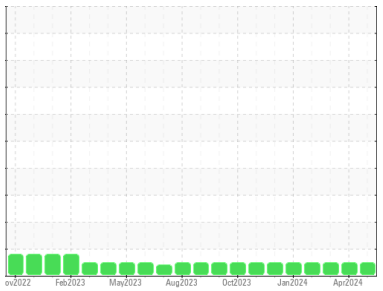
# OIL ANALYSIS REPORT

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.

**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 | | **WC0874857** | WC0769379 | WC0874785 |
| Sample Date | | Client Info | | **13 May 2024** | 16 Apr 2024 | 17 Mar 2024 |
| Machine Age | hrs | Client Info | | **43193** | 42634 | 42100 |
| Oil Age | hrs | Client Info | | **927** | 368 | 746 |
| Oil Changed | | Client Info | | **Not Changd** | N/A | Not Changd |
| 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 | 3 |
| Chromium | ppm | ASTM D5185m | >8 | **<1** | <1 | 0 |
| Nickel | ppm | ASTM D5185m | >2 | **<1** | 0 | <1 |
| Titanium | ppm | ASTM D5185m | >3 | **<1** | <1 | 0 |
| Silver | ppm | ASTM D5185m | >2 | **<1** | <1 | 0 |
| Aluminum | ppm | ASTM D5185m | >15 | **2** | 3 | 2 |
| Lead | ppm | ASTM D5185m | >18 | **<1** | 2 | <1 |
| Copper | ppm | ASTM D5185m | >80 | **5** | 2 | 3 |
| Tin | ppm | ASTM D5185m | >14 | **<1** | 1 | <1 |
| Vanadium | ppm | ASTM D5185m | | **<1** | <1 | 0 |
| Cadmium | ppm | ASTM D5185m | | **<1** | <1 | 0 |

| ADDITIVES | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Boron | ppm | ASTM D5185m | | **16** | 25 | 43 |
| Barium | ppm | ASTM D5185m | | **<1** | 0 | 0 |
| Molybdenum | ppm | ASTM D5185m | | **64** | 69 | 68 |
| Manganese | ppm | ASTM D5185m | | **<1** | 0 | <1 |
| Magnesium | ppm | ASTM D5185m | | **1423** | 1525 | 1401 |
| Calcium | ppm | ASTM D5185m | | **1183** | 1236 | 1188 |
| Phosphorus | ppm | ASTM D5185m | | **1042** | 1207 | 1070 |
| Zinc | ppm | ASTM D5185m | | **1246** | 1321 | 1258 |
| Sulfur | ppm | ASTM D5185m | | **3241** | 3626 | 3820 |

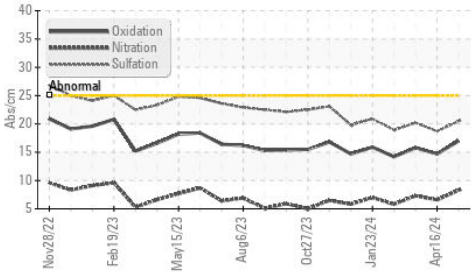
| CONTAMINANTS | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Silicon | ppm | ASTM D5185m | >20 | **4** | 5 | 3 |
| Sodium | ppm | ASTM D5185m | >75 | **2** | 0 | 2 |
| Potassium | ppm | ASTM D5185m | >20 | **2** | 3 | 2 |
| Water | % | ASTM D6304 | >0.1 | **NEG**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

| INFRA-RED | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Soot % | % | *ASTM D7844 | | **0.2** | 0.1 | 0.1 |
| Nitration | Abs/cm | *ASTM D7624 | >20 | **8.3** | 6.6 | 7.3 |
| Sulfation | Abs/.1mm | *ASTM D7415 | >30 | **20.5** | 18.7 | 20.2 |

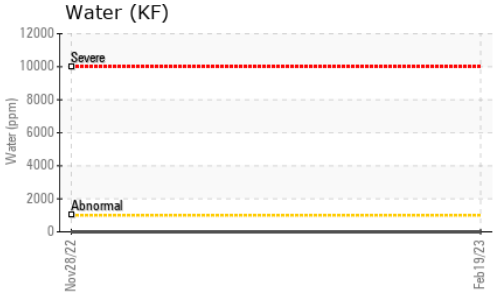
| FLUID DEGRADATION | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Oxidation | Abs/.1mm | *ASTM D7414 | >25 | **17.0** | 14.7 | 15.8 |
| Base Number (BN) | mg KOH/g | ASTM D2896 | | **13.30** | 12.23 | 13.10 |

