

Caterpillar Oil Aeration Test

Version

Form 1

Title / Validity Declaration Page

Conducted For

| | |
|--------|--|
| V = | Valid; The Reference Oil / Non-Reference Oil was evaluated in accordance with the test procedure. |
| I = | Invalid; The Reference / Non-Reference Oil was not evaluated in accordance with the test procedure. |
| N = | Results cannot be interpreted as representative of oil performance (Non-Reference Oil) and shall not be used in determining average test results using Multiple Test Criteria. |

| | |
|--|-----------------------------|
| | NR = Non-Reference Oil Test |
| | RO = Reference Oil Test |

| Test Number | | | |
|--|------------|-------------------|-------------|
| Stand: | Stand Run: | Engine No. | Engine Run: |
| End of Test Date: | | End of Test Time: | |
| Oil Code / CMIR: ^A | | | |
| Formulation / Stand Code: ^B | | | |
| Altcode 1: | Altcode 2: | Altcode 3: | |

In my opinion the test _____ been conducted in a valid manner in accordance with Test Method D8047 and the appropriate amendments through the information letter system. The remarks included in this report describe the anomalies associated with this test.

^A CMIR or Non-Reference Oil Code ^B ACC-Registered Tests Only

Submitted By: _____

Testing Laboratory

Signature

Typed Name

Title

**Caterpillar Oil Aeration Test
Form 2
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**Caterpillar Oil Aeration Test
Form 3
Summary of Test Method**

The CAT Oil Aeration Test is an engine-dynamometer test which evaluates the ability of an engine oil to resist aeration.

The test engine is a CAT C-13 diesel engine with ACERT technology. It is an in-line six cylinder, four stroke, turbocharged engine with electronically controlled fuel injection.

| Oil Aeration Test Conditions | |
|--------------------------------------|--------------|
| Parameter | Value |
| Time, h | 50 |
| Speed, r/min | 1800 |
| Load, Nm | 0 |
| Fuel Flow, g/min | Record |
| Coolant Out Temperature, °C | 90 |
| Fuel In Temperature, °C | 40 |
| Oil Gallery Temperature, °C | 90 |
| Intake Air Temperature, ° C | 25 |
| Tailpipe Exhaust Temperature, °C | Record |
| Intake Air Restriction, kPa Absolute | 96 |
| Intake Manifold Pressure, kPa | Record |
| Exhaust Back Pressure, kPa A | 104 |
| Coolant System Pressure, kPa | 99 - 107 |
| Oil Gallery Pressure, kPa | Record |
| Crankcase Pressure, kPaA | 103 |
| Oil Sump Temp | Record |

**Caterpillar Oil Aeration Test
Form 4
Test Information**

| | | |
|---------------------------|-----------|-----------|
| Laboratory: | EOT Date: | EOT Time: |
| Test Number: | | |
| Oil Code: | | |
| Formulation / Stand Code: | | |

Test Results

| | |
|-------------------------------------|--|
| Date Test Started | |
| Start Time | |
| Test Length | |
| Laboratory Oil Code | |
| TMC Oil Code ^A | |
| SAE Viscosity ^B | |
| Engine Serial Number | |
| Engine run Hours since last rebuild | |

| | |
|---|--|
| Average Oil Aeration (40-50 Hrs) (%) | |
| Original Result | |
| Correction Factor | |
| Corrected Result | |
| Severity Adjustment | |
| Final Original Unit Result | |

Last Stand Reference Results ^B

| | |
|--|--|
| Last Stand Reference Results ^B | |
| Test Number: | |
| Oil Code: | |
| Test Length | |
| TMC Oil Code ^A | |
| EOT Date | |
| EOT Time | |
| Number of Tests Since Stand Calibration ^C | |
| Stand Calibration Expiration Date | |
| Engine Number | |
| Engine Hours | |
| Engine Hours since last reference test | |
| Engine Serial No. | |
| Average Oil Aeration (40-50 Hrs) (%) | |
| Original Result | |
| Correction Factor | |
| Corrected Result | |
| Final Original Unit Result | |

^A Reference Tests Only

^B ACC-Registered Tests Only

^C Operationally valid tests only, including current test.

**Caterpillar Oil Aeration Test
Form 5
Test Aeration Graph**

| | | |
|---------------------------|-----------|-----------|
| Laboratory: | EOT Date: | EOT Time: |
| Test Number: | | |
| Oil Code: | | |
| Formulation / Stand Code: | | |



| | |
|--------------------------------|--|
| 40-50 Hr Aeration Slope | |
|--------------------------------|--|

