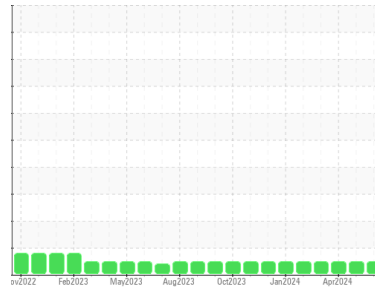




# OIL ANALYSIS REPORT

Sample Rating Trend



**NORMAL**



Area

**West Virginia**

Machine Id

**[West Virginia] Oil - Starboard Main Engine**

Component

**Starboard Main Engine**

Fluid

**MARATHON 15W40 (150 GAL)**

## DIAGNOSIS

### Recommendation

Resample at the next service interval to monitor. ( Customer Sample Comment: Thurman Richardson )

### 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     | <b>WC0874853</b>   | WC0874857   | WC0769379   |
| Sample Date   | Client Info     | <b>09 Jun 2024</b> | 13 May 2024 | 16 Apr 2024 |
| Machine Age   | hrs Client Info | <b>43715</b>       | 43193       | 42634       |
| Oil Age       | hrs Client Info | <b>27</b>          | 927         | 368         |
| Oil Changed   | Client Info     | <b>N/A</b>         | Not Changd  | N/A         |
| Sample Status |                 | <b>NORMAL</b>      | NORMAL      | NORMAL      |

## CONTAMINATION

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

## WEAR METALS

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

## ADDITIVES

| method     | limit/base      | current      | history1 | history2 |
|------------|-----------------|--------------|----------|----------|
| Boron      | ppm ASTM D5185m | <b>11</b>    | 16       | 25       |
| Barium     | ppm ASTM D5185m | <b>0</b>     | <1       | 0        |
| Molybdenum | ppm ASTM D5185m | <b>66</b>    | 64       | 69       |
| Manganese  | ppm ASTM D5185m | <b>&lt;1</b> | <1       | 0        |
| Magnesium  | ppm ASTM D5185m | <b>1626</b>  | 1423     | 1525     |
| Calcium    | ppm ASTM D5185m | <b>1229</b>  | 1183     | 1236     |
| Phosphorus | ppm ASTM D5185m | <b>1197</b>  | 1042     | 1207     |
| Zinc       | ppm ASTM D5185m | <b>1457</b>  | 1246     | 1321     |
| Sulfur     | ppm ASTM D5185m | <b>3995</b>  | 3241     | 3626     |

## CONTAMINANTS

| method    | limit/base          | current    | history1 | history2 |
|-----------|---------------------|------------|----------|----------|
| Silicon   | ppm ASTM D5185m >20 | <b>5</b>   | 4        | 5        |
| Sodium    | ppm ASTM D5185m >75 | <b>4</b>   | 2        | 0        |
| Potassium | ppm ASTM D5185m >20 | <b>1</b>   | 2        | 3        |
| Water     | % ASTM D6304 >0.1   | <b>NEG</b> | NEG      | NEG      |

## INFRA-RED

| method    | limit/base               | current     | history1 | history2 |
|-----------|--------------------------|-------------|----------|----------|
| Soot %    | % *ASTM D7844            | <b>0.1</b>  | 0.2      | 0.1      |
| Nitration | Abs/cm *ASTM D7624 >20   | <b>5.2</b>  | 8.3      | 6.6      |
| Sulfation | Abs/.1mm *ASTM D7415 >30 | <b>17.9</b> | 20.5     | 18.7     |

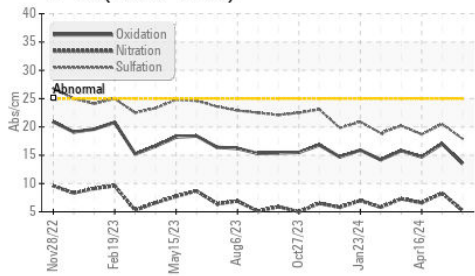
## FLUID DEGRADATION

| method           | limit/base               | current      | history1 | history2 |
|------------------|--------------------------|--------------|----------|----------|
| Oxidation        | Abs/.1mm *ASTM D7414 >25 | <b>13.5</b>  | 17.0     | 14.7     |
| Base Number (BN) | mg KOH/g ASTM D2896      | <b>11.78</b> | 13.30    | 12.23    |



