

# **OIL ANALYSIS REPORT**

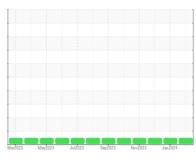
Area

# Huntington [Huntington] Oil - Starboard Main Engine

Starboard Main Engine

Starboard Walli El

**DIESEL ENGINE OIL SAE 15W40 (165 GAL)** 



Sample Rating Trend



# 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

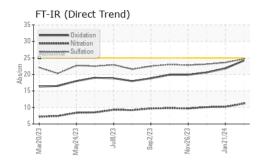
# **Fluid Condition**

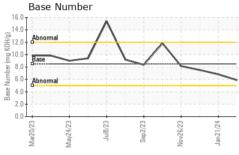
The BN result indicates that there is suitable alkalinity remaining in the oil. The condition of the oil is suitable for further service.

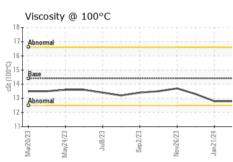
| Sample Number         Client Info         WC0874743         WC0804930         WC0845900           Sample Date         Client Info         19 Mar 2024         21 Jan 2024         23 Dec 2023           Machine Age         hrs         Client Info         21029         19870         19258           Oil Age         hrs         Client Info         Not Changd         Not Changd         N/A           Sample Status         NorMAL         NORMAL         NORMAL         NORMAL         NORMAL           CONTAMINATION         method         limit/base         current         history1         history2           Fuel         WC Method         >4.0         <1.0   | 044401 5 1115004  | AATION   |  | 11 1.0   |  |  |   |
|---|---|--|--|--|--|--|---|
| Sample Date   | SAMPLE INFORM   | MATION   | method   | limit/base   | current  | history1   | history2  |
| Machine Age         hrs         Client Info         21029         19870         19258           Oil Age         hrs         Client Info         0         0         0           Oil Changed         Client Info         Not Changd         Not Changd         N/A           Sample Status         NoRMAL         NORMAL         NORMAL         NORMAL           CONTAMINATION         method         Imit base         current         history1         history2           Fuel         WC Method         44.0         <1.0         <1.0         <1.0         <1.0           Glycol         WC Method         Imit base         current         history1         history2           Iron         ppm         ASTM 05185m         >8         0         <1         <1           Nickel         ppm         ASTM 05185m         >8         0         <1         <1           Nickel         ppm         ASTM 05185m         >2         0         <1         <1           Alluminum         ppm         ASTM 05185m         >2         0         <1         <1           Alluminum         ppm         ASTM 05185m         >8         6         9         6           Copper  | Sample Number   |  | Client Info  |  | WC0874743  | WC0804930  | WC0845900   |
| Oil Age         hrs         Client Info         Not Changd         Not Changd Not Ch | Sample Date   |  | Client Info  |  | 19 Mar 2024  | 21 Jan 2024  | 23 Dec 2023   |
| Oil Changed Sample Status   | Machine Age   | hrs  | Client Info  |  | 21029  | 19870  | 19258   |
| NORMAL   NORMAL   NORMAL   CONTAMINATION   method   limit/base   current   history1   history2   history2   | Oil Age   | hrs  | Client Info  |  | 0  | 0  | 0   |
| CONTAMINATION   | Oil Changed   |  | Client Info  |  | Not Changd   | Not Changd   | N/A   |
| Fuel  | Sample Status   |  |  |  | NORMAL   | NORMAL   | NORMAL  |
| WEAR METALS   | CONTAMINATION   | V  | method   | limit/base   | current  | history1   | history2  |
| WEAR METALS         method         limit/base         current         history1         history2           Iron         ppm         ASTM D5185m         >75         20         15         13           Chromium         ppm         ASTM D5185m         >8         0         <1         <1           Nickel         ppm         ASTM D5185m         >2         0         <1         <1           Titanium         ppm         ASTM D5185m         >3         0         <1         <1           Aluminum         ppm         ASTM D5185m         >2         0         <1         0           Aluminum         ppm         ASTM D5185m         >2         0         <1         0           Aluminum         ppm         ASTM D5185m         >15         2         3         2           Lead         ppm         ASTM D5185m         >80         12         17         6           Copper         ppm         ASTM D5185m         >80         12         17         6           Tin         ppm         ASTM D5185m         >80         12         17         6           Tin         ppm         ASTM D5185m         0         <1         <1  | Fuel  |  | WC Method  | >4.0   | <1.0   | <1.0   | <1.0  |
| Iron  | Glycol  |  | WC Method  |  | NEG  | NEG  | NEG   |
| Chromium         ppm         ASTM D5185m         >8         0         <1  | WEAR METALS   |  | method   | limit/base   | current  | history1   | history2  |
| Nickel  | Iron  | ppm  | ASTM D5185m  | >75  | 20   | 15   | 13  |
| Titanium  | Chromium  | ppm  | ASTM D5185m  | >8   | 0  | <1   | <1  |
| Silver  | Nickel  | ppm  | ASTM D5185m  | >2   | 0  | <1   | <1  |
