

D 7484 - ISB
Lubricant Performance Test

Report Packet Version No.

Method

Conducted For:

	V =	Valid; The reference oil / non-reference oil was evaluated in accordance with the test procedure.
	I =	Invalid; The reference oil / 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 an average test result using multiple test criteria.

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

Test Number					
Stand:	Stand Run:	Engine Serial Number:	Engine Hours:		
End Of Test Date:		End Of Test Time:			
Oil Code:					
Formulation / Stand Code:					
Alternate Codes					

In my opinion the test been conducted in a valid manner in accordance with Test Method D 7484 and the appropriate amendments through the information letter system. The remarks included in this report describe the anomalies associated with this test.
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Submitted By:

_____ Testing Laboratory

_____ Signature

_____ Typed Name

_____ Title

D 7484 - ISB Lubricant Performance Test
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D 7484 - ISB Lubricant Performance Test
Form 3
Summary Of Test Method

The ISB Lubricant Performance Test is an engine-dynamometer test which evaluates the ability of a lubricant to minimize valvetrain and camshaft wear. This test is a two-stage test. Stage A is 100 hours, steady state, and is run with retarded fuel injection timing to produce elevated soot levels in the oil. Stage B is 250 hours and is run under quick cyclic speed and load conditions to induce wear. The stages are run in sequence (Stage A followed by Stage B) for a total test length of 350 hours.

The test engine is a Cummins ISB diesel engine with EGR. It is an in-line six cylinder, four-stroke, turbocharged engine with electronically controlled fuel injection. The engine is re-used for multiple tests with new valvetrain parts for each test.

ISB Test Conditions

Parameter	Stage A	Stage B^A
Time, h	100	250
Injection Timing, °	-14 nominal	Varies
Speed, r/min	1600	Varies
Fuel Flow, kg/h	20	Varies
Inlet Manifold Temp., °C	68	Target 68
Coolant Out Temp., °C	99	Target 99
Fuel In Temp., °C	40	40
Oil Sump Temp., °C	110	Target 110
Intake Air Temp., °C	Record	Record
Intake Air Pressure, kPa (vacuum)	0 – 4	Record
Intake Manifold Pressure, kPa absolute	Record	Record
Exhaust Back Pressure, kPa	7	Wide Open, Varies
Crankcase Pressure, kPa	Record	Record
Coolant System Pressure, kPa	99 - 107	99 - 107
Power, kW	Record	Record
Torque, Nm	Record	Record
Pre-turbine Exhaust Temp., °C	Record	Record
Tailpipe Exhaust Temp., °C	Record	Record
Oil Gallery Temp., °C	Record	Record
Inlet Air Dew Point, °C	Record	Record
Inlet Air Humidity, kg/kg	Record	Record
Oil Gallery Pressure, kPa	Record	Record
Oil Filter Delta P, kPa	Record	Record
Fuel Pressure @ Lift Pump, kPa	Record	Record

^A Conditions indicated are 5 seconds into the peak power step of the transient cycle.

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Test Results Summary
Form 4

Laboratory:	EOT Date:	EOT Time:
Test Number:		
Formulation/Stand Code:		
Oil Code:	Engine Kit S/N:	

Date Test Started			
Start Time			
Test Length			
TMC Oil Code ^A			
Number of Valid Tests Since Stand Calibration ^B			
Laboratory Oil Code			
SAE Viscosity			
TGA Soot % At 100 h			
Average TGA Soot % (25 – 350 h)			
	Average Camshaft Wear (μm)	Average Tappet Mass Loss (mg)	Average Crosshead Mass Loss (mg)
Original Result			
Transformed Result			
Correction Factor			
Corrected Transformed Result			
Severity Adjustment			
Final Transformed Result			
Final Result			

Last Stand Reference Results			
Reference Test Number			
Oil Code			
Test Length			
TMC Oil Code			
EOT Date			
EOT Time			
Stand Calibration Expiration Date			
TGA Soot % AT 100 h			
Average TGA Soot % (25 – 350 h)			
	Average Camshaft Wear (μm)	Average Tappet Mass Loss (mg)	Average Crosshead Mass Loss (mg)
Final Result			

^A Reference Tests Only

^B For Non-Reference Tests Only, includes current test if valid.

