

**ISB  
Lubricant Performance Test**

**Report Packet Version No.**

ISB VERSION 20050124 BETA

**Method**

CCCCCCCC

**Conducted For:**

CC

CC

C	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.

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

Test Number			
Stand: CCCCC	Stand Run: CCCC	Engine Serial Number: CCCCCCCC	Engine Hours: CCCCC
End Of Test Date: YYYYMMDD		End Of Test Time: HH:MM	
Oil Code: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC			
Formulation / Stand Code: CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC			
Alternate Codes:	CCCCCCCCCCCCCCC	CCCCCCCCCCCCCCC	CCCCCCCCCCCCCCC

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

Submitted By: \_\_\_\_\_  
Testing Laboratory

\_\_\_\_\_  
Signature Image  
Signature

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

\_\_\_\_\_  
Title

**ISB Lubricant Performance Test  
Form 2  
Table of Contents**

1.	Final Report Cover Sheet	Form 1
2.	Table of Contents	Form 2
3.	Summary of Test Method	Form 3
4.	Test Results Summary	Form 4
5.	Operational Summary	Form 5
6.	Tappet Loss Summary	Form 6
7.	Crosshead Mass Loss Summary	Form 7
8.	Valve Adjusting Screw Mass Loss Summary	Form 8
9.	Rocker Lever Socket Mass Loss Summary	Form 9
10.	Valve Rocker Shaft Mass Loss Summary	Form 10
11.	Valve Push Rod Mass Loss Summary	Form 11
12.	Oil Analysis Summary	Form 12
13.	Unscheduled Downtime & Maintenance Summary	Form 13
14.	Test Fuel Analysis (Last Batch)	Form 14

**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) twice 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.

**ISM Test Conditions**

<b>Parameter</b>	<b>Stage A</b>	<b>Stage B</b>
Time, h	100	250
Injection Timing, °BTDC	15 nominal	Varies
Speed, r/min	1600	Varies
Fuel Flow, kg/h	20	Varies
Inlet Manifold Temp., °C	68	68
Coolant Out Temp., °C	99	99
Fuel In Temp., °C	40	40
Oil Sump Temp., °C	110	110
Intake Air Temp., °C	Record	Record
Intake Air Pressure, kPa absolute	Record	Record
Intake Manifold Pressure, kPa absolute	Record	Record
Exhaust Back Pressure, kPa absolute	107	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

**ISB Lubricant Performance Test  
Test Results Summary  
Form 4**

Laboratory: CC	EOT Date: YYYYMMDD	EOT Time: HH:MM
Test Number: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
Formulation/Stand Code: CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC		
Oil Code: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC	Engine Kit S/N: CCCCCCCCCC	

Date Test Started	YYYYMMDD
Start Time	HH:MM
Test Length	S1234
TMC Oil Code <sup>A</sup>	CCCCCC
Laboratory Oil Code	CCCCCCCCCCCCCCCCCCCC
SAE Viscosity	CCCCCC
TGA Soot % At 100 h	S123.1

	Average Camshaft Wear (µm)	Average Tappet Height Loss (µm)	Average Tappet Mass Loss (mg)	Average Crosshead Mass Loss (mg)	Average Valve Adjusting Screw Mass Loss (mg)
Original Result	S123.1	S123.1	S123.1	S123.1	S123.1
Transformed Result	S12.1234	S12.1234	S12.1234	S12.1234	S12.1234
Correction Factor	S12.1234	S12.1234	S12.1234	S12.1234	S12.1234
Corrected Transformed Result	S12.1234	S12.1234	S12.1234	S12.1234	S12.1234
Severity Adjustment	S12.1234	S12.1234	S12.1234	S12.1234	S12.1234
Final Transformed Result	S12.1234	S12.1234	S12.1234	S12.1234	S12.1234
<b>Final Result</b>	S123.1	S123.1	S123.1	S123.1	S123.1

<b>Last Stand Reference Results</b>					
Reference Test Number: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC					
Oil Code			CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
Test Length				S1234	
TMC Oil Code				CCCCCC	
EOT Date				YYYYMMDD	
EOT Time				HH:MM	
Stand Calibration Expiration Date				YYYYMMDD	
TGA Soot % AT 100 h				S123.1	
	Average Camshaft Wear (µm)	Average Tappet Height Loss (µm)	Average Tappet Mass Loss (mg)	Average Crosshead Mass Loss (mg)	Average Valve Adjusting Screw Mass Loss (mg)
<b>Final Result</b>	S123.1	S123.1	S123.1	S123.1	S123.1