**Caterpillar Oil Aeration Test
Form 6
Flow Density Meter Operational Summary**

| | | |
|---------------------------|-----------|-----------|
| Laboratory: | EOT Date: | EOT Time: |
| Test Number: | | |
| Oil Code: | | |
| Formulation / Stand Code: | | |

| Controlled Parameters | Parameter | Units | QI Threshold | EOT QI | Target | Average | Samples | BQD | Over/Under Range |
|-----------------------|---------------------------|-------|--------------|--------|--------|---------|---------|-----|------------------|
| | Sample Oil Temperature | °C | 0.000 | | 90 | | | | |
| | Sample Oil Flow Rate | L/min | 0.000 | | 1.5 | | | | |
| | Sample Oil Pressure | kPaA | 0.000 | | 84 | | | | |
| | Average MM enclosure Temp | °C | 0.000 | | 50 | | | | |

| Non-Controlled Parameters | Parameter | Units | Typical Value | Average |
|---------------------------|--|-------|---------------|---------|
| | Temperature of Sample Oil – FDM In | °C | 90.2 | |
| | Temperature of Sample Oil – FDM Out | °C | 89.8 | |
| | Δ FDM Sample Temp | °C | 0.4 | |
| | Pressure of Sample Oil – FDM In | kPaA | 85.2 | |
| | Pressure of Sample Oil – FDM Out | kPaA | 78.8 | |
| | Average Pressure Regulator Controller Output | % | 36.8 | |
| | Average Micropump Controller Output | % | 38.4 | |
| | Average FDM RTD Temperature | °C | TBD | |

| Micromtion Constants | Parameter | Units | Value |
|----------------------|---------------------------------|---|-------|
| | DAQ Slope | - | |
| | DAQ Intercept | - | |
| | D1 | g/cm ³ | |
| | D2 | g/cm ³ | |
| | K1 | μs | |
| | K2 | μs | |
| | Density Temperature Coefficient | (g/cm ³)/(g/cm ³ C°) | |

**Caterpillar Oil Aeration Test
Form 7
Engine Operational Summary**

| | | |
|---------------------------|-----------|-----------|
| Laboratory: | EOT Date: | EOT Time: |
| Test Number: | | |
| Oil Code: | | |
| Formulation / Stand Code: | | |

| | Parameter | Units | QI Threshold | EOT QI | Target | Average | Samples | BQD | Over/Under Range |
|----------------------------------|--------------------------|-------|--------------|--------|------------|---------|---------|-----|------------------|
| Controlled Parameters | Speed | r/min | 0.000 | | 1800 | | | | |
| | Inlet Air Temp. | °C | 0.000 | | 25 | | | | |
| | Intake Manifold Temp. | °C | 0.000 | | 40 | | | | |
| | Fuel In Temp. | °C | 0.000 | | 40 | | | | |
| | Coolant Out Temp. | °C | 0.000 | | 90 | | | | |
| | Oil Gallery Temp. | °C | 0.000 | | 90 | | | | |
| | Exhaust Back Press. | kPaA | 0.000 | | 104 | | | | |
| | Crankcase Pressure | kPaA | 0.000 | | 103 | | | | |
| | Inlet Air Pressure | kPaA | 0.000 | | 96.0 ± 1.5 | | | | |
| | Coolant System Press. | kPa | 0.000 | | 99-107 | | | | |
| Non-Controlled Parameters | Intake Manifold Press. | kPa | | | 23.8 | | | | |
| | Oil Sump Temp. | °C | | | 95.1 | | | | |
| | Oil Gallery Press. | kPa | | | 397 | | | | |
| | Fuel Flow | g/min | | | 118.1 | | | | |
| | Ambient Temp | °C | | | 27.2 | | | | |
| | Post Turbo Ex Temp | °C | | | 213 | | | | |
| | Blowby | l/min | | | 68.7 | | | | |
| | Barometric Pressure | kPaA | | | 99.1 | | | | |
| | Oil Pump Outlet Pressure | kPa | | | 569 | | | | |

| | Parameter | Units | Value |
|-------------------------|--------------------------|-------|-------|
| IVA Oil Pressure | IVA Minimum Oil Pressure | kPaG | |
| | IVA Maximum Oil Pressure | kPaG | |
| | IVA Delta Oil Pressure | kPaG | |

**Caterpillar Oil Aeration Test
Form 8
Oil Analysis Summary**

| | | |
|---------------------------|-----------|-----------|
| Laboratory: | EOT Date: | EOT Time: |
| Test Number: | | |
| Oil Code: | | |
| Formulation / Stand Code: | | |

| Hours | Viscosity @ 100 °C mm ² /s (D445) | Fuel Dilution Wt. %, (D3524) |
|-------|---|------------------------------------|
| | | |
| | | |
| | | |
| | | |
| | | |

| Hours | Metal Elements (mg/kg) (D5185) | | | | | | | | |
|-------|--------------------------------|----|----|----|----|----|----|----|---|
| | Fe | Pb | Cu | Cr | Al | Si | Sn | Na | K |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

| D4052 Baseline Density | |
|-----------------------------|---------|
| Temp | Density |
| 30 °C | |
| 40 °C | |
| 50 °C | |
| 60 °C | |
| 70 °C | |
| 80 °C | |
| 90 °C | |
| Calculated Baseline Density | |
| dρ/dT | |
| Predicted at 90 °C | |
| R ² Value | |