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Form 5

Operational Summary

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

Controlled Parameters	Parameter	Units			Stage Target		Stage Average		Stage B Cycles ^A	System Response ^C	
					A	B	A	B			
	Speed	r/min			1600	Varies					
	Fuel Flow	kg/h			20	Varies					
	Coolant Out	°C			99	99					
	Fuel In	°C			40	40					
	Oil Sump	°C			110	110					
	Intake Air	°C			25-35	25-35					
	Intake Manifold	°C			68	68					
	Intake Air Restriction	kPa			1-3	0-4					
	Exhaust	kPa			6-8	4 max					
Coolant	kPa			99-107	99-107						
Non-controlled Parameters	Parameter	Units	Typical Values ^B		Average Stage A		Average Stage B				
	Torque	N-m	TBD	TBD							
	Intake Manifold Pressure	kPa abs	TBD	TBD							
	Crankcase Pressure	kPa	TBD	TBD							
	Pre-Turbine Front	°C	TBD	TBD							
	Pre-Turbine Rear	°C	TBD	TBD							
	Tailpipe	°C	TBD	TBD							
	Oil Gallery Temperature	°C	TBD	TBD							
	Blowby	L/min	TBD	TBD							
	Main Oil Gallery Press.	kPa	TBD	TBD							
	Fuel Pressure (lift pump)	kPa	TBD	TBD							

^A Number of Stage B cycles. A minimum of 32,000 cycles is required.

^B Typical values determined from reference oil test database

^C Time for the output to reach 63.2% of final value for step change at input

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Form 6
Tappet Mass Loss Summary

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

Tappet Wear			
Location	Pretest Mass (g)	EOT Mass (g)	Mass Loss (mg)
1I			
1E			
2I			
2E			
3I			
3E			
4I			
4E			
5I			
5E			
6I			
6E			

Tappet Mass Loss Intake / Exhaust Summary (mg)	Intake		Exhaust	
	As Measured	Outlier Screened	As Measured	Outlier Screened
Average				
Minimum				
Maximum				
Standard Deviation				
Outlier Locations ^A				

^A Location Designation. Example: 3E

Tappet Mass Loss Overall Summary (mg)	As Measured	Outlier Screened	Soot Adjusted
Average			
Minimum			
Maximum			
Standard Deviation			

Tappet Batch ID	
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Form 7
Crosshead Mass Loss Summary

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

Location	Serial No.	Pretest Mass (g)	EOT Mass (g)	Mass Loss (mg)
1I				
1E				
2I				
2E				
3I				
3E				
4I				
4E				
5I				
5E				
6I				
6E				

Intake / Exhaust Crosshead Mass Loss Summary (mg)	Intake		Exhaust	
	As Measured	Outlier Screened	As Measured	Outlier Screened
Average				
Minimum				
Maximum				
Standard Deviation				
Outlier Locations ^A				

^A Location Designation. Example: 3E

Crosshead Mass Loss Overall Summary (mg)	As Measured	Outlier Screened	Soot Adjusted
Average			
Minimum			
Maximum			
Standard Deviation			

Crosshead Batch ID	
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Form 8
Cam Shaft Wear Summary

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

Lobe Number	Intake/Exhaust	Cam Shaft Wear (μm) ⁴	Pre-test Pit Location
1	Intake		
2	Exhaust		
3	Intake		
4	Exhaust		
5	Intake		
6	Exhaust		
7	Intake		
8	Exhaust		
9	Intake		
10	Exhaust		
11	Intake		
12	Exhaust		

⁴Average wear at front, middle, and rear of cam lobe.

Intake / Exhaust Cam Shaft Wear Summary (μm)	Intake		Exhaust	
	As Measured	Outlier Screened	As Measured	Outlier Screened
Average				
Minimum				
Maximum				
Standard Deviation				
Outlier Locations ^B				

^B Lobe Number.

Cam Shaft Wear Overall Summary (μm)	As Measured	Outlier Screened
Average		
Minimum		
Maximum		
Standard Deviation		

Camshaft Batch ID	
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Oil Analysis Summary

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

[illegible]

**D 7484 - ISB Lubricant Performance Test
Form 10
Unscheduled Downtime & Maintenance Summary**

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

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

[illegible]

**D 7484 - ISB Lubricant Performance Test
Form 10a
Unscheduled Downtime & Maintenance Summary**

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

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

[illegible]

D 7484 - ISB Lubricant Performance Test
Form 10b
Unscheduled Downtime & Maintenance Summary

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

[illegible][illegible]

D 7484 - ISB Lubricant Performance Test**Form 11****Test Fuel Analysis (Last Batch)**

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

Fuel Supplier		Fuel Batch Identifier		
Measurement	Specs.	Analysis		Test Method
		New	EOT	
Total Sulfur, ppm	7 – 15			D 5453
Gravity, °API	34 – 37			D 4052
Hydrocarbon Composition				
Aromatics % Wt.	26 – 31.5			D 5186
Olefins % Vol.	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, % Vol.	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, % Wt.	0.005 max			D 482
SLBOCLE, g	3100 min ^A			D 6078 ^A
90% Distillation, °C	293 - 332			D 86

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

**D 7484 - ISB Lubricant Performance Test
Form 12
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