<sup>A</sup> Reference Tests Only



**ISB Lubricant Performance Test  
Form 6  
Tappet Loss Summary**

Laboratory: CC	EOT Date: YYYYMMDD	EOT Time: HH:MM
Test Number: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
Formulation / Stand Code: CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC		
Oil Code: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		

Tappet Wear						
Location	Heights			Weights		
	SOT Height (mm)	EOT Height (mm)	Height Loss (µm)	SOT Mass (g)	EOT Mass (g)	Mass Loss (mg)
1E	S123.1234	S123.1234	S12.1	S123.1234	S123.1234	S12.1
1I	S123.1234	S123.1234	S12.1	S123.1234	S123.1234	S12.1
2I	S123.1234	S123.1234	S12.1	S123.1234	S123.1234	S12.1
2E	S123.1234	S123.1234	S12.1	S123.1234	S123.1234	S12.1
3E	S123.1234	S123.1234	S12.1	S123.1234	S123.1234	S12.1
3I	S123.1234	S123.1234	S12.1	S123.1234	S123.1234	S12.1
4I	S123.1234	S123.1234	S12.1	S123.1234	S123.1234	S12.1
4E	S123.1234	S123.1234	S12.1	S123.1234	S123.1234	S12.1
5E	S123.1234	S123.1234	S12.1	S123.1234	S123.1234	S12.1
5I	S123.1234	S123.1234	S12.1	S123.1234	S123.1234	S12.1
6I	S123.1234	S123.1234	S12.1	S123.1234	S123.1234	S12.1
6E	S123.1234	S123.1234	S12.1	S123.1234	S123.1234	S12.1

Intake / Exhaust Summary	Heights (µm)		Weights (mg)	
	Intake	Exhaust	Intake	Exhaust
Average Loss	S12.12	S12.12	S12.12	S12.12
Minimum Loss	S12.12	S12.12	S12.12	S12.12
Maximum Loss	S12.12	S12.12	S12.12	S12.12
Standard Deviation	S12.12	S12.12	S12.12	S12.12

Overall Summary	Heights (µm)	Weights (mg)
Average Loss	S123.1	S123.1
Minimum Loss	S12.12	S12.12
Maximum Loss	S12.12	S12.12
Standard Deviation	S12.12	S12.12

**ISB Lubricant Performance Test  
Form 7  
Crosshead Mass Loss Summary**

Laboratory: CC	EOT Date: YYYYMMDD	EOT Time: HH:MM
Test Number: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
Formulation / Stand Code: CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC		
Oil Code: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		

Location	Serial No.	Pretest Mass (g)	EOT Mass (g)	Mass Loss (mg)
1E	CCCCC	S123.1234	S123.1234	S12.1
1I	CCCCC	S123.1234	S123.1234	S12.1
2I	CCCCC	S123.1234	S123.1234	S12.1
2E	CCCCC	S123.1234	S123.1234	S12.1
3E	CCCCC	S123.1234	S123.1234	S12.1
3I	CCCCC	S123.1234	S123.1234	S12.1
4I	CCCCC	S123.1234	S123.1234	S12.1
4E	CCCCC	S123.1234	S123.1234	S12.1
5E	CCCCC	S123.1234	S123.1234	S12.1
5I	CCCCC	S123.1234	S123.1234	S12.1
6I	CCCCC	S123.1234	S123.1234	S12.1
6E	CCCCC	S123.1234	S123.1234	S12.1

Intake / Exhaust Summary	Intake		Exhaust	
	As Measured	Outlier Screened	As Measured	Outlier Screened
Average Crosshead Mass Loss (mg)	S12.12	S12.12	S12.12	S12.12
Minimum Crosshead Mass Loss (mg)	S12.1	S12.1	S12.1	S12.1
Maximum Crosshead Mass Loss (mg)	S12.1	S12.1	S12.1	S12.1
Standard Deviation (mg)	S12.12	S12.12	S12.12	S12.12
Outlier Crossheads Locations <sup>A</sup>	CCCCCCCC		CCCCCCCC	

<sup>A</sup> Location Designation. Example: 3E

Overall Summary	As Measured	Outlier Screened	Adjusted to x.x% Soot
Average Crosshead Mass Loss (mg)	S12.12	S12.12	S123.1
Minimum Crosshead Mass Loss (mg)	S12.1	S12.1	
Maximum Crosshead Mass Loss (mg)	S12.1	S12.1	
Standard Deviation (mg)	S12.12	S12.12	

**ISB Lubricant Performance Test  
Form 8  
Valve Adjusting Screw Mass Loss Summary**

Laboratory: CC	EOT Date: YYYYMMDD	EOT Time: HH:MM
Test Number:	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC	
Formulation / Stand Code:	CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC	
Oil Code:	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC	