**Caterpillar Oil Aeration Test
Form 9
Downtime Summary**

| | | |
|---------------------------|-----------|-----------|
| Laboratory: | EOT Date: | EOT Time: |
| Test Number: | | |
| Oil Code: | | |
| Formulation / Stand Code: | | |

| Number of Downtime Occurrences | | | |
|--------------------------------|------|----------|-------------------------------|
| Test Hours | Date | Downtime | Reasons |
| | | | |
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| | | | |
| | | | Total Downtime (hours) |

**Caterpillar Oil Aeration Test
Form 11
Test Fuel Batch Analysis**

| | | |
|---------------------------|-----------|----------------|
| Laboratory: | EOT Date: | EOT Time: |
| Test Number: | | |
| Oil Code: | | |
| Formulation / Stand Code: | | |
| Fuel Supplier: | | Fuel Batch ID: |

| Measurement | Specs. | Batch Analysis | Test Method |
|-----------------------------------|-----------------------|----------------|---------------------|
| Total Sulfur, ppm | 7 – 15 | | D 5453 |
| Gravity, °API | 34 – 37 | | D 4052 |
| Hydrocarbon Composition | | | |
| Aromatics, % Weight | 26 – 31.5 | | D 5186 |
| Olefins, % Volume | Report | | D 1319 |
| Cetane Index | Report | | D 976 |
| Cetane No. | 43 – 47 | | D 613 |
| Copper Strip Corrosion | 1 Maximum | | D 130 |
| Flash Point, °C | 54 Minimum | | D 93 |
| Pour Point, °C | -18 Maximum | | D 97 |
| Carbon Residue on 10% Residuum, % | 0.35 Maximum | | D 524 (10% Bottoms) |
| Water & Sediment, % Volume | 0.05 Maximum | | D 2709 |
| Viscosity, cSt @ 40°C | 2.0 – 2.6 | | D 445 |
| Total Acid Number | 0.05 Maximum | | D 664 |
| Strong Acid Number | 0.00 Maximum | | D 664 |
| Accelerated Stability | 1.5 max | | D 2274 |
| Ash, % Weight | 0.005 Maximum | | D 482 |
| SLBOCLE, g | 3100 min ^A | | D 6078 ^A |
| 90% Distillation, °C | 282 – 338 | | D 86 |

^A May be altered to be consistent with CARB or ASTM diesel fuel specifications.

**Caterpillar Oil Aeration Test
Form 12
Build-Up and Hardware Information**

| | | |
|---------------------------|-----------|-----------|
| Laboratory: | EOT Date: | EOT Time: |
| Test Number: | | |
| Oil Code: | | |
| Formulation / Stand Code: | | |

| Part | Part Number |
|------------------------------|-------------|
| Intake Valve | |
| Exhaust Valve | |
| Cylinder Head | |
| Head Gasket | |
| Pistons | |
| Injectors | |
| Rod Bearings | |
| Liners | |
| Top Ring | |
| 2 nd Ring | |
| Oil Ring | |
| Rocker Cover Gasket | |
| Oil Pan Gasket | |
| Front Cover Gasket | |
| Valve Guides | |
| Valve Guide Seals | |
| Oil Filter | |
| Oil Filter Date Code | |
| Oil Filter Batch Code | |
| Low Pressure Turbo | |
| High Pressure Turbo | |
| Micromotion Serial Number | |
| Micromotion Calibration Date | |

**Caterpillar Oil Aeration Test
Form 13
American Chemistry Council Code of Practice
Test Laboratory Conformance Statement**

| | | | | |
|------------------------|--|------------|--|-----------|
| Test Laboratory | | | | |
| Test Sponsor | | | | |
| Formulation/Stand Code | | | | |
| Test Number | | | | |
| Start Date | | Start Time | | Time Zone |

Declarations

- No. 1 All requirements of the ACC Code of Practice for which the test laboratory is responsible were met in the conduct of this test. Yes _____ No _____*
- No. 2 The laboratory ran this test for the full duration following all procedural requirements; and all operational validity requirements of the latest version of the applicable test procedure (ASTM or other), including all updates issued by the organization responsible for the test, were met. Yes _____ No _____*
- If the response to this Declaration is “No”, does the test engineer consider the deviations from operational validity requirements that occurred to be beyond the control of the laboratory? Yes _____* No _____
- No. 3 A deviation occurred for one of the test parameters identified by the organization responsible for the test as being a special case. Yes _____* No _____ *(This currently applies only to specific deviations identified in the ASTM Information Letter System)*

Check The Appropriate Conclusion

| | |
|--|---|
| | Operational review of this test indicates that the results should be included in the Multiple Test Acceptance Criteria calculations. |
| | *Operational review of this test indicates that the results should not be included in the Multiple Test Acceptance Criteria calculations. |

Note: *Supporting comments are required for all responses identified with an asterisk.*

| |
|-----------------|
| Comments |
| |
| |
| |
| |

Signature

Date

Typed Name

Title