# OIL ANALYSIS REPORT

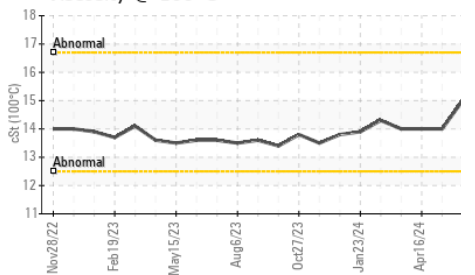
FT-IR (Direct Trend)



Water (KF)



Viscosity @ 100°C



Water (KF)

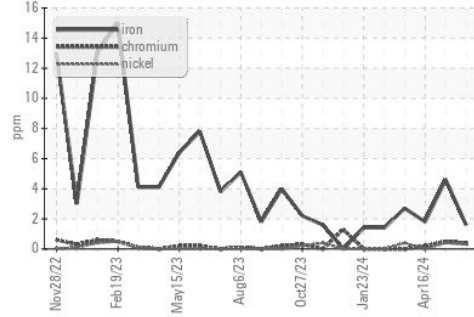


| VISUAL           | method | limit/base | current | history1 | history2 |
|------------------|--------|------------|---------|----------|----------|
| White Metal      | scalar | *Visual    | NONE    | NONE     | NONE     |
| Yellow Metal     | scalar | *Visual    | NONE    | NONE     | NONE     |
| 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      |

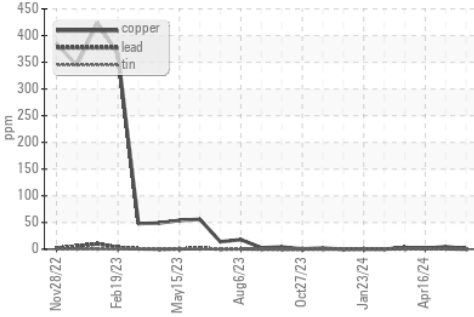
| FLUID PROPERTIES | method | limit/base | current | history1 | history2 |
|------------------|--------|------------|---------|----------|----------|
| Visc @ 100°C     | cSt    | ASTM D445  | 15.0    | 14.0     | 14.0     |

## GRAPHS

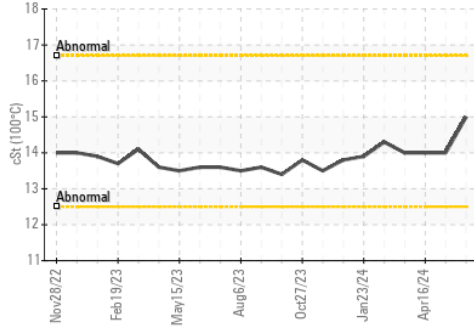
Ferrous Alloys



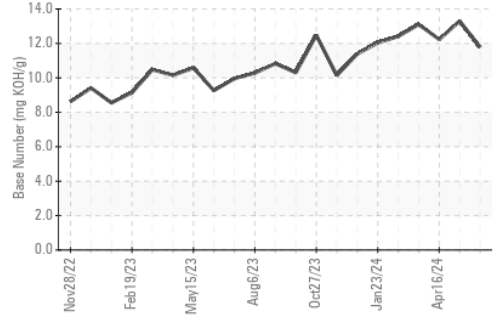
Non-ferrous Metals



Viscosity @ 100°C



Base Number



**Laboratory** : WearCheck USA - 501 Madison Ave., Cary, NC 27513  
**Sample No.** : WC0874853      **Received** : 14 Jun 2024  
**Lab Number** : 06210367      **Tested** : 18 Jun 2024  
**Unique Number** : 11083231      **Diagnosed** : 18 Jun 2024 - Don Baldrige  
**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)