Location	Pretest Mass (g)	EOT Mass (g)	Mass Loss (mg)
1E	S123.1234	S123.1234	S12.1
1I	S123.1234	S123.1234	S12.1
2I	S123.1234	S123.1234	S12.1
2E	S123.1234	S123.1234	S12.1
3E	S123.1234	S123.1234	S12.1
3I	S123.1234	S123.1234	S12.1
4I	S123.1234	S123.1234	S12.1
4E	S123.1234	S123.1234	S12.1
5E	S123.1234	S123.1234	S12.1
5I	S123.1234	S123.1234	S12.1
6I	S123.1234	S123.1234	S12.1
6E	S123.1234	S123.1234	S12.1

Intake / Exhaust Summary	Intake		Exhaust	
	As Measured	Outlier Screened	As Measured	Outlier Screened
Average Mass Loss (mg)	S12.12	S12.12	S12.12	S12.12
Minimum Mass Loss (mg)	S12.1	S12.1	S12.1	S12.1
Maximum Mass Loss (mg)	S12.1	S12.1	S12.1	S12.1
Standard Deviation (mg)	S12.12	S12.12	S12.12	S12.12
Outlier Locations <sup>A</sup>	CCCCCCC		CCCCCCC	

<sup>A</sup> Location Designation. Example: 3E

Overall Summary	As Measured	Outlier Screened	Adjusted to x.x% Soot
Average Mass Loss (mg)	S12.12	S12.12	S123.1
Minimum Mass Loss (mg)	S12.1	S12.1	
Maximum Mass Loss (mg)	S12.1	S12.1	
Standard Deviation (mg)	S12.12	S12.12	

**ISB Lubricant Performance Test  
Form 9  
Rocker Lever Socket Mass Loss Summary**

Laboratory: CC	EOT Date: YYYYMMDD	EOT Time: HH:MM
Test Number: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
Formulation / Stand Code: CC-CCCCCCCCC-C-C-CCCCCC-CC-CC-CCCC		
Oil Code: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		

Location	Pretest Mass (g)	EOT Mass (g)	Mass Loss (mg)
1E	S123.1234	S123.1234	S12.1
1I	S123.1234	S123.1234	S12.1
2I	S123.1234	S123.1234	S12.1
2E	S123.1234	S123.1234	S12.1
3E	S123.1234	S123.1234	S12.1
3I	S123.1234	S123.1234	S12.1
4I	S123.1234	S123.1234	S12.1
4E	S123.1234	S123.1234	S12.1
5E	S123.1234	S123.1234	S12.1
5I	S123.1234	S123.1234	S12.1
6I	S123.1234	S123.1234	S12.1
6E	S123.1234	S123.1234	S12.1

Intake / Exhaust Summary	Intake		Exhaust	
	As Measured	Outlier Screened	As Measured	Outlier Screened
Average Mass Loss (mg)	S12.12	S12.12	S12.12	S12.12
Minimum Mass Loss (mg)	S12.12	S12.12	S12.12	S12.12
Maximum Mass Loss (mg)	S12.12	S12.12	S12.12	S12.12
Standard Deviation (mg)	S12.12	S12.12	S12.12	S12.12
Outlier Locations <sup>A</sup>	CCCCCCCC		CCCCCCCC	

<sup>A</sup> Location Designation. Example: 3E

Overall Summary	As Measured	Outlier Screened	Adjusted to x.x% Soot
Average Mass Loss (mg)	S12.12	S12.12	S12.12
Minimum Mass Loss (mg)	S12.12	S12.12	
Maximum Mass Loss (mg)	S12.12	S12.12	
Standard Deviation (mg)	S12.12	S12.12	

**ISB Lubricant Performance Test  
Form 10  
Valve Rocker Shaft Mass Loss Summary**

Laboratory: CC	EOT Date: YYYYMMDD	EOT Time: HH:MM
Test Number:	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC	
Formulation / Stand Code:	CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC	
Oil Code:	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC	

Location	Pretest Mass (g)	EOT Mass (g)	Mass Loss (mg)
1E	S123.1234	S123.1234	S12.1
1I	S123.1234	S123.1234	S12.1
2I	S123.1234	S123.1234	S12.1
2E	S123.1234	S123.1234	S12.1
3E	S123.1234	S123.1234	S12.1
3I	S123.1234	S123.1234	S12.1
4I	S123.1234	S123.1234	S12.1
4E	S123.1234	S123.1234	S12.1
5E	S123.1234	S123.1234	S12.1
5I	S123.1234	S123.1234	S12.1
6I	S123.1234	S123.1234	S12.1
6E	S123.1234	S123.1234	S12.1

