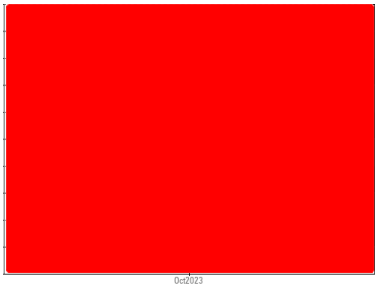
# OIL ANALYSIS REPORT

Sample Rating Trend




WEAR PARTICLES

Machine Id
## JOHN DEERE 9860
Component
**Filter**
Fluid
**JOHN DEERE ENGINE OIL PLUS 50 II 15W40 (18 LTR)**

## DIAGNOSIS

**Recommendation**

A shop rag containing metal particles and debris was submitted for analysis. There are two parts to his patch, a rag was submitted with debris and metal. There is 2.969g of sand on the patch, under the sand there are a few ferrous rolling debris. The 2nd patch has 6.749g of metal and stones. There are pieces of needle rolling bearings present, also pieces resembling gear teeth. Somme pieces have been exposed to high heat and/or stress, bluing and yellowing. Large chunks are ferrous, and smaller, thinner rolling wear is non-ferrous. Diagnostician's Note: The oil and filter sample did not contain coarse dirt. If dirt was present in the oil and was the cause of the engine failure then coarse dirt would have been evident in the filter analysis. The rolling fatigue particles and especially those with tempering (coloring due to high temperature) are indicative of a main bearing and crankshaft failure consistent with excessive coolant present in the engine oil leading to main bearing seizure. The lack of significant cutting wear particles in both this sample and the filter analysis, and the lack of coarse dirt in the oil/filter analysis, rules out the situation where severe dirt ingression caused the failure.

**Wear Particles**

Wear particle analysis indicates that the ferrous rolling particles are severe. Wear particle analysis indicates that the ferrous cutting and patch weight particles are abnormal. A representative wear particle was digested and analysed by ICP Spectroscopy the most likely alloy matches are Low alloy steel 86XX (86XX), Low alloy steel 92XX (92XX) and Low alloy steel 87XX (87XX).

**Contaminants**

Wear particle analysis indicates that the sand/dirt particles are severe.

| SAMPLE INFORMATION | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Sample Number | | Client Info | | **PP** | --- | --- |
| Sample Date | | Client Info | | **06 Oct 2023** | --- | --- |
| Machine Age | hrs | Client Info | | **3569** | --- | --- |
| Oil Age | hrs | Client Info | | **0** | --- | --- |
| Oil Changed | | Client Info | | **N/A** | --- | --- |
| Sample Status | | | | **SEVERE** | --- | --- |

| WEAR METALS | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Iron | ppm | ASTM D5185(m) | | **1479** | --- | --- |
| Chromium | ppm | ASTM D5185(m) | | **9** | --- | --- |
| Nickel | ppm | ASTM D5185(m) | | **6** | --- | --- |
| Titanium | ppm | ASTM D5185(m) | | **0** | --- | --- |
| Silver | ppm | ASTM D5185(m) | | **2** | --- | --- |
| Aluminum | ppm | ASTM D5185(m) | | **8** | --- | --- |
| Lead | ppm | ASTM D5185(m) | | **4** | --- | --- |
| Copper | ppm | ASTM D5185(m) | | **4** | --- | --- |
| Tin | ppm | ASTM D5185(m) | | **4** | --- | --- |
| Antimony | ppm | ASTM D5185(m) | | **2** | --- | --- |
| Vanadium | ppm | ASTM D5185(m) | | **<1** | --- | --- |
| Beryllium | ppm | ASTM D5185(m) | | **0** | --- | --- |
| Cadmium | ppm | ASTM D5185(m) | | **<1** | --- | --- |

| FERROGRAPHY | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Ferrous Rubbing | Scale 0-10 | ASTM D7684* | | | | |
| Ferrous Sliding | Scale 0-10 | ASTM D7684* | | | | |
| Ferrous Cutting | Scale 0-10 | ASTM D7684* | | **2** | | |
| Ferrous Rolling | Scale 0-10 | ASTM D7684* | | **6** | | |
| Ferrous Break-in | Scale 0-10 | ASTM D7684* | | | | |
| Ferrous Spheres | Scale 0-10 | ASTM D7684* | | | | |
| Ferrous Black Oxides | Scale 0-10 | ASTM D7684* | | | | |
| Ferrous Red Oxides | Scale 0-10 | ASTM D7684* | | | | |
| Ferrous Corrosive | Scale 0-10 | ASTM D7684* | | | | |
| Ferrous Other | Scale 0-10 | ASTM D7684* | | | | |
| Nonferrous Rubbing | Scale 0-10 | ASTM D7684* | | | | |
| Nonferrous Sliding | Scale 0-10 | ASTM D7684* | | | | |
| Nonferrous Cutting | Scale 0-10 | ASTM D7684* | | | | |
| Nonferrous Rolling | Scale 0-10 | ASTM D7684* | | | | |
| Nonferrous Other | Scale 0-10 | ASTM D7684* | | | | |
| Sand/Dirt | Scale 0-10 | ASTM D7684* | | **8** | | |
| Fibres | Scale 0-10 | ASTM D7684* | | | | |
| Spheres | Scale 0-10 | ASTM D7684* | | | | |
| Other | Scale 0-10 | ASTM D7684* | | | | |
| Patch Weight | mg | ASTM D7684* | | **9675** | --- | --- |

