

## **OIL ANALYSIS REPORT**

#### Sample Rating Trend



Machine Id

## KENWORTH 331

Component Diesel Engine

Fluid SERVICE PRO 15W40 SYN BLEND (--- 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 INFORM   | IATION   | method  | limit/base  | current   | history1  | history2   |
|---|--|---|---|---|---|--|
| Sample Number   |  | Client Info   |   | RW0005400   | RW0004772   | RW0004766  |
| Sample Date   |  | Client Info   |   | 06 May 2024   | 27 Feb 2024   | 11 Dec 2023  |
| Machine Age   | mls  | Client Info   |   | 282592  | 266971  | 250377   |
| Oil Age   | mls  | Client Info   |   | 15621   | 16594   | 17450  |
| Oil Changed   |  | Client Info   |   | Changed   | Changed   | Changed  |
| Sample Status   |  |   |   | NORMAL  | NORMAL  | NORMAL   |
| CONTAMINATIO  | ٧  | method  | limit/base  | current   | history1  | history2   |
| Fuel  |  | WC Method   | >3.0  | <1.0  | <1.0  | <1.0   |
| Water   |  | WC Method   | >0.2  | NEG   | NEG   | NEG  |
| Glycol  |  | WC Method   |   | NEG   | NEG   | NEG  |
| WEAR METALS   |  | method  | limit/base  | current   | history1  | history2   |
| Iron  | ppm  | ASTM D5185m   | >165  | 28  | 32  | 30   |
| Chromium  | ppm  | ASTM D5185m   | >5  | <1  | 1   | 1  |
| Nickel  | ppm  | ASTM D5185m   | >4  | 0   | 0   | 0  |
| Titanium  | ppm  | ASTM D5185m   | >2  | 0   | <1  | 0  |
| Silver  | ppm  | ASTM D5185m   | >2  | 0   | <1  | 0  |
| Aluminum  | ppm  | ASTM D5185m   | >20   | 6   | 6   | 5  |
| Lead  | ppm  | ASTM D5185m   | >150  | 2   | 2   | 2  |
| Copper  | ppm  | ASTM D5185m   | >90   | 0   | 1   | <1   |
| Tin   | ppm  | ASTM D5185m   | >5  | 1   | <1  | 1  |
| Vanadium  | ppm  | ASTM D5185m   |   | 0   | <1  | 0  |
| Cadmium   | ppm  | ASTM D5185m   |   | 0   | 0   | 0  |
|   |  |   |   |   |   |  |
| ADDITIVES   |  | method  | limit/base  | current   | history1  | history2   |
| ADDITIVES<br>Boron  | ppm  | method<br>ASTM D5185m   | limit/base  | current<br>8  | history1<br>2   | history2<br>2  |
|   | ppm<br>ppm   |   | limit/base  |   |   |  |
| Boron   |  | ASTM D5185m   | limit/base  | 8   | 2   | 2  |
| Boron<br>Barium   | ppm  | ASTM D5185m<br>ASTM D5185m  | limit/base  | 8<br>1  | 2   | 2<br>0   |
| Boron<br>Barium<br>Molybdenum   | ppm<br>ppm   | ASTM D5185m<br>ASTM D5185m<br>ASTM D5185m   | limit/base  | 8<br>1<br>66  | 2<br>1<br>66  | 2<br>0<br>64   |
| Boron<br>Barium<br>Molybdenum<br>Manganese  | ppm<br>ppm<br>ppm  | ASTM D5185m<br>ASTM D5185m<br>ASTM D5185m<br>ASTM D5185m  | limit/base  | 8<br>1<br>66<br><1  | 2<br>1<br>66<br><1  | 2<br>0<br>64<br><1   |
| Boron<br>Barium<br>Molybdenum<br>Manganese<br>Magnesium   | ppm<br>ppm<br>ppm<br>ppm   | ASTM D5185m<br>ASTM D5185m<br>ASTM D5185m<br>ASTM D5185m<br>ASTM D5185m   | limit/base  | 8<br>1<br>66<br><1<br>915   | 2<br>1<br>66<br><1<br>962   | 2<br>0<br>64<br><1<br>986  |
| Boron<br>Barium<br>Molybdenum<br>Manganese<br>Magnesium<br>Calcium  | 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  | limit/base  | 8<br>1<br>66<br><1<br>915<br>1193   | 2<br>1<br>66<br><1<br>962<br>1179   | 2<br>0<br>64<br><1<br>986<br>1237  |