Intake / Exhaust Summary	Intake		Exhaust	
	As Measured	Outlier Screened	As Measured	Outlier Screened
Average Mass Loss (mg)	S12.12	S12.12	S12.12	S12.12
Minimum Mass Loss (mg)	S12.12	S12.12	S12.12	S12.12
Maximum Mass Loss (mg)	S12.12	S12.12	S12.12	S12.12
Standard Deviation (mg)	S12.12	S12.12	S12.12	S12.12
Outlier Locations <sup>A</sup>	CCCCCCCC		CCCCCCCC	

<sup>A</sup> Location Designation. Example: 3E

Overall Summary	As Measured	Outlier Screened	Adjusted to x.x% Soot
Average Mass Loss (mg)	S12.12	S12.12	S12.12
Minimum Mass Loss (mg)	S12.12	S12.12	
Maximum Mass Loss (mg)	S12.12	S12.12	
Standard Deviation (mg)	S12.12	S12.12	

**ISB Lubricant Performance Test  
Form 11  
Valve Push Rods Mass Loss Summary**

Laboratory: CC	EOT Date: YYYYMMDD	EOT Time: HH:MM
Test Number: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
Formulation / Stand Code: CC-CCCCCCCCC-C-C-CCCCCC-CC-CC-CCCC		
Oil Code: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		

Location	Pretest Mass (g)	EOT Mass (g)	Mass Loss (mg)
1E	S123.1234	S123.1234	S12.1
1I	S123.1234	S123.1234	S12.1
2I	S123.1234	S123.1234	S12.1
2E	S123.1234	S123.1234	S12.1
3E	S123.1234	S123.1234	S12.1
3I	S123.1234	S123.1234	S12.1
4I	S123.1234	S123.1234	S12.1
4E	S123.1234	S123.1234	S12.1
5E	S123.1234	S123.1234	S12.1
5I	S123.1234	S123.1234	S12.1
6I	S123.1234	S123.1234	S12.1
6E	S123.1234	S123.1234	S12.1

Intake / Exhaust Summary	Intake		Exhaust	
	As Measured	Outlier Screened	As Measured	Outlier Screened
Average Mass Loss (mg)	S12.12	S12.12	S12.12	S12.12
Minimum Mass Loss (mg)	S12.12	S12.12	S12.12	S12.12
Maximum Mass Loss (mg)	S12.12	S12.12	S12.12	S12.12
Standard Deviation (mg)	S12.12	S12.12	S12.12	S12.12
Outlier Locations <sup>A</sup>	CCCCCCCC		CCCCCCCC	

<sup>A</sup> Location Designation. Example: 3E

Overall Summary	As Measured	Outlier Screened	Adjusted to x.x% Soot
Average Mass Loss (mg)	S12.12	S12.12	S12.12
Minimum Mass Loss (mg)	S12.12	S12.12	
Maximum Mass Loss (mg)	S12.12	S12.12	
Standard Deviation (mg)	S12.12	S12.12	









**ISB Lubricant Performance Test  
Form 14  
Test Fuel Analysis (Last Batch)**

Laboratory: CC	EOT Date: YYYYMMDD	EOT Time: HH:MM
Test Number:	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC	
Formulation / Stand Code:	CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC	
Oil Code:	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC	

Fuel Supplier		Fuel Batch Identifier		
Measurement	Specs.	Analysis		Test Method
		New	EOT	
Total Sulfur, ppm	7 - 15	S12.12	S12.12	D 5453
Gravity, °API	34 - 37	S12.1	S12.1	D 4052
<b>Hydrocarbon Composition</b>				
Aromatics % Wt.	26 - 31.5	S12.1		D 5186
Olefins % Vol.	Report	S12.1		D 1319
Cetane Index	Report	S12.1		D 976
Cetane No.	43 - 47	S12.1		D 613
Copper Strip Corrosion	1 Maximum	CCCC		D 130
Flash Point, °C	54 Minimum	S123		D 93
Pour Point, °C	-18 Maximum	S123		D 97
Carbon Residue on 10% Residuum, %	0.35 Maximum	S12.12		D 524 (10% Bottoms)
Water & Sediment, % Vol.	0.05 Maximum	AAAAAA		D 2709
Viscosity, cSt @ 40°C	2.0 - 2.6	S12.1		D 445
Total Acid Number	0.05 Maximum	S1.12		D 664
Strong Acid Number	0.00 Maximum	S1.12		D 664
Accelerated Stability	1.5 max	S12.1		D 2274
Ash, % Wt.	0.005 max	S123.123		D 482
SLBOCLE, g	3100 min <sup>A</sup>	S1234567		D 6078 <sup>A</sup>
90% Distillation, °C	293 - 332	S1234		D 86

<sup>A</sup>May be altered to be consistent with CARB or ASTM diesel fuel specifications.