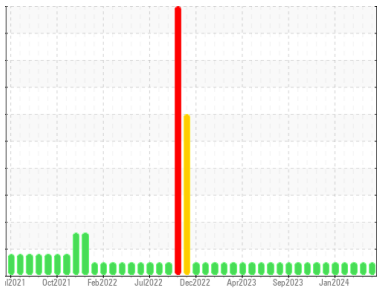
# OIL ANALYSIS REPORT

Sample Rating Trend



NORMAL

Area
**Findlay**
Machine Id
## [Findlay] Oil - Starboard Main Engine
Component
**Starboard Main Engine**
Fluid
**MOBIL 15W40 (220 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 | | **WC0874650** | WC0874643 | WC0874735 |
| Sample Date | | Client Info | | **18 Jun 2024** | 14 May 2024 | 23 Apr 2024 |
| Machine Age | hrs | Client Info | | **14075** | 13739 | 13316 |
| Oil Age | hrs | Client Info | | **10918** | 10582 | 10129 |
| Oil Changed | | Client Info | | **Filtered** | Filtered | 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 | **13** | 13 | 12 |
| Chromium | ppm | ASTM D5185m | >8 | **<1** | <1 | <1 |
| Nickel | ppm | ASTM D5185m | >2 | **1** | <1 | <1 |
| Titanium | ppm | ASTM D5185m | >3 | **0** | 0 | <1 |
| Silver | ppm | ASTM D5185m | >2 | **0** | 0 | <1 |
| Aluminum | ppm | ASTM D5185m | >15 | **2** | 2 | 3 |
| Lead | ppm | ASTM D5185m | >18 | **15** | 16 | 16 |
| Copper | ppm | ASTM D5185m | >80 | **35** | 34 | 40 |
| Tin | ppm | ASTM D5185m | >14 | **0** | 1 | 2 |
| 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 | | **26** | 30 | 27 |
| Barium | ppm | ASTM D5185m | | **0** | 0 | 0 |
| Molybdenum | ppm | ASTM D5185m | | **52** | 53 | 54 |
| Manganese | ppm | ASTM D5185m | | **<1** | <1 | <1 |
| Magnesium | ppm | ASTM D5185m | | **1343** | 1336 | 1310 |
| Calcium | ppm | ASTM D5185m | | **1596** | 1580 | 1605 |
| Phosphorus | ppm | ASTM D5185m | | **1125** | 1084 | 1227 |
| Zinc | ppm | ASTM D5185m | | **1416** | 1421 | 1387 |
| Sulfur | ppm | ASTM D5185m | | **3296** | 3343 | 3034 |

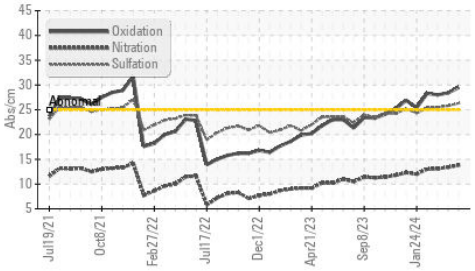
| CONTAMINANTS | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Silicon | ppm | ASTM D5185m | >20 | **3** | 3 | 4 |
| Sodium | ppm | ASTM D5185m | >118 | **4** | 3 | 1 |
| Potassium | ppm | ASTM D5185m | >20 | **3** | 3 | 5 |
| Water | % | ASTM D6304 | >0.1 | **NEG** | NEG | NEG |

| INFRA-RED | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Soot % | % | *ASTM D7844 | | **0.1** | 0.1 | 0.1 |
| Nitration | Abs/cm | *ASTM D7624 | >20 | **13.8** | 13.4 | 13.1 |
| Sulfation | Abs/.1mm | *ASTM D7415 | >30 | **26.3** | 25.8 | 25.5 |

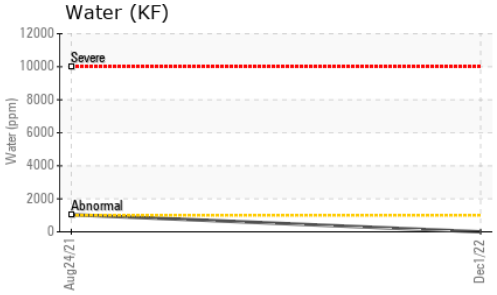
| FLUID DEGRADATION | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Oxidation | Abs/.1mm | *ASTM D7414 | >25 | **29.5** | 28.4 | 28.0 |
| Base Number (BN) | mg KOH/g | ASTM D2896 | | **8.51** | 8.73 | 8.86 |