| Boron<br>Barium<br>Molybdenum<br>Manganese<br>Magnesium<br>Calcium<br>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  | limit/base  | 8<br>1<br>66<br><1<br>915<br>1193<br>1104   | 2<br>1<br>66<br><1<br>962<br>1179<br>1142   | 2<br>0<br>64<br><1<br>986<br>1237<br>1041  |
| Boron<br>Barium<br>Molybdenum<br>Manganese<br>Magnesium<br>Calcium<br>Phosphorus<br>Zinc  | 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   | limit/base  | 8<br>1<br>66<br><1<br>915<br>1193<br>1104<br>1286   | 2<br>1<br>66<br><1<br>962<br>1179<br>1142<br>1285   | 2<br>0<br>64<br><1<br>986<br>1237<br>1041<br>1272  |
| Boron<br>Barium<br>Molybdenum<br>Manganese<br>Magnesium<br>Calcium<br>Phosphorus<br>Zinc<br>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  |   | 8<br>1<br>66<br><1<br>915<br>1193<br>1104<br>1286<br>3378   | 2<br>1<br>66<br><1<br>962<br>1179<br>1142<br>1285<br>3180<br>history1<br>5  | 2<br>0<br>64<br><1<br>986<br>1237<br>1041<br>1272<br>3008  |
| Boron<br>Barium<br>Molybdenum<br>Manganese<br>Magnesium<br>Calcium<br>Phosphorus<br>Zinc<br>Sulfur<br>CONTAMINANTS  | 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  | limit/base  | 8<br>1<br>66<br><1<br>915<br>1193<br>1104<br>1286<br>3378<br>current  | 2<br>1<br>66<br><1<br>962<br>1179<br>1142<br>1285<br>3180<br>history1<br>5<br>2                                       | 2<br>0<br>64<br><1<br>986<br>1237<br>1041<br>1272<br>3008<br>history2  |
| Boron<br>Barium<br>Molybdenum<br>Manganese<br>Magnesium<br>Calcium<br>Phosphorus<br>Zinc<br>Sulfur<br>CONTAMINANTS<br>Silicon   | ppm<br>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<br>ASTM D5185m  | limit/base  | 8<br>1<br>66<br><1<br>915<br>1193<br>1104<br>1286<br>3378<br>current<br>5   | 2<br>1<br>66<br><1<br>962<br>1179<br>1142<br>1285<br>3180<br>history1<br>5  | 2<br>0<br>64<br><1<br>986<br>1237<br>1041<br>1272<br>3008<br>history2<br>5   |
| Boron<br>Barium<br>Molybdenum<br>Manganese<br>Magnesium<br>Calcium<br>Phosphorus<br>Zinc<br>Sulfur<br>CONTAMINANTS<br>Silicon<br>Sodium   | ppm<br>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<br>ASTM D5185m  | limit/base<br>>35                                     | 8<br>1<br>66<br><1<br>915<br>1193<br>1104<br>1286<br>3378<br>current<br>5<br>3  | 2<br>1<br>66<br><1<br>962<br>1179<br>1142<br>1285<br>3180<br>history1<br>5<br>2                                       | 2<br>0<br>64<br><1<br>986<br>1237<br>1041<br>1272<br>3008<br>history2<br>5<br>2  |
| Boron<br>Barium<br>Molybdenum<br>Manganese<br>Magnesium<br>Calcium<br>Phosphorus<br>Zinc<br>Sulfur<br>CONTAMINANTS<br>Silicon<br>Sodium<br>Potassium  | ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm               | ASTM D5185m<br>ASTM D5185m   | limit/base<br>>35<br>>20                              | 8<br>1<br>66<br><1<br>915<br>1193<br>1104<br>1286<br>3378<br>current<br>5<br>3<br>6   | 2<br>1<br>66<br><1<br>962<br>1179<br>1142<br>1285<br>3180<br>history1<br>5<br>2<br>7<br>history1<br>2                 | 2<br>0<br>64<br><1<br>986<br>1237<br>1041<br>1272<br>3008<br>history2<br>5<br>2<br>3   |