| Aluminum         ppm         ASTM D5185m         >15         2         3         2           Lead         ppm         ASTM D5185m         >18         6         9         6           Copper         ppm         ASTM D5185m         >80         12         17         6           Tin         ppm         ASTM D5185m         >14         <1   | Titanium  | ppm  | ASTM D5185m  | >3   | 0  | <1   | <1  |
| Lead  | Silver  | ppm  | ASTM D5185m  | >2   | 0  | <1   | 0   |
| Copper         ppm         ASTM D5185m         >80         12         17         6           Tin         ppm         ASTM D5185m         >14         <1   | Aluminum  | ppm  | ASTM D5185m  | >15  | 2  | 3  | 2   |
| Tin   | Lead  | ppm  | ASTM D5185m  | >18  | 6  | 9  | 6   |
| Vanadium         ppm         ASTM D5185m         0         <1         0           Cadmium         ppm         ASTM D5185m         0         <1         <1           ADDITIVES         method         limit/base         current         history1         history2           Boron         ppm         ASTM D5185m         250         77         96         95           Barium         ppm         ASTM D5185m         10         0         0         2           Molybdenum         ppm         ASTM D5185m         100         80         87         85           Manganese         ppm         ASTM D5185m         100         80         87         85           Magnesium         ppm         ASTM D5185m         450         833         823         806           Calcium         ppm         ASTM D5185m         3000         1364         1392         1382           Phosphorus         ppm         ASTM D5185m         1150         777         773         779           Zinc         ppm         ASTM D5185m         1350         967         974         969           Sulfur         ppm         ASTM D5185m         >20         6         4  | Copper  | ppm  | ASTM D5185m  | >80  | 12   | 17   | 6   |
| Cadmium         ppm         ASTM D5185m         0         <1         <1           ADDITIVES         method         limit/base         current         history1         history2           Boron         ppm         ASTM D5185m         250         77         96         95           Barium         ppm         ASTM D5185m         10         0         0         2           Molydenum         ppm         ASTM D5185m         100         80         87         85           Manganese         ppm         ASTM D5185m         100         80         87         85           Magnesium         ppm         ASTM D5185m         100         833         823         806           Calcium         ppm         ASTM D5185m         450         833         823         806           Calcium         ppm         ASTM D5185m         3000         1364         1392         1382           Phosphorus         ppm         ASTM D5185m         1150         777         773         779           Zinc         ppm         ASTM D5185m         1350         967         974         969           Sulfur         ppm         ASTM D5185m         >20         6 <td>Tin</td> <td>ppm</td> <td>ASTM D5185m</td> <td>&gt;14</td> <th>&lt;1</th> <td>1</td> <td>&lt;1</td>   | Tin   | ppm  | ASTM D5185m  | >14  | <1   | 1  | <1  |
| ADDITIVES   | Vanadium  | ppm  | ASTM D5185m  |  | 0  | <1   | 0   |
| Boron   | Cadmium   | ppm  | ASTM D5185m  |  | 0  | <1   | <1  |
| Barium         ppm         ASTM D5185m         10         0         0         2           Molybdenum         ppm         ASTM D5185m         100         80         87         85           Manganese         ppm         ASTM D5185m         100         833         823         806           Calcium         ppm         ASTM D5185m         3000         1364         1392         1382           Phosphorus         ppm         ASTM D5185m         1150         777         773         779           Zinc         ppm         ASTM D5185m         1350         967         974         969           Sulfur         ppm         ASTM D5185m         4250         3086         2690         2931           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >20         6         4         5           Sodium         ppm         ASTM D5185m         >20         <1         4         2           Water         %         ASTM D5185m         >20         <1         NEG         NEG           INFRA-RED         method         limit/base  | A D D IT IVEO   |  |  |  |  |  |   |
| Molybdenum         ppm         ASTM D5185m         100         80         87         85           Manganese         ppm         ASTM D5185m         < 1   | ADDITIVES   |  | method   | limit/base   | current  | history1   | history2  |
| Manganese         ppm         ASTM D5185m         <1  |   | ppm  |  |  |  |  |   |
| Magnesium         ppm         ASTM D5185m         450         833         823         806           Calcium         ppm         ASTM D5185m         3000         1364         1392         1382           Phosphorus         ppm         ASTM D5185m         1150         777         773         779           Zinc         ppm         ASTM D5185m         1350         967         974         969           Sulfur         ppm         ASTM D5185m         4250         3086         2690         2931           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >20         6         4         5           Sodium         ppm         ASTM D5185m         >158         4         7         2           Potassium         ppm         ASTM D5185m         >20         <1         4         2           Water         %         ASTM D6304         >0.1         NEG         NEG         NEG           INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7844   | Boron   |  | ASTM D5185m  | 250  | 77   | 96   | 95  |
