

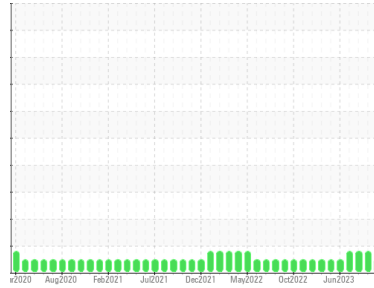


OIL ANALYSIS REPORT



Area
Map Runner
Machine Id
[Map Runner] Oil - Starboard Main Engine
Component
Starboard Main Engine
Fluid
DIESEL ENGINE OIL SAE 15W40 (37 GAL)

Sample Rating Trend



NORMAL



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 acceptable for the time in service.

SAMPLE INFORMATION

| | method | limit/base | current | history1 | history2 |
|---------------|-------------|-------------|--------------------|-------------|-------------|
| Sample Number | Client Info | | WC0846090 | WC0719211 | WC0805266 |
| Sample Date | Client Info | | 24 Oct 2023 | 27 Sep 2023 | 30 Aug 2023 |
| Machine Age | hrs | Client Info | 3443 | 2867 | 2267 |
| Oil Age | hrs | Client Info | 535 | 1313 | 713 |
| Oil Changed | Client Info | | Changed | Not Changd | Oil Added |
| Sample Status | | | NORMAL | ABNORMAL | ABNORMAL |

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 | 7 | 21 | 11 |
| Chromium | ppm | ASTM D5185m >8 | <1 | 0 | 0 |
| Nickel | ppm | ASTM D5185m >2 | <1 | 0 | 0 |
| Titanium | ppm | ASTM D5185m >3 | <1 | <1 | <1 |
| Silver | ppm | ASTM D5185m >2 | 0 | 0 | 0 |
| Aluminum | ppm | ASTM D5185m >15 | 2 | <1 | <1 |
| Lead | ppm | ASTM D5185m >18 | 0 | 3 | 3 |
| Copper | ppm | ASTM D5185m >80 | 73 | ▲ 215 | ▲ 316 |
| Tin | ppm | ASTM D5185m >14 | <1 | <1 | <1 |
| Vanadium | ppm | ASTM D5185m | <1 | 0 | <1 |
| Cadmium | ppm | ASTM D5185m | <1 | 0 | 0 |

ADDITIVES

| | method | limit/base | current | history1 | history2 |
|------------|--------|------------------|--------------|----------|----------|
| Boron | ppm | ASTM D5185m 250 | 2 | 2 | 3 |
| Barium | ppm | ASTM D5185m 10 | <1 | 0 | 0 |
| Molybdenum | ppm | ASTM D5185m 100 | 67 | 66 | 65 |
| Manganese | ppm | ASTM D5185m | 0 | <1 | <1 |
| Magnesium | ppm | ASTM D5185m 450 | 1483 | 1560 | 1516 |
| Calcium | ppm | ASTM D5185m 3000 | 1123 | 1224 | 1221 |
| Phosphorus | ppm | ASTM D5185m 1150 | 1109 | 1054 | 1083 |
| Zinc | ppm | ASTM D5185m 1350 | 1342 | 1358 | 1307 |
| Sulfur | ppm | ASTM D5185m 4250 | 4016 | 3057 | 3963 |

CONTAMINANTS

| | method | limit/base | current | history1 | history2 |
|-----------|--------|------------------|----------|----------|----------|
| Silicon | ppm | ASTM D5185m >20 | 3 | 4 | 3 |
| Sodium | ppm | ASTM D5185m >158 | 3 | 3 | 3 |
| Potassium | ppm | ASTM D5185m >20 | 2 | <1 | 0 |