| Boron<br>Barium<br>Molybdenum<br>Manganese<br>Magnesium<br>Calcium<br>Phosphorus<br>Zinc<br>Sulfur<br>CONTAMINANTS<br>Silicon<br>Sodium<br>Potassium<br>INFRA-RED                                     | ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm               | ASTM D5185m<br>ASTM D5185m  | limit/base<br>>35<br>>20<br>limit/base                | 8<br>1<br>66<br><1<br>915<br>1193<br>1104<br>1286<br>3378<br>current<br>5<br>3<br>6<br>current                                      | 2<br>1<br>66<br><1<br>962<br>1179<br>1142<br>1285<br>3180<br>history1<br>5<br>2<br>7<br>history1                      | 2<br>0<br>64<br><1<br>986<br>1237<br>1041<br>1272<br>3008<br>history2<br>5<br>2<br>3<br>3                                    |
| Boron<br>Barium<br>Molybdenum<br>Manganese<br>Magnesium<br>Calcium<br>Phosphorus<br>Zinc<br>Sulfur<br>CONTAMINANTS<br>Silicon<br>Sodium<br>Potassium<br>INFRA-RED<br>Soot %                           | ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm | ASTM D5185m<br>ASTM D5185m                               | limit/base<br>>35<br>>20<br>limit/base<br>>7.5        | 8<br>1<br>66<br><1<br>915<br>1193<br>1104<br>1286<br>3378<br>current<br>5<br>3<br>6<br>current<br>2.1                               | 2<br>1<br>66<br><1<br>962<br>1179<br>1142<br>1285<br>3180<br>history1<br>5<br>2<br>7<br>history1<br>2                 | 2<br>0<br>64<br><1<br>986<br>1237<br>1041<br>1272<br>3008<br>history2<br>5<br>2<br>3<br>3<br>history2<br>2.2                 |
| Boron<br>Barium<br>Molybdenum<br>Manganese<br>Magnesium<br>Calcium<br>Phosphorus<br>Zinc<br>Sulfur<br>CONTAMINANTS<br>Silicon<br>Sodium<br>Potassium<br>INFRA-RED<br>Soot %<br>Nitration              | ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm | ASTM D5185m<br>ASTM D5185m                               | limit/base<br>>35<br>>20<br>limit/base<br>>7.5<br>>20 | 8<br>1<br>66<br><1<br>915<br>1193<br>1104<br>1286<br>3378<br>current<br>5<br>3<br>6<br>current<br>2.1<br>12.1                       | 2<br>1<br>66<br><1<br>962<br>1179<br>1142<br>1285<br>3180<br>history1<br>5<br>2<br>7<br>history1<br>2<br>12.1         | 2<br>0<br>64<br><1<br>986<br>1237<br>1041<br>1272<br>3008<br>history2<br>5<br>2<br>2<br>3<br>history2<br>2.2<br>12.0         |
| Boron<br>Barium<br>Molybdenum<br>Manganese<br>Magnesium<br>Calcium<br>Phosphorus<br>Zinc<br>Sulfur<br>CONTAMINANTS<br>Silicon<br>Sodium<br>Potassium<br>INFRA-RED<br>Soot %<br>Nitration<br>Sulfation | ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm<br>ppm | ASTM D5185m<br>ASTM D5185m | limit/base >35 >20 limit/base >7.5 >20 >30            | 8<br>1<br>66<br><1<br>915<br>1193<br>1104<br>1286<br>3378<br><u>current</u><br>5<br>3<br>6<br><u>current</u><br>2.1<br>12.1<br>25.6 | 2<br>1<br>66<br><1<br>962<br>1179<br>1142<br>1285<br>3180<br>history1<br>5<br>2<br>7<br>history1<br>2<br>12.1<br>24.6 | 2<br>0<br>64<br><1<br>986<br>1237<br>1041<br>1272<br>3008<br>history2<br>5<br>2<br>3<br>3<br>history2<br>2.2<br>12.0<br>25.4 |