# OIL ANALYSIS REPORT

| ADDITIVES | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Molybdenum | ppm | ASTM D5185(m) | | **3** | --- | --- |
| Manganese | ppm | ASTM D5185(m) | | **12** | --- | --- |
| Magnesium | ppm | ASTM D5185(m) | | **10** | --- | --- |
| Calcium | ppm | ASTM D5185(m) | | **113** | --- | --- |
| Zinc | ppm | ASTM D5185(m) | | **9** | --- | --- |
| Sulfur | ppm | ASTM D5185(m) | | **95** | --- | --- |
| Lithium | ppm | ASTM D5185(m) | | **<1** | --- | --- |

| CONTAMINANTS | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| Silicon | ppm | ASTM D5185(m) | | **18** | --- | --- |

| VISUAL | | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|---|
| White Metal | scalar | Visual* | NONE | **NONE** | --- | --- |
| Yellow Metal | scalar | Visual* | NONE | **NONE** | --- | --- |
| Precipitate | scalar | Visual* | NONE | **NONE** | --- | --- |
| Silt | scalar | Visual* | NONE | **NONE** | --- | --- |
| Debris | scalar | Visual* | NONE | **NONE** | --- | --- |
| Sand/Dirt | scalar | Visual* | NONE | **NONE** | --- | --- |
| Appearance | scalar | Visual* | NORML | **NORML** | --- | --- |
| Odor | scalar | Visual* | NORML | **NORML** | --- | --- |

| SAMPLE IMAGES | method | limit/base | current | history1 | history2 |
|---|---|---|---|---|---|
| Color | | |  | *no image* | *no image* |
| Bottom | | |  | *no image* | *no image* |

ISO 17025:2017 Accredited Laboratory

**Laboratory** : WearCheck - C8-1175 Appleby Line, Burlington, ON L7L 5H9
**Sample No.** : PP **Received** : 11 Oct 2023
**Lab Number** : 02588455 **Diagnosed** : 14 Oct 2023
**Unique Number** : 5657521 **Diagnostician** : Bill Quesnel
**Test Package** : TEST ( Additional Tests: Filter, ICP, ICP-Digest )

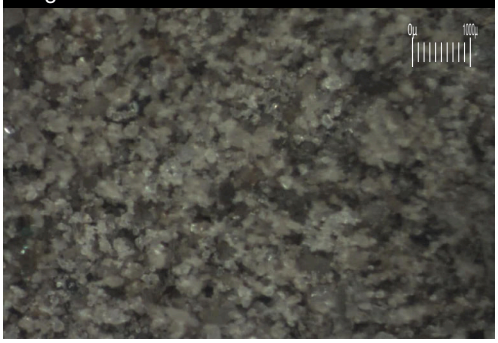
*To discuss this sample report, contact Customer Service at 1-800-268-2131.*
*Test denoted (*) outside scope of accreditation, (m) method modified, (e) tested at external lab.*
*Validity of results and interpretation are based on the sample and information as supplied.*

**GREAT LAKES APPRAISALS**
RR # 6
WOODSTOCK, ON
CA N4S 7W1
Contact: Neil Langlois
neil@workcity.ca
T: (519)532-0944
F: (519)462-1068

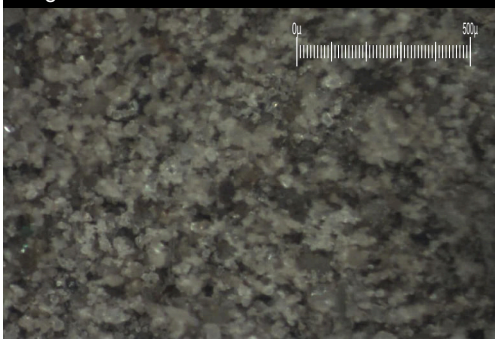
# FILTER REPORT

Machine Id
## JOHN DEERE 9860
Component
**Filter**
Fluid
**JOHN DEERE ENGINE OIL PLUS 50 II 15W40 (18 LTR)**

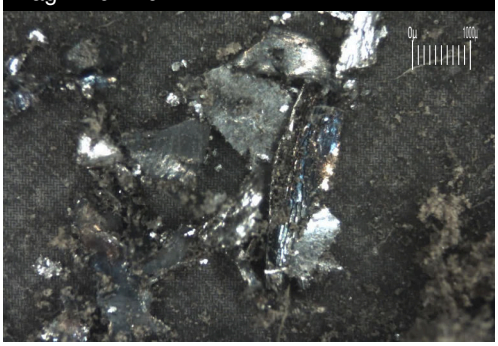
Magn: 10x Illum: RW



Magn: 60x Illum: RW



Magn: 10x Illum: RW



Magn: 10x Illum: RW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| Nonferrous Cutting | Scale 0-10 | ASTM D7684* | | | | |
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| Spheres | Scale 0-10 | ASTM D7684* | | | | |
| Other | Scale 0-10 | ASTM D7684* | | | | |
| Patch Weight | mg | ASTM D7684* | | **9675** | --- | --- |

## WEAR

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