

# 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: <sup>A</sup>			
Formulation / Stand Code: <sup>B</sup>			
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.

<sup>A</sup> CMIR or Non-Reference Oil Code <sup>B</sup> 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.

<b>Oil Aeration Test Conditions</b>	
<b>Parameter</b>	<b>Value</b>
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 <sup>A</sup>	
SAE Viscosity <sup>B</sup>	
Engine Serial Number	
Engine run Hours since last rebuild	

<b>Average Oil Aeration (40-50 Hrs) (%)</b>	
Original Result	
Correction Factor	
Corrected Result	
Severity Adjustment	
Final Original Unit Result	

**Last Stand Reference Results <sup>B</sup>**

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

<sup>A</sup> Reference Tests Only

<sup>B</sup> ACC-Registered Tests Only

<sup>C</sup> 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:		



<b>40-50 Hr Aeration Slope</b>	
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**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 <sup>3</sup>	
	D2	g/cm <sup>3</sup>	
	K1	μs	
	K2	μs	
	Density Temperature Coefficient	(g/cm <sup>3</sup> )/(g/cm <sup>3</sup> 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
<b>Controlled Parameters</b>	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				
<b>Non-Controlled Parameters</b>	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
<b>IVA Oil Pressure</b>	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 <sup>2</sup> /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 <sup>2</sup> Value	





**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
<b>Hydrocarbon Composition</b>			
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 <sup>A</sup>		D 6078 <sup>A</sup>
90% Distillation, °C	282 – 338		D 86

<sup>A</sup> 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 <sup>nd</sup> 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.*

<b>Comments</b>

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Typed Name

\_\_\_\_\_  
Title