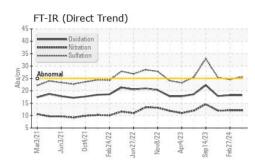
A

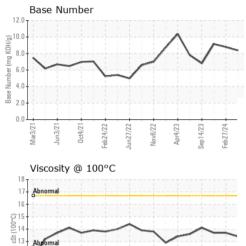
Mar3/21

12

11 10

# **OIL ANALYSIS REPORT**





eb24/22

0ct4/21

Nov8/22 Apr4/23

|                          | VISUAL  |                        | method                              | limit/base   | current                       | history1                            | history2                              |  |
|--------------------------|---|------------------------|-------------------------------------|--|-------------------------------|-------------------------------------|---------------------------------------|--|
|                          | White Metal   | scalar                 | *Visual                             | NONE   | NONE                          | NONE                                | NONE                                  |  |
| Δ                        | 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                                  |  |
| Sep14/23 -<br>Feb27/24 - | Appearance  | scalar                 | *Visual                             | NORML  | NORML                         | NORML                               | NORML                                 |  |
| Sep1<br>Feb2             | Odor  | scalar                 | *Visual                             | NORML  | NORML                         | NORML                               | NORML                                 |  |
|                          | Emulsified Water  | scalar                 | *Visual                             | >0.2   | NEG                           | NEG                                 | NEG                                   |  |
|                          | Free Water  | scalar                 | *Visual                             |  | NEG                           | NEG                                 | NEG                                   |  |
| ~                        | FLUID PROPERT   | IES                    | method                              | limit/base   | current                       | history1                            | history2                              |  |
| $\sqrt{-}$               | Visc @ 100°C  | cSt                    | ASTM D445                           |  | 13.4                          | 13.7                                | 13.7                                  |  |
|                          | GRAPHS  |                        |                                     |  |                               |                                     |                                       |  |
|                          | Iron (ppm)  |                        |                                     | 200  | Lead (ppm)                    |                                     |                                       |  |
| 4 3                      | 300<br>250  |                        |                                     | 300  | 0                             | 1                                   |                                       |  |
| Sep14/23<br>Feb27/24     | 200   |                        |                                     | 200  | ·                             |                                     |                                       |  |
| es er                    | Abnormal  |                        |                                     | <u>통</u> 150   | Abnormal                      |                                     |                                       |  |
|                          | 100 -   |                        |                                     | 100  |                               |                                     |                                       |  |
|                          | 50  |                        |                                     | 50   |                               |                                     |                                       |  |
|                          |   | 3/22 -                 | Apr4/23 +                           | 0/24   |                               | 4/22 -                              | 4/23 +<br>1/23 -                      |  |
|                          | Mar3/21<br>Jun3/21<br>Oct4/21<br>Feb24/22   | Jun27/22<br>Nov8/22    | Apr4/23<br>Sep14/23                 | Feb27/24   | Mar3/21<br>Jun3/21<br>Oct4/21 | Feb24/22<br>Jun27/22<br>Nov8/22     | Apr4/23<br>Sep14/23<br>Feb27/24       |  |
| $\sim$                   | Aluminum (ppm)  | -                      |                                     |  | Chromium (p                   | -                                   |                                       |  |
|                          |   |                        |                                     | 12   | Tanne a sere a ser            |                                     |                                       |  |
|                          | 60  |                        |                                     | 10   |                               |                                     |                                       |  |
|                          |   |                        |                                     | 8  |                               |                                     |                                       |  |
| Sep14/23<br>Feb27/24     |   |                        |                                     | Line and a   | Abnormal                      |                                     |                                       |  |
| Sep<br>Feb               | 20 Abnormal   | $\sim$                 | ~                                   | 2  |                               |                                     |                                       |  |
|                          |   | 2+2                    |                                     |  |                               |                                     |                                       |  |
