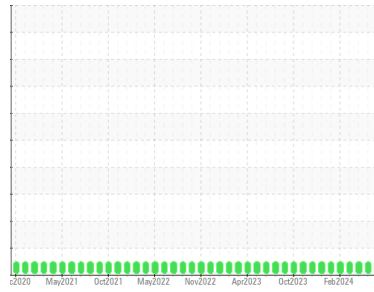




OIL ANALYSIS REPORT

Sample Rating Trend



NORMAL



Area

Kentucky

Machine Id

[Kentucky] Oil - Starboard Main Engine

Component

Starboard Main Engine

Fluid

DIESEL ENGINE OIL SAE 15W40 (160 GAL)

DIAGNOSIS

Recommendation

Resample at the next service interval to monitor. (Customer Sample Comment: Chris wray)

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 INFORMATION

	method	limit/base	current	history1	history2
Sample Number	Client Info		WC0874598	WC0874596	WC0874818
Sample Date	Client Info		09 Jul 2024	25 May 2024	25 Apr 2024
Machine Age	hrs	Client Info	15716	14963	14434
Oil Age	hrs	Client Info	1306	553	896
Oil Changed	Client Info		Not Chngd	N/A	Changed
Sample Status			NORMAL	NORMAL	NORMAL

CONTAMINATION

	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	5	2	18
Chromium	ppm	ASTM D5185m >8	0	0	<1
Nickel	ppm	ASTM D5185m >2	0	0	<1
Titanium	ppm	ASTM D5185m >3	0	0	<1
Silver	ppm	ASTM D5185m >2	0	0	<1
Aluminum	ppm	ASTM D5185m >15	<1	2	3
Lead	ppm	ASTM D5185m >18	0	<1	9
Copper	ppm	ASTM D5185m >80	3	5	13
Tin	ppm	ASTM D5185m >14	0	0	1
Vanadium	ppm	ASTM D5185m	0	<1	<1
Cadmium	ppm	ASTM D5185m	0	0	<1

ADDITIVES

	method	limit/base	current	history1	history2
Boron	ppm	ASTM D5185m 250	27	0	20
Barium	ppm	ASTM D5185m 10	0	0	<1
Molybdenum	ppm	ASTM D5185m 100	65	65	91
Manganese	ppm	ASTM D5185m	0	<1	<1
Magnesium	ppm	ASTM D5185m 450	1531	1560	1959
Calcium	ppm	ASTM D5185m 3000	1384	1361	1909
Phosphorus	ppm	ASTM D5185m 1150	1183	1222	1557
Zinc	ppm	ASTM D5185m 1350	1447	1476	1948
Sulfur	ppm	ASTM D5185m 4250	4161	4375	4369

CONTAMINANTS

	method	limit/base	current	history1	history2
Silicon	ppm	ASTM D5185m >20	4	3	5
Sodium	ppm	ASTM D5185m >158	2	1	6
Potassium	ppm	ASTM D5185m >20	<1	4	2
Water	%	ASTM D6304 >0.1	NEG	NEG	NEG

INFRA-RED

	method	limit/base	current	history1	history2
Soot %	%	*ASTM D7844	0.1	0.2	0.2
Nitration	Abs/cm	*ASTM D7624 >20	9.1	8.0	12.3
Sulfation	Abs/.1mm	*ASTM D7415 >30	21.6	20.0	24.5

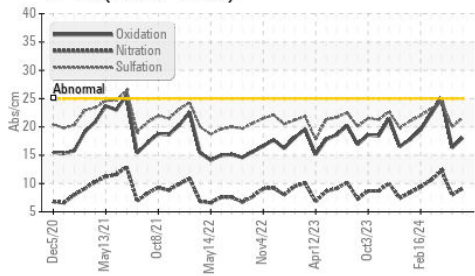
FLUID DEGRADATION

	method	limit/base	current	history1	history2
Oxidation	Abs/.1mm	*ASTM D7414 >25	18.1	16.3	25.1
Base Number (BN)	mg KOH/g	ASTM D2896 8.5	12.12	12.47	10.07

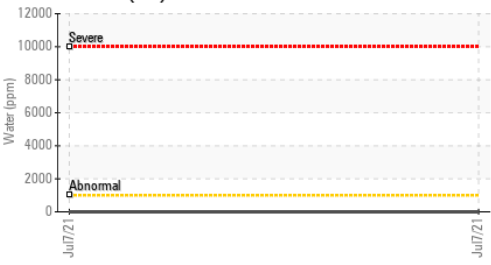


OIL ANALYSIS REPORT

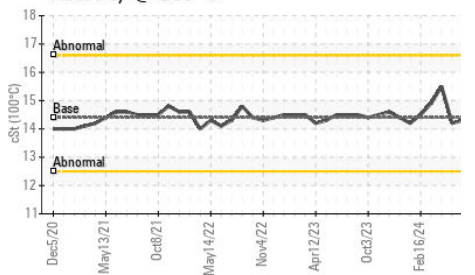
FT-IR (Direct Trend)



