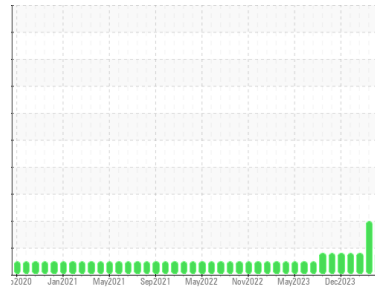




# OIL ANALYSIS REPORT

Sample Rating Trend



**WEAR**



Area

**Marathon**

Machine Id

**[Marathon] Oil - Starboard Main Engine**

Component

**Starboard Main Engine**

Fluid

**DIESEL ENGINE OIL SAE 15W40 (150 GAL)**

## DIAGNOSIS

### Recommendation

No corrective action is recommended at this time. Resample at the next service interval to monitor. ( Customer Sample Comment: Chris Comuzie )

### Wear

The copper level is abnormal. Elemental level of copper (Cu) probably due to leaching of copper from copper components (i.e. cooling core) by the oil additives. All other 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	<b>WC0874610</b>	WC0874606	WC0846112
Sample Date	Client Info	<b>31 May 2024</b>	11 May 2024	01 Apr 2024
Machine Age	hrs	Client Info	0	6797
Oil Age	hrs	Client Info	<b>7885</b>	7546
Oil Changed	Client Info	<b>Filtered</b>	N/A	Filtered
Sample Status		<b>ABNORMAL</b>	ABNORMAL	ABNORMAL

## CONTAMINATION

method	limit/base	current	history1	history2
Fuel	WC Method	>4.0	<b>&lt;1.0</b>	<1.0
Glycol	WC Method		<b>NEG</b>	NEG

## WEAR METALS

method	limit/base	current	history1	history2		
Iron	ppm	ASTM D5185m	>75	<b>34</b>	34	25
Chromium	ppm	ASTM D5185m	>8	<b>&lt;1</b>	<1	<1
Nickel	ppm	ASTM D5185m	>2	<b>0</b>	<1	0
Titanium	ppm	ASTM D5185m	>3	<b>&lt;1</b>	<1	<1
Silver	ppm	ASTM D5185m	>2	<b>0</b>	0	0
Aluminum	ppm	ASTM D5185m	>15	<b>2</b>	4	2
Lead	ppm	ASTM D5185m	>18	<b>8</b>	9	5
Copper	ppm	ASTM D5185m	>80	<b>93</b>	93	93
Tin	ppm	ASTM D5185m	>14	<b>1</b>	2	2
Vanadium	ppm	ASTM D5185m		<b>0</b>	<1	0
Cadmium	ppm	ASTM D5185m		<b>0</b>	0	0

## ADDITIVES

method	limit/base	current	history1	history2		
Boron	ppm	ASTM D5185m	250	<b>115</b>	116	114
Barium	ppm	ASTM D5185m	10	<b>0</b>	0	0
Molybdenum	ppm	ASTM D5185m	100	<b>98</b>	96	85
Manganese	ppm	ASTM D5185m		<b>0</b>	1	<1
Magnesium	ppm	ASTM D5185m	450	<b>711</b>	752	697
Calcium	ppm	ASTM D5185m	3000	<b>1658</b>	1721	1604
Phosphorus	ppm	ASTM D5185m	1150	<b>863</b>	848	802
Zinc	ppm	ASTM D5185m	1350	<b>1084</b>	1090	1017
Sulfur	ppm	ASTM D5185m	4250	<b>2871</b>	2925	2694

## CONTAMINANTS

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

## INFRA-RED

method	limit/base	current	history1	history2		
Soot %	%	*ASTM D7844		<b>0.3</b>	0.3	0.3
Nitration	Abs/cm	*ASTM D7624	>20	<b>11.6</b>	11.7	11.2
Sulfation	Abs/.1mm	*ASTM D7415	>30	<b>25.2</b>	25.2	25.2

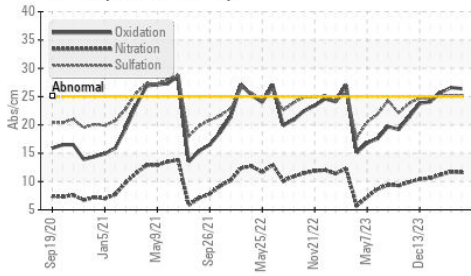
## FLUID DEGRADATION

method	limit/base	current	history1	history2		
Oxidation	Abs/.1mm	*ASTM D7414	>25	<b>26.4</b>	26.6	25.7
Base Number (BN)	mg KOH/g	ASTM D2896	8.5	<b>6.45</b>	6.29	6.53