| Calcium         ppm         ASTM D5185m         3000         1364         1392         1382           Phosphorus         ppm         ASTM D5185m         1150         777         773         779           Zinc         ppm         ASTM D5185m         1350         967         974         969           Sulfur         ppm         ASTM D5185m         4250         3086         2690         2931           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >20         6         4         5           Sodium         ppm         ASTM D5185m         >158         4         7         2           Potassium         ppm         ASTM D5185m         >20         <1         4         2           Water         %         ASTM D6304         >0.1         NEG         NEG         NEG           INFRA-RED         method         limit/base         current         history1         history2           Soot %         "ASTM D7624         >20         11.2         10.2         10.1           Sulfation         Abs/.1mm         "ASTM D7415         >30   | Boron<br>Barium   | ppm  | ASTM D5185m<br>ASTM D5185m   | 250<br>10  | 77<br>0  | 96<br>0  | 95<br>2   |
| Phosphorus         ppm         ASTM D5185m         1150         777         773         779           Zinc         ppm         ASTM D5185m         1350         967         974         969           Sulfur         ppm         ASTM D5185m         4250         3086         2690         2931           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >20         6         4         5           Sodium         ppm         ASTM D5185m         >158         4         7         2           Potassium         ppm         ASTM D5185m         >20         <1  | Boron<br>Barium<br>Molybdenum   | ppm<br>ppm   | ASTM D5185m<br>ASTM D5185m<br>ASTM D5185m  | 250<br>10  | 77<br>0<br>80  | 96<br>0<br>87  | 95<br>2<br>85   |
| Zinc         ppm         ASTM D5185m         1350         967         974         969           Sulfur         ppm         ASTM D5185m         4250         3086         2690         2931           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >20         6         4         5           Sodium         ppm         ASTM D5185m         >158         4         7         2           Potassium         ppm         ASTM D5185m         >20         <1  | Boron<br>Barium<br>Molybdenum   | ppm<br>ppm   | ASTM D5185m<br>ASTM D5185m<br>ASTM D5185m<br>ASTM D5185m   | 250<br>10<br>100   | 77<br>0<br>80<br><1  | 96<br>0<br>87<br>2   | 95<br>2<br>85<br><1   |
| Sulfur         ppm         ASTM D5185m         4250         3086         2690         2931           CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >20         6         4         5           Sodium         ppm         ASTM D5185m         >158         4         7         2           Potassium         ppm         ASTM D5185m         >20         <1         4         2           Water         %         ASTM D6304         >0.1         NEG         NEG         NEG           INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7844         0.3         0.3         0.3           Nitration         Abs/cm         *ASTM D7624         >20         11.2         10.2         10.1           Sulfation         Abs/.1mm         *ASTM D7415         >30         24.7         23.6         23.1           FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25  | Boron<br>Barium<br>Molybdenum<br>Manganese<br>Magnesium   | ppm<br>ppm<br>ppm  | ASTM D5185m<br>ASTM D5185m<br>ASTM D5185m<br>ASTM D5185m<br>ASTM D5185m  | 250<br>10<br>100<br>450  | 77<br>0<br>80<br><1<br>833   | 96<br>0<br>87<br>2<br>823  | 95<br>2<br>85<br><1<br>806  |
| CONTAMINANTS         method         limit/base         current         history1         history2           Silicon         ppm         ASTM D5185m         >20         6         4         5           Sodium         ppm         ASTM D5185m         >158         4         7         2           Potassium         ppm         ASTM D5185m         >20         <1         4         2           Water         %         ASTM D6304         >0.1         NEG         NEG         NEG           INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7844         0.3         0.3         0.3           Nitration         Abs/cm         *ASTM D7624         >20         11.2         10.2         10.1           Sulfation         Abs/.1mm         *ASTM D7415         >30         24.7         23.6         23.1           FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         24.2         21.8         20.6  | Boron Barium Molybdenum Manganese Magnesium Calcium   | ppm<br>ppm<br>ppm<br>ppm   | ASTM D5185m<br>ASTM D5185m<br>ASTM D5185m<br>ASTM D5185m<br>ASTM D5185m<br>ASTM D5185m   | 250<br>10<br>100<br>450<br>3000  | 77<br>0<br>80<br><1<br>833<br>1364   | 96<br>0<br>87<br>2<br>823<br>1392  | 95<br>2<br>85<br><1<br>806<br>1382  |