# OIL ANALYSIS REPORT

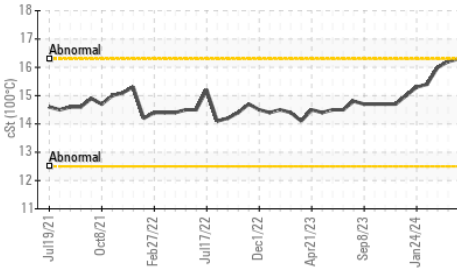
FT-IR (Direct Trend)



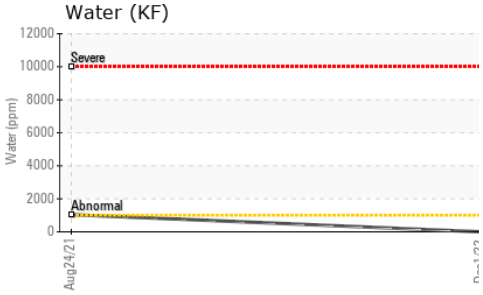

Water (KF)




Viscosity @ 100°C




Water (KF)

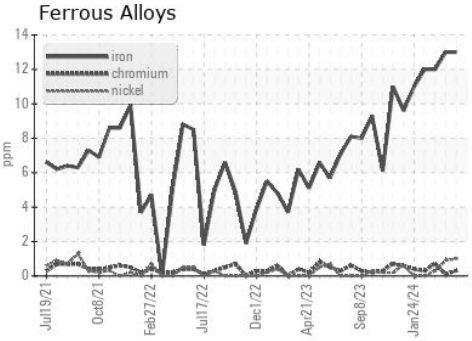



| VISUAL | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| White Metal | scalar | *Visual | NONE | **NONE** | NONE | NONE |
| Yellow Metal | scalar | *Visual | NONE | **NONE** | NONE | NONE |
| Precipitate | scalar | *Visual | NONE | **NONE** | NONE | NONE |
|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

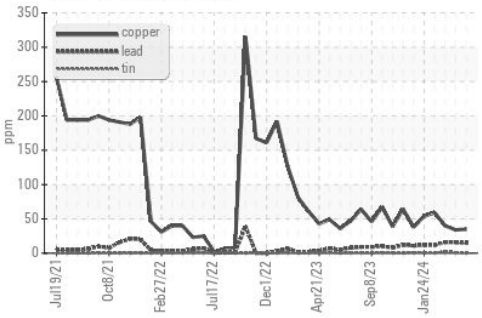
| FLUID PROPERTIES | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Visc @ 100°C | cSt | ASTM D445 | | **16.3** | 16.2 | 16.0 |

## GRAPHS

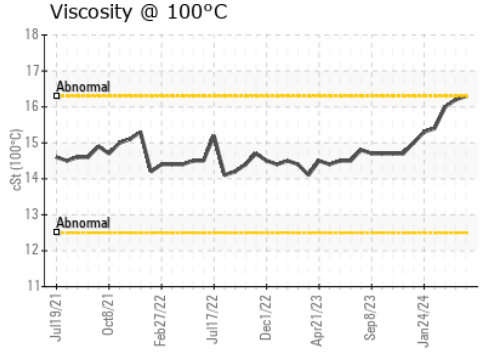
Ferrous Alloys



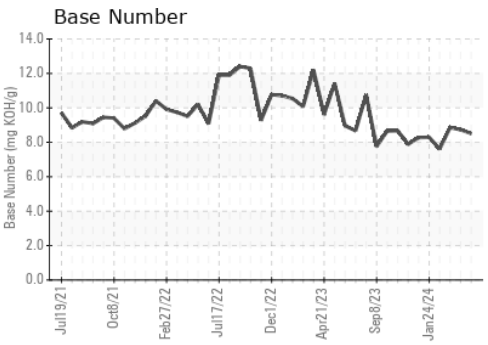

Non-ferrous Metals




Viscosity @ 100°C




Base Number




Certificate L2367

**Laboratory** : WearCheck USA - 501 Madison Ave., Cary, NC 27513
**Sample No.** : WC0874650 **Received** : 25 Jun 2024
**Lab Number** : 06219916 **Tested** : 26 Jun 2024
**Unique Number** : 11098113 **Diagnosed** : 26 Jun 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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Report Id: MARCAT [WUSCAR] 06219916 (Generated: 06/30/2024 15:39:34) Rev: 1

Submitted By: M/V FINDLAY