|                          | Mar3/21<br>Jun3/21<br>0ct4/21   | Jun27/22<br>Nov8/22    | Apr4/23<br>Sep 14/23                | Feb 27/2 4   | Mar3/21<br>Jun3/21<br>Oct4/21 | Feb24/22<br>Jun27/22<br>Nov8/22     | Apr4/23<br>Sep14/23<br>Feb27/24       |  |
|                          | ц.  | n<br>N                 | Ser                                 | B  |                               |                                     | Ser Ser                               |  |
|                          | Copper (ppm)  |                        |                                     | 80   | Silicon (ppm)                 | 1                                   |                                       |  |
|                          | Severe  |                        |                                     |  | Saura                         |                                     |                                       |  |
|                          | 150-  |                        |                                     | 60   |                               |                                     |                                       |  |
|                          | E 100 - Abnormal  |                        |                                     | 틆 40   | - Abnormal                    |                                     | <u>,</u>                              |  |
|                          | 50-   |                        |                                     | 20   | $\mathbf{X}$                  |                                     |                                       |  |
|                          | 0   |                        |                                     |  |                               |                                     |                                       |  |
|                          |   | un27/22 -<br>Nov8/22 - | Apr4/23 -                           | Feb27/24 -   | Mar3/21                       | eb24/22 -<br>un27/22 -<br>Nov8/22 - | Apr4/23 -<br>Sep14/23 -<br>Feb27/24 - |  |
|                          | Mar3/21<br>Jun3/21<br>Oct4/21<br>Feb24/22   | Jun27/22<br>Nov8/22    | Apr4/23<br>Sep 14/23                | Feb 2  | Jun.<br>Oct                   | Feb24/22<br>Jun27/22<br>Nov8/22     | Apr4/23<br>Sep14/23<br>Feb27/24       |  |
|                          | Viscosity @ 100°C   |                        |                                     |  | Base Numbe                    | r                                   |                                       |  |
|                          | Abnormal  |                        |                                     | 12.0   |                               |                                     |                                       |  |
|                          | 10  |                        |                                     | (b)H10.0<br>BW 200<br>BW 20<br>BW 200<br>BW 200<br>B |                               |                                     | $\wedge \wedge$                       |  |
|                          | (J. 001)<br>(J. | ~                      | $\sim$                              | 프 6.0  | $\sim$                        |                                     | $\sim$                                |  |
|                          | Abromal   |                        |                                     | 4.0  |                               |                                     |                                       |  |
|                          |   |                        |                                     | 88 2.0   | +                             |                                     |                                       |  |
|                          |   | 22                     | 23                                  | 0.0  | )                             | 22                                  | 23                                    |  |
|                          | Mar3/21<br>Jun3/21<br>Oct4/21<br>Feb24/22   | Jun27/22<br>Nov8/22    | Apr4/23<br>Sep14/23                 | Feb27/24   | Mar3/21<br>Jun3/21<br>Oct4/21 | Feb24/22<br>Jun27/22<br>Nov8/22     | Apr4/23<br>Sep14/23<br>Feb27/24       |  |
|                          | - L   | -<br>-                 | õ                                   | LE.  | -                             | 4 J -                               | is it                                 |  |
|                          | W 0 100   |                        |                                     |  |                               |                                     |                                       |  |
| boratory                 | : WearCheck USA - 50  |                        |                                     |  |                               | MICHIGAN WO                         |                                       |  |
| mple No.                 | : RW0005400<br>: 06177899   | Recei<br>Teste         |                                     | 3 May 2024<br>4 May 2024   |                               | X.                                  | P.O. BOX 337<br>ANDERBILT, M          |  |
| n Niimnor                |   |                        | Diagnosed : 14 May 2024 - Wes Davis |  |                               | VANDERBILT, M<br>US 4979            |                                       |  |
| b Number                 | : 11029225  | Diadr                  | iosea : 14                          | + iviay 2024 - vv  | res Davis                     |                                     | 03 49/9:                              |  |
|                          |   | Diagr                  |                                     | + IVIAY 2024 - VV  | les Davis                     | Contact                             | STEVE WOLFE                           |  |

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)

Report Id: MICVAN [WUSCAR] 06177899 (Generated: 05/14/2024 14:34:44) Rev: 1

Certificate L2367

Contact/Location: STEVE WOLFE - MICVAN

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