# OIL ANALYSIS REPORT

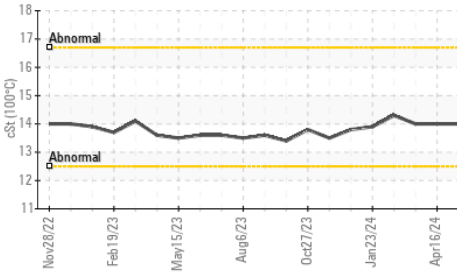
FT-IR (Direct Trend)



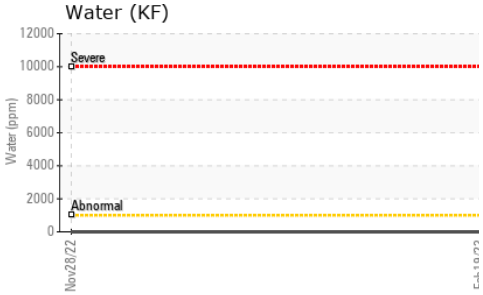

Water (KF)




Viscosity @ 100°C




Water (KF)

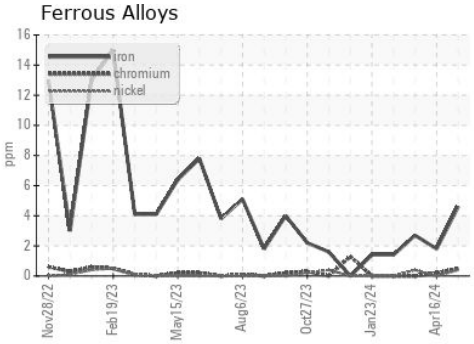



| VISUAL | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| White Metal | scalar | *Visual | NONE | **NONE** | NONE | NONE |
| Yellow Metal | scalar | *Visual | NONE | **NONE** | NONE | NONE |
| Precipitate | scalar | *Visual | NONE | **NONE** | NONE | NONE |
|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

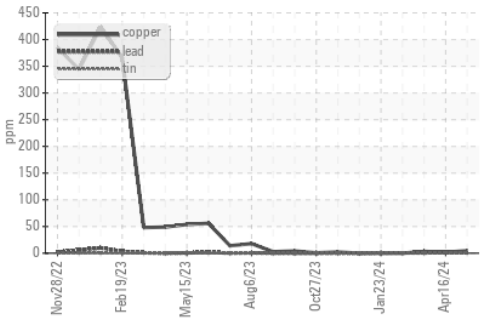
| FLUID PROPERTIES | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Visc @ 100°C | cSt | ASTM D445 | | **14.0** | 14.0 | 14.0 |

## GRAPHS

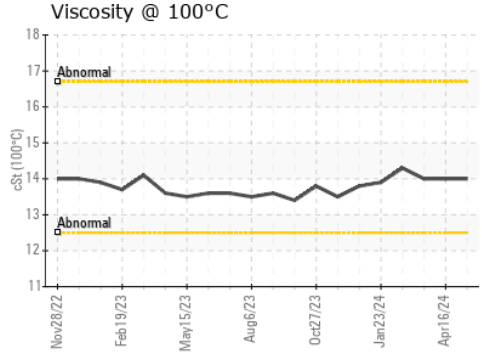
Ferrous Alloys



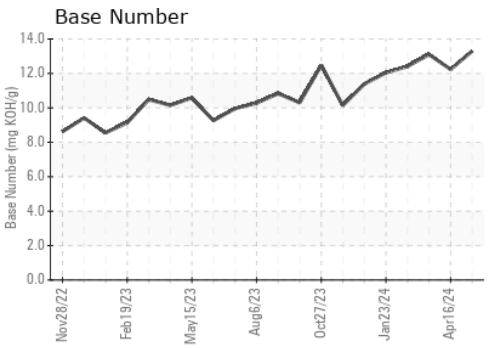

Non-ferrous Metals




Viscosity @ 100°C




Base Number




Certificate L2367

**Laboratory** : WearCheck USA - 501 Madison Ave., Cary, NC 27513
**Sample No.** : WC0874857 **Received** : 16 May 2024
**Lab Number** : 06181552 **Tested** : 20 May 2024
**Unique Number** : 11032878 **Diagnosed** : 20 May 2024 - Sean Felton
**Test Package** : IND 2 ( Additional Tests: KF )

*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)*

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