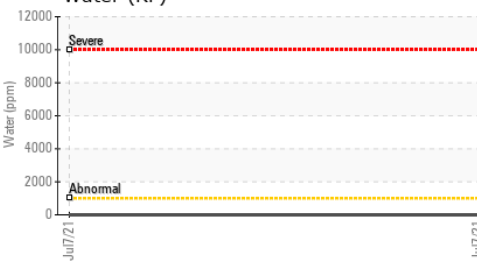
Water (KF)



Viscosity @ 100°C



Water (KF)

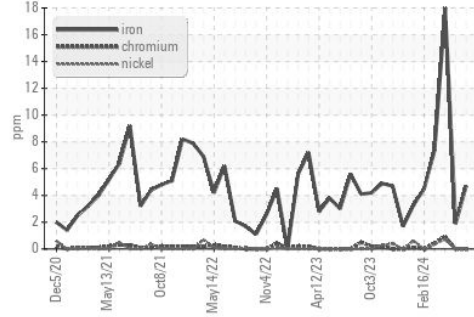


VISUAL	method	limit/base	current	history1	history2
White Metal	scalar	*Visual	NONE	NONE	NONE
Yellow Metal	scalar	*Visual	NONE	NONE	NONE
Precipitate	scalar	*Visual	NONE	NONE	NONE
Silt	scalar	*Visual	NONE	NONE	NONE
Debris	scalar	*Visual	NONE	NONE	NONE
Sand/Dirt	scalar	*Visual	NONE	NONE	NONE
Appearance	scalar	*Visual	NORML	NORML	NORML
Odor	scalar	*Visual	NORML	NORML	NORML
Emulsified Water	scalar	*Visual	>0.1	NEG	NEG
Free Water	scalar	*Visual		NEG	NEG

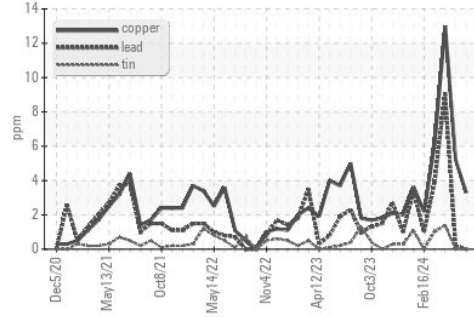
FLUID PROPERTIES	method	limit/base	current	history1	history2	
Visc @ 100°C	cSt	ASTM D445	14.4	14.3	14.2	15.5

GRAPHS

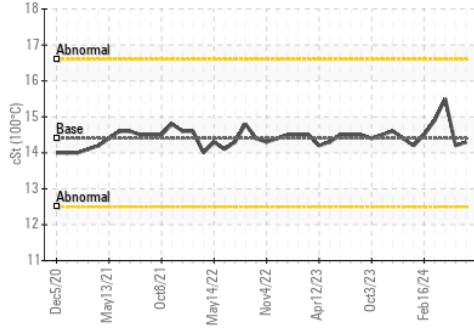
Ferrous Alloys



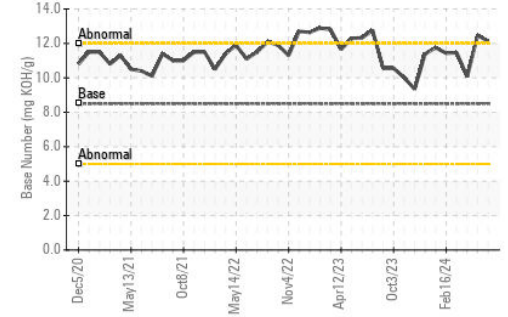
Non-ferrous Metals



Viscosity @ 100°C



Base Number



Laboratory : WearCheck USA - 501 Madison Ave., Cary, NC 27513
Sample No. : WC0874598 **Received** : 15 Jul 2024
Lab Number : **06236279** **Tested** : 16 Jul 2024
Unique Number : 11125113 **Diagnosed** : 16 Jul 2024 - Sean Felton
Test Package : IND 2 (Additional Tests: KF)

MARATHON PETROLEUM CO.
 101 12TH ST
 CATLETTSBURG, KY
 US 41169
 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)