| Silicon         ppm         ASTM D5185m         >20         6         4         5           Sodium         ppm         ASTM D5185m         >158         4         7         2           Potassium         ppm         ASTM D5185m         >20         <1  | Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus  | ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm                             | ASTM D5185m<br>ASTM D5185m<br>ASTM D5185m<br>ASTM D5185m<br>ASTM D5185m<br>ASTM D5185m<br>ASTM D5185m  | 250<br>10<br>100<br>450<br>3000<br>1150                                    | 77<br>0<br>80<br><1<br>833<br>1364<br>777  | 96<br>0<br>87<br>2<br>823<br>1392<br>773   | 95<br>2<br>85<br><1<br>806<br>1382<br>779   |
| Sodium         ppm         ASTM D5185m         >158         4         7         2           Potassium         ppm         ASTM D5185m         >20         <1         4         2           Water         %         ASTM D6304         >0.1         NEG         NEG         NEG           INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7844         0.3         0.3         0.3           Nitration         Abs/cm         *ASTM D7624         >20         11.2         10.2         10.1           Sulfation         Abs/.1mm         *ASTM D7415         >30         24.7         23.6         23.1           FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         24.2         21.8         20.6   | Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc   | ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm                             | ASTM D5185m<br>ASTM D5185m<br>ASTM D5185m<br>ASTM D5185m<br>ASTM D5185m<br>ASTM D5185m<br>ASTM D5185m<br>ASTM D5185m   | 250<br>10<br>100<br>450<br>3000<br>1150                                    | 77<br>0<br>80<br><1<br>833<br>1364<br>777<br>967                                     | 96<br>0<br>87<br>2<br>823<br>1392<br>773<br>974                                    | 95<br>2<br>85<br><1<br>806<br>1382<br>779<br>969                                  |
| Potassium         ppm         ASTM D5185m         >20         <1  | Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur  | ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm                      | ASTM D5185m<br>ASTM D5185m<br>ASTM D5185m<br>ASTM D5185m<br>ASTM D5185m<br>ASTM D5185m<br>ASTM D5185m<br>ASTM D5185m<br>ASTM D5185m  | 250<br>10<br>100<br>450<br>3000<br>1150<br>1350<br>4250                    | 77<br>0<br>80<br><1<br>833<br>1364<br>777<br>967<br>3086                             | 96<br>0<br>87<br>2<br>823<br>1392<br>773<br>974<br>2690                            | 95<br>2<br>85<br><1<br>806<br>1382<br>779<br>969<br>2931                          |
| Water         %         ASTM D6304         >0.1         NEG         NEG         NEG           INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7844         0.3         0.3         0.3           Nitration         Abs/cm         *ASTM D7624         >20         11.2         10.2         10.1           Sulfation         Abs/.1mm         *ASTM D7415         >30         24.7         23.6         23.1           FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         24.2         21.8         20.6  | Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS   | ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm                      | ASTM D5185m  | 250<br>10<br>100<br>450<br>3000<br>1150<br>1350<br>4250<br>limit/base      | 77 0 80 <1 833 1364 777 967 3086   | 96<br>0<br>87<br>2<br>823<br>1392<br>773<br>974<br>2690<br>history1                | 95<br>2<br>85<br><1<br>806<br>1382<br>779<br>969<br>2931<br>history2              |
| INFRA-RED         method         limit/base         current         history1         history2           Soot %         %         *ASTM D7844         0.3         0.3         0.3           Nitration         Abs/cm         *ASTM D7624         >20         11.2         10.2         10.1           Sulfation         Abs/.1mm         *ASTM D7415         >30         24.7         23.6         23.1           FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         24.2         21.8         20.6  | Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon   | ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm               | ASTM D5185m  | 250 10 100 450 3000 1150 1350 4250 limit/base >20                          | 77 0 80 <1 833 1364 777 967 3086 current 6   | 96<br>0<br>87<br>2<br>823<br>1392<br>773<br>974<br>2690<br>history1                | 95 2 85 <1 806 1382 779 969 2931 history2   |
| Soot %         %         *ASTM D7844         0.3         0.3         0.3           Nitration         Abs/cm         *ASTM D7624         >20         11.2         10.2         10.1           Sulfation         Abs/.1mm         *ASTM D7415         >30         24.7         23.6         23.1           FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         24.2         21.8         20.6  | Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium  | ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm               | ASTM D5185m  | 250 10 100 450 3000 1150 1350 4250 limit/base >20 >158                     | 77 0 80 <1 833 1364 777 967 3086  current 6 4  | 96<br>0<br>87<br>2<br>823<br>1392<br>773<br>974<br>2690<br>history1<br>4           | 95 2 85 <1 806 1382 779 969 2931 history2 5                                       |