INFRA-RED

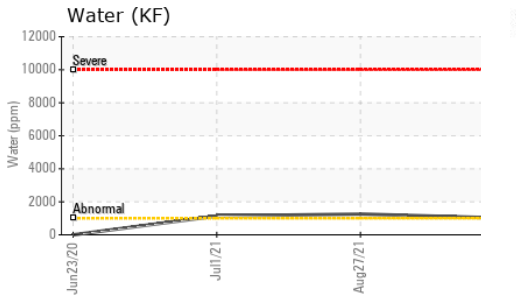
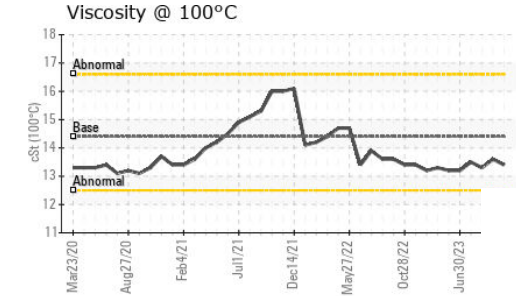
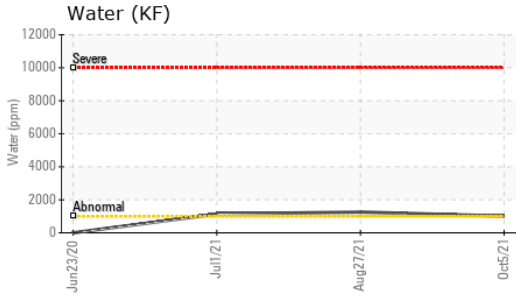
| | method | limit/base | current | history1 | history2 |
|-----------|----------|-----------------|-------------|----------|----------|
| Soot % | % | *ASTM D7844 | 0.2 | 0.4 | 0.2 |
| Nitration | Abs/cm | *ASTM D7624 >20 | 7.8 | 9.6 | 8.4 |
| Sulfation | Abs/.1mm | *ASTM D7415 >30 | 20.4 | 22.2 | 20.9 |

FLUID DEGRADATION

| | method | limit/base | current | history1 | history2 |
|------------------|----------|-----------------|--------------|----------|----------|
| Oxidation | Abs/.1mm | *ASTM D7414 >25 | 16.2 | 19.5 | 17.0 |
| Base Number (BN) | mg KOH/g | ASTM D2896 8.5 | 15.30 | 10.83 | 12.11 |



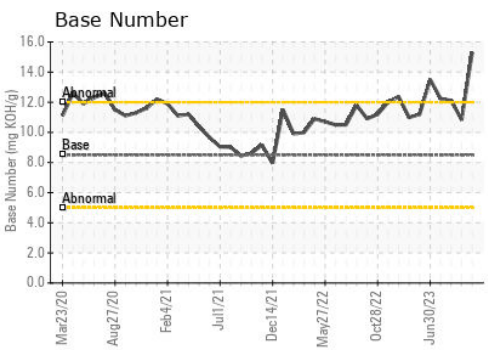
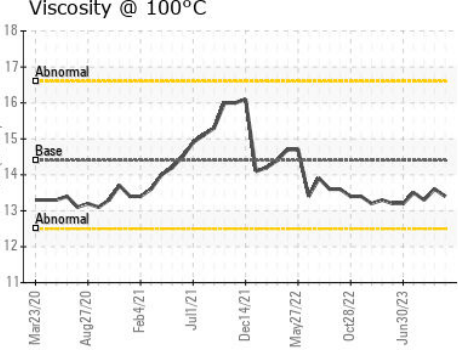
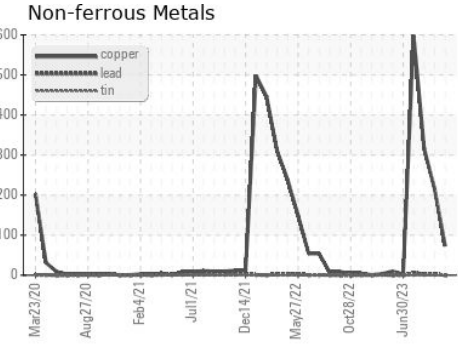
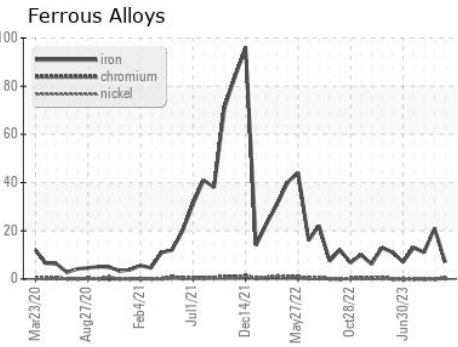
OIL ANALYSIS REPORT



| 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 | 13.4 | 13.6 | 13.3 |

GRAPHS



Certificate L2367

Laboratory : WearCheck USA - 501 Madison Ave., Cary, NC 27513
Sample No. : WC0846090
Lab Number : 05995892
Unique Number : 10724252
Test Package : IND 2 (Additional Tests: KF)

Received : 01 Nov 2023
Diagnosed : 02 Nov 2023
Diagnostician : Sean Felton

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)

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