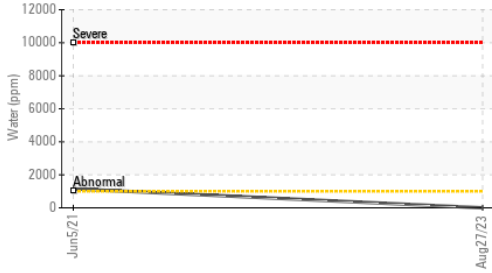


# OIL ANALYSIS REPORT

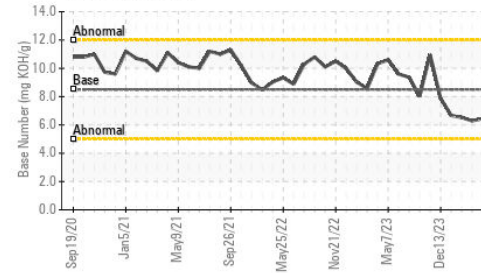
FT-IR (Direct Trend)



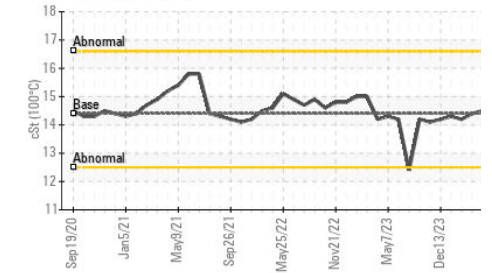
Water (KF)



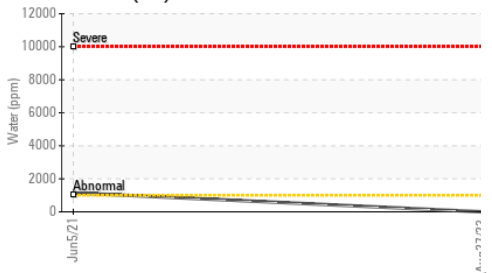
Base Number



Viscosity @ 100°C



Water (KF)

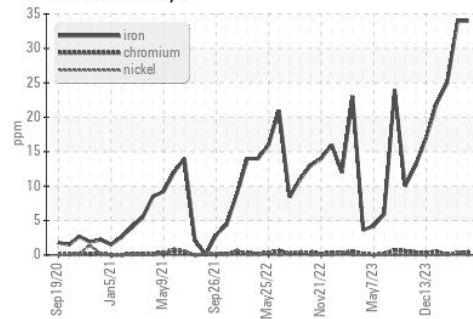


VISUAL	method	limit/base	current	history1	history2
White Metal	scalar	*Visual	NONE	▲ MODER	NONE
Yellow Metal	scalar	*Visual	NONE	NONE	NONE
Precipitate	scalar	*Visual	NONE	NONE	NONE
Silt	scalar	*Visual	NONE	NONE	NONE
Debris	scalar	*Visual	NONE	NONE	NONE
Sand/Dirt	scalar	*Visual	NONE	NONE	NONE
Appearance	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

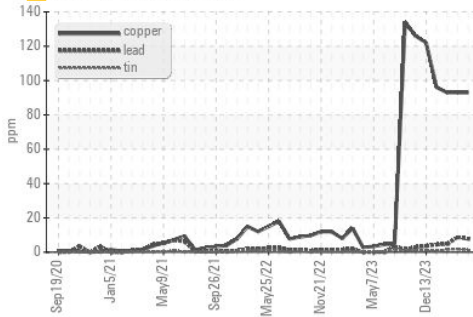
FLUID PROPERTIES	method	limit/base	current	history1	history2
Visc @ 100°C	cSt	ASTM D445	14.4	14.5	14.4

## GRAPHS

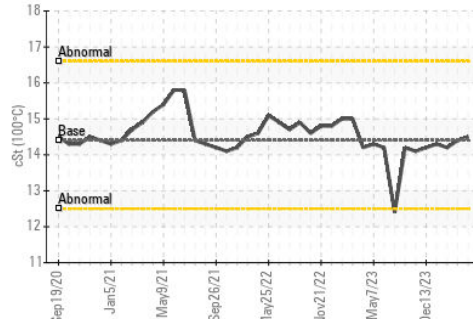
Ferrous Alloys



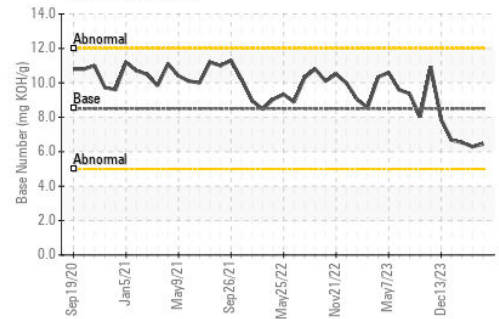
Non-ferrous Metals



Viscosity @ 100°C



Base Number



Certificate L2367

Laboratory : WearCheck USA - 501 Madison Ave., Cary, NC 27513

Sample No. : WC0874610

Lab Number : 06204911

Unique Number : 11072372

Test Package : IND 2 ( Additional Tests: KF )

Received : 10 Jun 2024

Tested : 13 Jun 2024

Diagnosed : 13 Jun 2024 - Sean Felton

MARATHON PETROLEUM CO.

101 12TH ST

CATLETTSBURG, KY

US 41169

Contact: CORY GUMBERT

cagumbert@marathonpetroleum.com

T: (606)585-3950

F: x:

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)