| Nitration         Abs/cm         *ASTM D7624         >20         11.2         10.2         10.1           Sulfation         Abs/.1mm         *ASTM D7415         >30         24.7         23.6         23.1           FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         24.2         21.8         20.6   | Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium  | ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm        | ASTM D5185m  | 250 10 100 450 3000 1150 1350 4250 limit/base >20 >158 >20                 | 77 0 80 <1 833 1364 777 967 3086  current 6 4 <1                                     | 96<br>0<br>87<br>2<br>823<br>1392<br>773<br>974<br>2690<br>history1<br>4<br>7      | 95 2 85 <1 806 1382 779 969 2931 history2 5 2 2                                   |
| Sulfation         Abs/.1mm         *ASTM D7415         >30         24.7         23.6         23.1           FLUID DEGRADATION         method         limit/base         current         history1         history2           Oxidation         Abs/.1mm         *ASTM D7414         >25         24.2         21.8         20.6   | Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium Water  | ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm        | ASTM D5185m  | 250 10 100 450 3000 1150 1350 4250 limit/base >20 >158 >20 >0.1            | 77 0 80 <1 833 1364 777 967 3086  current 6 4 <1 NEG                                 | 96 0 87 2 823 1392 773 974 2690 history1 4 7 4 NEG                                 | 95 2 85 <1 806 1382 779 969 2931 history2 5 2 NEG                                 |
| FLUID DEGRADATION method limit/base current history1 history2  Oxidation Abs/.1mm *ASTM D7414 >25 24.2 21.8 20.6  | Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium Water INFRA-RED  | ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm | ASTM D5185m ASTM D6304   | 250 10 100 450 3000 1150 1350 4250 limit/base >20 >158 >20 >0.1            | 77 0 80 <1 833 1364 777 967 3086 current 6 4 <1 NEG current                          | 96 0 87 2 823 1392 773 974 2690 history1 4 7 4 NEG                                 | 95 2 85 <1 806 1382 779 969 2931 history2 5 2 NEG history2                        |
| Oxidation Abs/.1mm *ASTM D7414 >25 <b>24.2</b> 21.8 20.6  | Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium Water INFRA-RED Soot %                                   | ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm | ASTM D5185m ASTM D6304                                     | 250 10 100 450 3000 1150 1350 4250 limit/base >20 >158 >20 >0.1 limit/base | 77 0 80 <1 833 1364 777 967 3086 current 6 4 <1 NEG current 0.3                      | 96 0 87 2 823 1392 773 974 2690 history1 4 7 4 NEG history1 0.3                    | 95 2 85 <1 806 1382 779 969 2931 history2 5 2 2 NEG history2 0.3                  |
|   | Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium Water INFRA-RED Soot % Nitration                         | ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm | ASTM D5185m ASTM D6304  method  *ASTM D7844  *ASTM D7844                                       | 250 10 100 450 3000 1150 1350 4250 limit/base >20 >158 >20 >0.1 limit/base | 77 0 80 <1 833 1364 777 967 3086  current 6 4 <1 NEG  current 0.3 11.2               | 96 0 87 2 823 1392 773 974 2690 history1 4 7 4 NEG history1 0.3 10.2               | 95 2 85 <1 806 1382 779 969 2931 history2 5 2 NEG history2 0.3 10.1               |
|   | Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium Water INFRA-RED Soot % Nitration Sulfation               | ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm | ASTM D5185m ASTM D6304  method  *ASTM D7844  *ASTM D7624  *ASTM D76145 | 250 10 100 450 3000 1150 1350 4250 limit/base >20 >158 >20 >0.1 limit/base | 77 0 80 <1 833 1364 777 967 3086 current 6 4 <1 NEG current 0.3 11.2 24.7            | 96 0 87 2 823 1392 773 974 2690 history1 4 7 4 NEG history1 0.3 10.2 23.6          | 95 2 85 <1 806 1382 779 969 2931 history2 5 2 NEG history2 0.3 10.1 23.1          |
| Dago Harrison (DIT) Inghong Activides 0.02 J.UI   | Boron Barium Molybdenum Manganese Magnesium Calcium Phosphorus Zinc Sulfur CONTAMINANTS Silicon Sodium Potassium Water INFRA-RED Soot % Nitration Sulfation FLUID DEGRADA | ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm | ASTM D5185m ASTM D6304  method  *ASTM D7844  *ASTM D7624  *ASTM D7415  method                  | 250 10 100 450 3000 1150 1350 4250 limit/base >20 >158 >20 >0.1 limit/base | 77 0 80 <1 833 1364 777 967 3086  current 6 4 <1 NEG  current 0.3 11.2 24.7  current | 96 0 87 2 823 1392 773 974 2690 history1 4 7 4 NEG history1 0.3 10.2 23.6 history1 | 95 2 85 <1 806 1382 779 969 2931 history2 5 2 NEG history2 0.3 10.1 23.1 history2 |



