon] Oil - Starboard Main Engine Component

Starboard Main Engine

DIESEL ENGINE OIL SAE 15W40 (150 GAL)

DIAGNOSIS

Recommendation

Resample at the next service interval to monitor. (Customer Sample Comment: Ronnie Wilbanks)

Wear

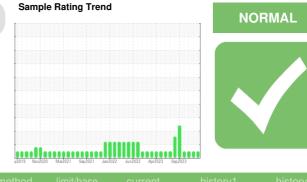
All component wear rates are normal.

Contamination

There is no indication of any contamination in the oil.

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.



SAMPLE INFORM	IATION	method	limit/base	current	history1	history2
Sample Number		Client Info		WC0735814	WC0735800	WC0769005
Sample Date		Client Info		30 Dec 2023	30 Nov 2023	02 Nov 2023
Machine Age	hrs	Client Info		9796	9170	8574
Oil Age	hrs	Client Info		9796	9170	8574
Oil Changed		Client Info		Not Changd	Oil Added	Not Changd
Sample Status				NORMAL	NORMAL	NORMAL
CONTAMINATION	J	method	limit/base	current	history1	history2
Fuel		WC Method	>4.0	<1.0	<1.0	<1.0
Glycol		WC Method	- 110	NEG	NEG	NEG
WEAR METALS		method	limit/base	current	history1	history2
Iron	nom	ASTM D5185m	>75	34	34	35
Chromium	ppm ppm	ASTM D5185m	>8	1	2	2
Nickel		ASTM D5185m	>2	، <1	<1	<1
Titanium	ppm ppm	ASTM D5185m	>2	0	<1	<1
Silver	ppm	ASTM D5185m	>3	0	0	0
Aluminum	ppm	ASTM D5185m	>15	4	5	5
Lead	ppm	ASTM D5185m	>18	50	43	44
Copper	ppm	ASTM D5185m	>80	69	69	72
Tin	ppm	ASTM D5185m	>14	18	17	17
Vanadium	ppm	ASTM D5185m	214	0	0	0
Cadmium	ppm	ASTM D5185m		0	0	0
	PP			•	0	-
ADDITIVES		method			historv1	history2
ADDITIVES Boron	nnm	method	limit/base	current	history1	history2
Boron	ppm	ASTM D5185m	250	4	3	3
Boron Barium	ppm	ASTM D5185m ASTM D5185m	250 10	4 0	3	3 0
Boron Barium Molybdenum	ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m	250	4 0 1	3 0 0	3 0 0
Boron Barium Molybdenum Manganese	ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	250 10 100	4 0 1 0	3 0 0 <1	3 0 0 <1
Boron Barium Molybdenum Manganese Magnesium	ppm ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	250 10 100 450	4 0 1 0 37	3 0 0 <1 20	3 0 0 <1 18
Boron Barium Molybdenum Manganese Magnesium Calcium	ppm ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	250 10 100	4 0 1 0	3 0 0 <1	3 0 0 <1
Boron Barium Molybdenum Manganese Magnesium	ppm ppm ppm ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	250 10 100 450 3000	4 0 1 0 37 3258	3 0 0 <1 20 3210	3 0 0 <1 18 3146
Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus	ppm ppm ppm ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m	250 10 100 450 3000 1150	4 0 1 0 37 3258 23	3 0 0 <1 20 3210 15	3 0 0 <1 18 3146 49
Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc	ppm 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 1350	4 0 1 0 37 3258 23 32	3 0 0 <1 20 3210 15 0	3 0 0 <1 18 3146 49 7
Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur	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 1350 4250	4 0 1 0 37 3258 23 32 4217	3 0 0 <1 20 3210 15 0 4477	3 0 0 <1 18 3146 49 7 4032
Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS	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 1350 4250 limit/base >20	4 0 1 0 37 3258 23 32 32 4217 current	3 0 0 <1 20 3210 15 0 4477 history1	3 0 0 <1 18 3146 49 7 4032 history2
Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon	ppm	ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m ASTM D5185m method	250 10 100 450 3000 1150 1350 4250 limit/base >20	4 0 1 0 37 3258 23 32 4217 current 10	3 0 0 <1 20 3210 15 0 4477 history1 6	3 0 0 <1 18 3146 49 7 4032 history2 6
Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium	ppm	ASTM D5185m 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 limit/base >20 >158	4 0 1 0 37 3258 23 32 4217 current 10 16	3 0 0 <1 20 3210 15 0 4477 history1 6 15	3 0 0 <1 18 3146 49 7 4032 history2 6 20
Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium	ppm	ASTM D5185m ASTM D5185m	250 10 100 450 3000 1150 1350 4250 imit/base >20 >158 >20	4 0 1 37 3258 23 32 4217 <u>current</u> 10 16 <	3 0 0 <1 20 3210 15 0 4477 history1 6 15 0	3 0 0 <1 18 3146 49 7 4032 history2 6 20 0
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 ASTM D5185m	250 10 100 450 3000 1150 1350 4250 limit/base >20 >158 >20 >0.1	4 0 1 37 3258 23 32 4217 <i>current</i> 10 16 <1 NEG	3 0 0 3 20 3210 15 0 4477 history1 6 15 0 8 15 0 8 NEG NEG history1	3 0 0 <1 18 3146 49 7 4032 history2 6 20 0 8 20 0 0 NEG history2
Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium Vater INFRA-RED Soot %	ppm	ASTM D5185m ASTM D5185m	250 10 100 450 3000 1150 1350 4250 limit/base >20 >158 >20 >0.1	4 0 1 0 37 3258 23 32 4217 <i>current</i> 10 16 <1 NEG <i>current</i> 0.5	3 0 0 (20 3210 15 0 4477 history1 6 15 0 NEG NEG history1 0.5	3 0 0 <1 18 3146 49 7 4032 history2 6 20 0 NEG NEG history2 0.6
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 ASTM D5185m	250 10 100 450 3000 1150 1350 4250 imit/base >20 >158 >20 >0.1 imit/base	4 0 1 37 3258 23 32 4217 <i>current</i> 10 16 <1 NEG	3 0 0 3 20 3210 15 0 4477 history1 6 15 0 8 15 0 8 NEG NEG history1	3 0 0 <1 18 3146 49 7 4032 history2 6 20 0 8 20 0 0 NEG history2
Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium Vater INFRA-RED Soot % Nitration	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m ASTM D5185m	250 10 100 450 3000 1150 1350 4250 imit/base >20 >158 >20 >0.1 imit/base	4 0 1 0 37 3258 23 32 4217 <i>current</i> 10 16 <1 NEG <i>current</i> 0.5 14.1	3 0 0 3 1 2 0 3210 15 0 4477 history1 6 15 0 NEG NEG NEG 13.9	3 0 0 <1 18 3146 49 7 4032 history2 6 20 0 NEG NEG NEG 14.2
Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium Vater INFRA-RED Soot % Nitration Sulfation	ppm ppm ppm ppm ppm ppm ppm ppm ppm ppm	ASTM D5185m ASTM D5185m	250 10 100 450 3000 1150 1350 4250 imit/base >20 >158 >20 >0.1 imit/base >20 >30 30 imit/base	4 0 1 0 37 3258 23 32 4217 <i>current</i> 10 16 <1 NEG <i>current</i> 0.5 14.1 23.0	3 0 0 3 20 3210 15 0 4477 history1 6 15 0 4477 history1 6 15 0 NEG NEG history1 0.5 13.9 22.5	3 0 0 <1 18 3146 49 7 4032 history2 6 20 0 NEG 0 NEG history2 0.6 14.2 23.0

8.78

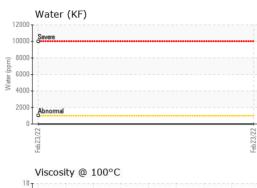
Base Number (BN) mg KOH/g ASTM D2896 8.5

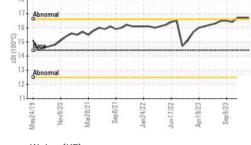
8.34

9.20



OIL ANALYSIS REPORT



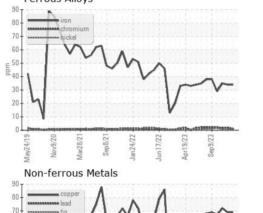


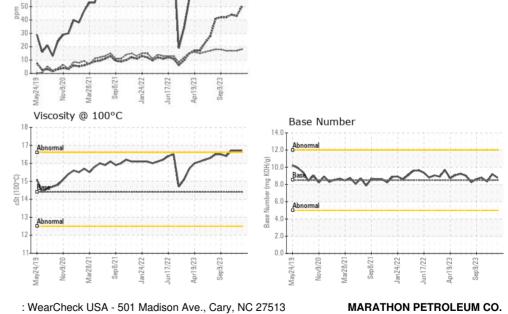


VISUAL		method	limit/base	current	history1	history2
White Metal	scalar	*Visual	NONE	NONE	NONE	NONE
Yellow Metal	scalar	*Visual	NONE	NONE	NONE	NONE
Precipitate	scalar	*Visual	NONE	NONE	NONE	NONE
Silt	scalar	*Visual	NONE	NONE	NONE	NONE
Debris	scalar	*Visual	NONE	NONE	NONE	NONE
Sand/Dirt	scalar	*Visual	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 PROPERT	TIES	method	limit/base	current	history1	history2
Visc @ 100°C	cSt	ASTM D445	14.4	16.7	16.7	16.7
GRAPHS						

Ferrous Alloys

60 50





Laboratory Sample No. : WC0735814 Recieved : 11 Jan 2024 101 12TH ST Lab Number :06058315 : 12 Jan 2024 CATLETTSBURG, KY Diagnosed Unique Number : 10829697 Diagnostician : Sean Felton US 41169 Test Package : IND 2 (Additional Tests: KF) Contact: CORY GUMBERT Certificate L2367 To discuss this sample report, contact Customer Service at 1-800-237-1369. cagumbert@marathonpetroleum.com * - Denotes test methods that are outside of the ISO 17025 scope of accreditation. T: (606)585-3950 Statements of conformity to specifications are based on the simple acceptance decision rule (JCGM 106:2012) F: x:

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