# **OIL ANALYSIS REPORT**



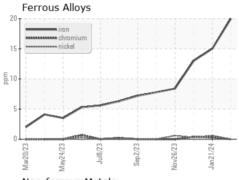


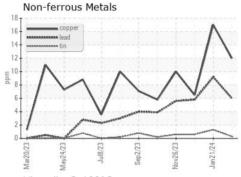


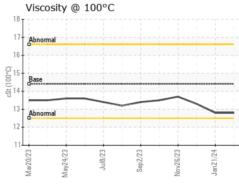
| VISUAL                  |        | method  | limit/base | current | history1 | history2 |
|-------------------------|--------|---------|------------|---------|----------|----------|
| White Metal             | scalar | *Visual | NONE       | LIGHT   | NONE     | NONE     |
| Yellow Metal            | 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    |
| <b>Emulsified Water</b> | scalar | *Visual | >0.1       | NEG     | NEG      | NEG      |
| Free Water              | scalar | *Visual |            | NEG     | NEG      | NEG      |

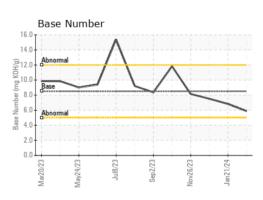
| FLUID PROPERTIES |     | method    |      |      |      | history2 |
|------------------|-----|-----------|------|------|------|----------|
| Visc @ 100°C     | cSt | ASTM D445 | 14.4 | 12.8 | 12.8 | 13.3     |

## **GRAPHS**













Certificate 12367

Laboratory Sample No.

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

: WC0874743 Lab Number : 06140135 Unique Number : 10964943

Received **Tested** Diagnosed

: 05 Apr 2024 : 09 Apr 2024

: 09 Apr 2024 - Sean Felton

MARATHON PETROLEUM CO. 101 12TH ST CATLETTSBURG, KY US 41169 Contact: CORY GUMBERT

cagumbert@marathonpetroleum.com T: (606)585-3950

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)

F: x: