

**M11 EGR
Lubricant Performance Test**

Report Packet Version No.

M11EGR VERSION 20021031

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

Stand:	CCCCC	Engine:	CCCCCCC	Engine Run No:	CCCC
End Of Test Date:	YYYYMMDD	End Of Test Time:	HH:MM		
Oil Code:	CC				
Formulation / Stand Code:	CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC				
Alternate Codes:	CCCCCCCCCCCCCCCC	CCCCCCCCCCCCCCCC	CCCCCCCCCCCCCCCC	CCCCCCCCCCCCCCCC	CCCCCCCCCCCCCCCC

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:

CC

Testing Laboratory

Signature Image

Signature

CC

Typed Name

CC

Title

**M11 EGR Lubricant Performance Test
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**M11 EGR Lubricant Performance Test
Form 3
Summary Of Test Method**

The M11 EGR Lubricant Performance Test is an engine-dynamometer test which evaluates the ability of a lubricant to minimize crosshead wear, filter plugging, sludge build-up, and top ring weight loss. This test is a two-stage, steady state test (constant speed and load). Stage A is 50 hours and is run with retarded fuel injection timing to produce elevated soot levels in the oil. Stage B is 50 hours and is run under heavy load conditions to induce wear. The stages are run in sequence (Stage A followed by Stage B) three times for a total test length of 300 hours.

The test engine is a Cummins M11 diesel engine with EGR. It is an in-line six cylinder, four-stroke, turbocharged engine with electronically controlled fuel injection. A two-h break-in is conducted prior to each test since a new engine build is used for each test.

M11 EGR Test Conditions

Parameter	Stage A	Stage B
Time, h	50	50
Injection Timing, °BTDC	16 min	32
Speed, r/min	1800	1600
Fuel Flow, kg/h	58.0	64.4
Intake CO 2%	0.97 - 1.09	0.78 - 0.85
Inlet Manifold Temp., °C	80	65.5
Coolant Out Temp., °C	65.5	65.5
Fuel In Temp., °C	40	40
Oil Gallery Temp., °C	115	115
Intake Air Temp., °C	Record	Record
Intake Air Pressure, kPa absolute	Record	Record
Intake Manifold Pressure, kPa absolute	300 Minimum	320 Minimum
Exhaust Back Pressure, kPa absolute	107	107
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 Sump 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

**M11 EGR Lubricant Performance Test
Test Results Summary
Form 4**

Laboratory: CC	EOT Date: YYYYMMDD	EOT Time: HH:MM
Stand: CCCCC	Engine: CCCCCCCC	Engine Run No.: CCCC
Formulation/Stand Code: CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC		
Oil Code: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		Engine Kit S/N: CCCCCCCCCC

Date Test Started	YYYYMMDD
Start Time	HH:MM
Test Length	S1234
TMC Oil Code ^A	CCCCCC
Laboratory Oil Code	CCCCCCCCCCCCCCCCCCCC
SAE Viscosity	CCCCCC
TGA Soot % At 50 h	S123.1
TGA Soot % At 250 h	S123.1
Average TGA Soot % 0 - 300 h (≥ 4.6)	S123.1
Total Oil Consumption, kg	S12.12

	Adj. Average Crosshead Mass Loss (mg)	Filter Plugging Delta P (kPa)	Average Sludge Rating (merits)	Avg. Top Ring Weight Loss (mg)
Original Result	S12.1234	S123	S1.1	S123.1
Transformed Result ^B	S12.1234	S12.1234	S1.1234	S123.1234
Correction Factor ^B	S12.1234	S1.1234	S1.1234	S1.1234
Corrected Transformed Result ^B	S12.1234	S12.1234	S1.1234	S123.1234
Severity Adjustment ^B	S12.1234	S1.1234	S1.1234	S1.1234
Final Transformed Result ^B	S12.1234	S12.1234	S1.1234	S123.1234
Final Result	S123.1	S123	S1.1	S123.1

Last Stand Reference Results				
Test Number: CCCCC	CCCCCCCC	CCCC		
Oil Code	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC			
Test Length	S1234			
TMC Oil Code	CCCCCC			
EOT Date	YYYYMMDD			
EOT Time	HH:MM			
Stand Calibration Expiration Date	YYYYMMDD			
TGA Soot % AT 50 h	S123.1			
TGA Soot % AT 250 h (8.0 - 9.0)	S123.1			
Average TGA Soot % 0 - 300 h (≥ 4.6)	S123.1			
Total Oil Consumption, kg	S12.12			

	Adj. Average Crosshead Mass Loss (mg)	Filter Plugging Delta P (kPa)	Average Sludge Rating (merits)	Avg. Top Ring Weight Loss (mg)
Original Result	S12.1234	S123	S1.1	S123.1
Transformed Result ^B	S12.1234	S12.1234	S1.1234	S123.1234
Correction Factor ^B	S12.1234	S1.1234	S1.1234	S1.1234
Corrected Transformed Result ^B	S12.1234	S12.1234	S1.1234	S123.1234
Final Transformed Result ^B	S12.1234	S12.1234	S1.1234	S123.1234
Final Result	S123.1	S123	S1.1	S123.1

^A Reference Tests Only

^B Filter Plugging Delta P Value in Transformed Units

**M11 EGR Lubricant Performance Test
Form 5
Operational Summary**

Laboratory:	CC	EOT Date:	YYYYMMDD	EOT Time:	HH:MM
Stand:	CCCCC	Engine:	CCCCCCCC	Engine Run No.:	CCCC
Formulation/Stand Code: CC-CCCCCCCCC-C-C-CCCCCC-CC-CC-CCCCC					
Oil Code: CCC					

Parameter	Units	QI Threshold	EOT QI ^A	Target	Average	Samples ^B	BQD ^C	Over/Under Range ^D
Speed	r/min	0.000	S12.123	1800	S123456	S1234	S1234	S1234
Fuel Flow	kg/h	0.000	S12.123	58.0	S123.1	S1234	S1234	S1234
Coolant Out	°C	0.000	S12.123	65.5	S123.1	S1234	S1234	S1234
Fuel In	°C	0.000	S12.123	40	S12.1	S1234	S1234	S1234
Oil Gallery	°C	0.000	S12.123	115	S123.1	S1234	S1234	S1234
Intake Manifold	°C	0.000	S12.123	80.0	S12.1	S1234	S1234	S1234
Exhaust	kPa	0.000	S12.123	107	S123.1	S1234	S1234	S1234
Parameter	Units	QI Threshold	EOT QI^A	Target	Average	Samples^B	BQD^C	Over/Under Range^D
Typical Values^E								
Torque	N-m	TBD	TBD	S1234.1	S1234.1			
Power	kW	TBD	TBD	S123.1	S123.1			
Intake CO	%	0.97 - 1.09 ^F	0.78 - 0.85 ^F	S1.12	S1.12			
Blowby	L/min		TBD		S12.1			
Coolant In	°C		TBD		S123.1			
Intake Air	°C		TBD		S12.1			
Pre-Turbine (F)	°C		TBD		S123.1			
Pre-Turbine (R)	°C		TBD		S123.1			
Tailpipe	°C		TBD		S123.1			
Fuel	kPa		TBD		S1234.1			
Oil Gallery	kPa		TBD		S123.1			
Coolant	kPa		99 - 107		S123.1			
Intake Manifold	kPa		TBD		S123.1			
Crankcase	kPa		TBD		S1.1			
Intake Air	kPa		TBD		S12.12			

^A QI values above the threshold are acceptable by the Cummins Surveillance Panel. QI values below the threshold may not be considered acceptable based on an engineering review. See the comments section of this report.

^B Total number of data points taken

^C Number of Bad Quality Data points not used in the calculation of the statistical measures

^D Number of points clipped by over/under range limits

^E Typical values determined from reference oil test database

^F Intake CO₂ rates must be within specified range

**M11 EGR Lubricant Performance Test
Form 6
Crosshead Mass Loss Summary**

Laboratory: CC	EOT Date: YYYYMMDD	EOT Time: HH:MM	
Test Number			
Stand: CCCCC	Engine: CCCCCCC	Engine Run No.: CCCC	
Formulation / Stand Code: CC-CCCCCCCCC-C-C-CCCCCC-CC-CC-CCCC			
Oil Code: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC			

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 ⁴	CCCCCCCC		CCCCCCCC	

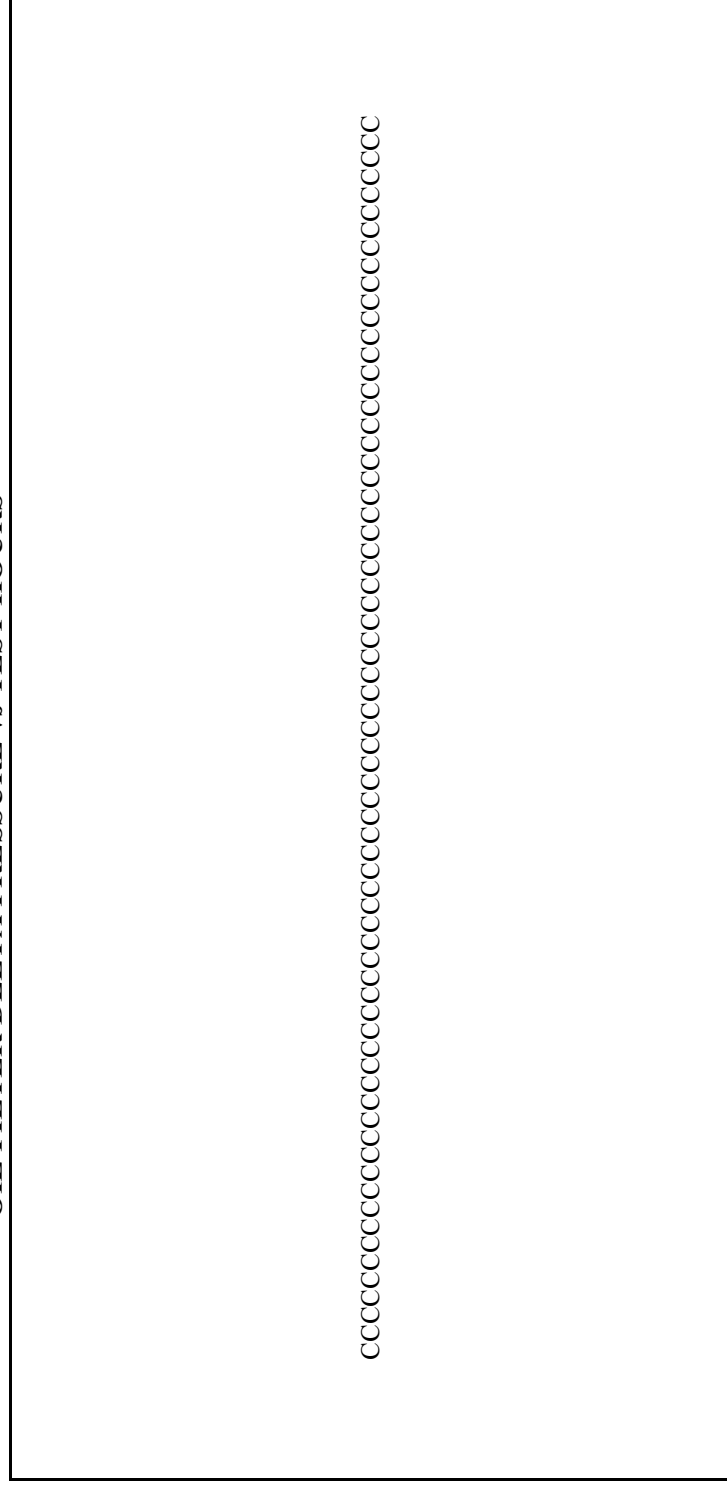
⁴ Location Designation. Example: 3E

Overall Summary	As Measured	Outlier Screened	Adjusted to 4.6% Soot
Average Crosshead Mass Loss (mg)	S12.12	S12.12	S12.1234
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	

**M11 EGR Lubricant Performance Test
Form 7
Oil Filter Delta Pressure Plot**

Laboratory:	CC	EOT Date:	YYMMDD	EOT Time:	HH:MM
Stand:	CCCC	Engine:	CCCCCCC	Engine Run No.:	CCCC
Formulation / Stand Code:	CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC				
Oil code:	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC				

OIL FILTER DELTA PRESSURE vs TEST HOURS



OIL FILTER DELTA P (kPa)

CC

TEST HOURS

**M11 EGR Lubricant Performance Test
Form 8
Sludge Rating Summary**

Laboratory: CC	EOT Date: YYYYMMDD	EOT Time: HH:MM
Test Number		
Stand: CCCCC	Engine: CCCCCCC	Engine Run No.: CCCC
Formulation / Stand Code: CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC		
Oil Code: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		

Sludge Rating Summary

Sludge Depth	Valve Cover % of Area	Valve Cover Volume Factor	Oil Pan % of Area	Oil Pan Volume Factor
1/4A	S12	S1.12	S12	S1.12
1/2A	S12	S1.12	S12	S1.12
3/4A	S12	S1.12	S12	S1.12
A	S12	S1.12	S12	S1.12
AB	S12	S1.12	S12	S1.12
B	S12	S1.12	S12	S1.12
BC	S12	S1.12	S12	S1.12
C	S12	S1.12	S12	S1.12
D	S12	S1.12	S12	S1.12
E	S12	S1.12	S12	S1.12
F	S12	S1.12	S12	S1.12
G	S12	S1.12	S12	S1.12
H	S12	S1.12	S12	S1.12
I	S12	S1.12	S12	S1.12
J	S12	S1.12	S12	S1.12
Total Volume Factor:		S12.12	Total Volume Factor:	S12.12
Merit Rating:		S12.12	Merit Rating:	S12.12
Average Sludge Rating:			S1.1	

**M11 EGR Lubricant Performance Test
Form 9
Rod Bearing Mass Loss**

Laboratory: CC	EOT Date: YYYYMMDD	EOT Time: HH:MM
Test Number		
Stand: CCCCC	Engine CCCCCCCC	Engine Run No.: CCCC
Formulation / Stand Code: CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC		
Oil Code: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		

Cylinder Number	Bearing Location	Pretest Mass (g)	Post-Test Mass (g)	Mass Loss (mg)
1	Upper	S123.1234	S123.1234	S123.1
	Lower	S123.1234	S123.1234	S123.1
2	Upper	S123.1234	S123.1234	S123.1
	Lower	S123.1234	S123.1234	S123.1
3	Upper	S123.1234	S123.1234	S123.1
	Lower	S123.1234	S123.1234	S123.1
4	Upper	S123.1234	S123.1234	S123.1
	Lower	S123.1234	S123.1234	S123.1
5	Upper	S123.1234	S123.1234	S123.1
	Lower	S123.1234	S123.1234	S123.1
6	Upper	S123.1234	S123.1234	S123.1
	Lower	S123.1234	S123.1234	S123.1

	Bearing Mass Loss
Average (mg)	S123.1
Minimum (mg)	S123.1
Maximum (mg)	S123.1
Standard Deviation (mg)	S1.12

**M11 EGR Lubricant Performance Test
Form 11
PISTON 1 Deposit Ratings**

Laboratory:	CC	EOT Date:	YYMMDD	EOT Time:	HH:MM
Stand:	CCCC	Engine:	CCCCCCC	Engine Run No.:	CCCC
Formulation / Stand Code:	CC-CCCCCCCCC-C-CCCCC-CC-CCCC				
Oil Code:	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC				

Total Piston Ratings Summary																			
Dep. Factor	Grooves			Lands			Dep. Factor	Groove			Lands			Oil Cooling	Under Crown				
	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3		No. 3	No. 3	No. 3	No. 3	No. 3	No. 3			No. 3			
	A,%	Dem.	A,%	Dem.	A,%	Dem.		A,%	Dem.	A,%	Dem.	A,%	Dem.	A,%	Dem.				
HC-1.0	S12	S12.12	S12	S12.12	S12	S12.12		S12	S12.12	S12	S12.12	S12	S12.12						
MC-0.5	S12	S12.12						S12	S12.12										
LC-.25	S12	S12.12	S12	S12.12	S12	S12.12		S12	S12.12	S12	S12.12	S12	S12.12	S12	S1.123				
Total	S12	S12.12	S12	S12.12	S12	S12.12		S12	S12.12	S12	S12.12	S12	S12.12	S12	S1.123				
8-9	S12	S12.12	S12	S12.12	S12	S12.12													
7-7.9	S12	S12.12	S12	S12.12	S12	S12.12													
6-6.9	S12	S12.12	S12	S12.12	S12	S12.12	7.5	S12	S12.12	S12	S12.12	S12	S12.12	S12	S1.123				
5-5.9	S12	S12.12	S12	S12.12	S12	S12.12													
4-4.9	S12	S12.12	S12	S12.12	S12	S12.12													
3-3.9	S12	S12.12	S12	S12.12	S12	S12.12													
2-2.9	S12	S12.12	S12	S12.12	S12	S12.12													
1-1.9	S12	S12.12	S12	S12.12	S12	S12.12													
>0-0.9	S12	S12.12	S12	S12.12	S12	S12.12													
Clean	0	0	0	0	0	0	Clean	0	0	0	0	0	0	0	0				
Total	S12	S12.12	S12	S12.12	S12	S12.12													
Rating			S12.12		S12.12														
TGC							Unweighted Deposits							Top Land Carbon			T.L. Flaked Carbon %		
S12.12							S12.123							S12.12			S123.12		

**M11 EGR Lubricant Performance Test
Form 12
Piston 2 Deposit Ratings**

Laboratory:	CC	EOT Date:	YYMMDD	EOT Time:	HH:MM
Stand:	CCCC	Engine:	CCCCCCC	Engine Run No.:	CCCC
Formulation / Stand Code:	CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC				
Oil Code:	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC				

Total Piston Ratings Summary																
Dep. Factor	Grooves			Lands			Dep. Factor	Groove			Lands			Oil Cooling	Under Crown	
	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3		No. 3	No. 3	No. 3	No. 4	No. 4	No. 4			
	A,%	Dem.	A,%	Dem.	A,%	Dem.		A,%	Dem.	A,%	Dem.	A,%	Dem.	A,%	Dem.	
HC-1.0	S12	S12.12	S12	S12.12	S12	S12.12		S12	S12.12	S12	S12.12	S12	S12.12			
MC-0.5	S12	S12.12						S12	S12.12							
LC-.25	S12	S12.12	S12	S12.12	S12	S12.12		S12	S12.12	S12	S12.12	S12	S12.12	S12	S1.123	
Total	S12	S12.12	S12	S12.12	S12	S12.12		S12	S12.12	S12	S12.12	S12	S12.12	S12	S1.123	
8-9	S12	S12.12	S12	S12.12	S12	S12.12										
7-7.9	S12	S12.12	S12	S12.12	S12	S12.12										
6-6.9	S12	S12.12	S12	S12.12	S12	S12.12	7.5	S12	S12.12	S12	S12.12	S12	S12.12	S12	S1.123	
5-5.9	S12	S12.12	S12	S12.12	S12	S12.12										
4-4.9	S12	S12.12	S12	S12.12	S12	S12.12										
3-3.9	S12	S12.12	S12	S12.12	S12	S12.12										
2-2.9	S12	S12.12	S12	S12.12	S12	S12.12										
1-1.9	S12	S12.12	S12	S12.12	S12	S12.12										
>0-0.9	S12	S12.12	S12	S12.12	S12	S12.12										
Clean	0	0	0	0	0	0	Clean	0	0	0	0	0	0	0	0	
Total	S12	S12.12	S12	S12.12	S12	S12.12		S12	S12.12	S12	S12.12	S12	S12.12	S12	S1.123	
Rating	S12.12			S12.12				S12.12			S12.12			S12.12		
TGC	S12.12			S12.123				S12.12			S12.12			S12.123		
Unweighted Deposits	S12.123			S12.123				S12.12			S12.12			S12.123		
Top Land Carbon	S12.12			S12.12				S12.12			S12.12			S12.123		
T.L. Flaked Carbon %	S12.12			S12.12				S12.12			S12.12			S12.123		

**M11 EGR Lubricant Performance Test
Form 13
Piston 3 Deposit Ratings**

Laboratory:	CC	EOT Date:	YYYYMMDD	EOT Time:	HH:MM
Stand:	CCCCC	Engine:	CCCCCCCC	Engine Run No.:	CCCC
Formulation / Stand Code:	CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC				
Oil Code:	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC				

Total Piston Ratings Summary																		
Dep. Factor	Grooves			Lands			Dep. Factor	Lands			Groove		Oil Cooling		Under Crown			
	No. 1	No. 2	No. 1	No. 1	No. 2	No. 2		No. 3	No. 3	No. 4	No. 3	No. 3	A, %	Dem.	A, %	Dem.	A, %	Dem.
HC -1.0	S12	S12.12	S12	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12			
MC -0.5	S12	S12.12																
LC - .25	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	S123.12	S12	S1.123	
Total	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	S123.12	S12	S1.123	
8 - 9	S12	S12.12	S12	S12.12	S12	S12.12												
7 - 7.9	S12	S12.12	S12	S12.12	S12	S12.12												
6 - 6.9	S12	S12.12	S12	S12.12	S12	S12.12	7.5					S12	S12.12	S12	S123.12	S12	S1.123	
5 - 5.9	S12	S12.12	S12	S12.12	S12	S12.12												
4 - 4.9	S12	S12.12	S12	S12.12	S12	S12.12	4.5					S12	S12.12	S12	S123.12	S12	S1.123	
3 - 3.9	S12	S12.12	S12	S12.12	S12	S12.12												
2 - 2.9	S12	S12.12	S12	S12.12	S12	S12.12												
1 - 1.9	S12	S12.12	S12	S12.12	S12	S12.12	1.5					S12	S12.12	S12	S123.12	S12	S1.123	
>0 - 0.9	S12	S12.12	S12	S12.12	S12	S12.12												
Clean	0	0	0	0	0	0	Clean					0	0	0	0	0	0	
Total	S12	S12.12	S12	S12.12	S12	S12.12						S12	S12.12	S12	S123.12	S12	S1.123	
Rating	S12.12			S12.12			S12.12			S12.12		S123.12		S1.123				
TGC	S12.12			S12.12			S12.12			S12.12		S123.12		S1.123				
Unweighted Deposits	S12.12			S12.12			S12.12			S12.12		S123.12		S1.123				
Top Land Carbon	S12.12			S12.12			S12.12			S12.12		S123.12		S1.123				
T.L. Flaked Carbon %	S12.12			S12.12			S12.12			S12.12		S123.12		S1.123				

**M11 EGR Lubricant Performance Test
Form 14
Piston 4 Deposit Ratings**

Laboratory:	CC	EOT Date: YYYYMMDD	EOT Time: HH:MM
Test Number			
Stand:	CCCCC	Engine: CCCCCC	Engine Run No.: CCCC
Formulation / Stand Code:	CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC		
Oil Code:	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		

Total Piston Ratings Summary																																							
Dep. Factor	Grooves				Lands				Dep. Factor	Lands				Oil Cooling	Under Crown																								
	No. 1	No. 2	No. 1	No. 2	No. 1	No. 2	No. 1	No. 2		No. 3	No. 4	No. 3	No. 4			A, %	Dem.	A, %	Dem.	A, %	Dem.																		
HC -1.0	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12																			
MC -0.5	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12																			
LC - .25	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12																			
Total	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12																			
8 - 9	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12																															
7 - 7.9	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12																															
6 - 6.9	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	7.5																														
5 - 5.9	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12																															
4 - 4.9	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12																															
3 - 3.9	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12																															
2 - 2.9	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	4.5																														
1 - 1.9	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12																															
>0 - 0.9	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12	1.5																														
Clean	0	0	0	0	0	0	0	0	Clean	0	0	0	0	0	0	0	0	0	0	0																			
Total	S12	S12.12	S12	S12.12	S12	S12.12	S12	S12.12																															
Rating	S12.12				S12.12				S12.12				S12.12				S12.12																						
TGC										Unweighted Deposits										Top Land Carbon										T.L. Flaked Carbon %									
S12.12										S12.123										S12.12										S123.12									

**M11 EGR Lubricant Performance Test
Form 15
Piston 5 Deposit Ratings**

Laboratory:	CC	EOT Date:	YYMMDD	EOT Time:	HH:MM
Stand:	CCCC	Engine:	CCCCCCC	Engine Run No.:	CCCC
Formulation / Stand Code:	CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC				
Oil Code:	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC				

Total Piston Ratings Summary															
Dep. Factor	Grooves			Lands			Dep. Factor	Groove			Lands			Oil Cooling	Under Crown
	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3		No. 3	No. 3	No. 3	No. 4	No. 4	No. 4		
	A,%	Dem.	A,%	Dem.	A,%	Dem.		A,%	Dem.	A,%	Dem.	A,%	Dem.	A,%	Dem.
HC-1.0	S12	S12.12	S12	S12.12	S12	S12.12		S12	S12.12	S12	S12.12	S12	S12.12		
MC-0.5	S12	S12.12						S12	S12.12						
LC-.25	S12	S12.12	S12	S12.12	S12	S12.12		S12	S12.12	S12	S12.12	S12	S12.12	S12	S1.123
Total	S12	S12.12	S12	S12.12	S12	S12.12		S12	S12.12	S12	S12.12	S12	S12.12	S12	S1.123
8-9	S12	S12.12	S12	S12.12	S12	S12.12									
7-7.9	S12	S12.12	S12	S12.12	S12	S12.12									
6-6.9	S12	S12.12	S12	S12.12	S12	S12.12	7.5	S12	S12.12	S12	S12.12	S12	S12.12	S12	S1.123
5-5.9	S12	S12.12	S12	S12.12	S12	S12.12									
4-4.9	S12	S12.12	S12	S12.12	S12	S12.12									
3-3.9	S12	S12.12	S12	S12.12	S12	S12.12									
2-2.9	S12	S12.12	S12	S12.12	S12	S12.12									
1-1.9	S12	S12.12	S12	S12.12	S12	S12.12									
>0-0.9	S12	S12.12	S12	S12.12	S12	S12.12									
Clean	0	0	0	0	0	0	Clean	0	0	0	0	0	0	0	0
Total	S12	S12.12	S12	S12.12	S12	S12.12									
Rating	S12.12			S12.12				S12.12			S12.12			S12.12	
TGC	S12.12			S12.123				S12.12			S12.12			S12.123	
Unweighted Deposits	S12.123			S12.123				S12.12			S12.12			S12.123	
Top Land Carbon	S12.12			S12.12				S12.12			S12.12			S12.123	
T.L. Flaked Carbon %	S12.12			S12.12				S12.12			S12.12			S12.123	

**M11 EGR Lubricant Performance Test
Form 16
Piston 6 Deposit Ratings**

Laboratory:	CC	EOT Date:	YYMMDD	EOT Time:	HH:MM
Stand:	CCCC	Engine:	CCCCCCC	Engine Run No.:	CCCC
Formulation / Stand Code:	CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC				
Oil Code:	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC				

Total Piston Ratings Summary																								
Dep. Factor	Grooves			Lands			Dep. Factor	Groove			Lands			Oil Cooling	Under Crown									
	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3		No. 3	No. 3	No. 3	No. 3	No. 3	No. 3			No. 3								
	A,%	Dem.	A,%	Dem.	A,%	Dem.		A,%	Dem.	A,%	Dem.	A,%	Dem.	A,%	Dem.									
HC-1.0	S12	S12.12	S12	S12.12	S12	S12.12		S12	S12.12	S12	S12.12	S12	S12.12											
MC-0.5	S12	S12.12						S12	S12.12															
LC-.25	S12	S12.12	S12	S12.12	S12	S12.12		S12	S12.12	S12	S12.12	S12	S12.12	S12	S1.123									
Total	S12	S12.12	S12	S12.12	S12	S12.12		S12	S12.12	S12	S12.12	S12	S12.12	S12	S1.123									
8-9	S12	S12.12	S12	S12.12	S12	S12.12																		
7-7.9	S12	S12.12	S12	S12.12	S12	S12.12																		
6-6.9	S12	S12.12	S12	S12.12	S12	S12.12	7.5	S12	S12.12	S12	S12.12	S12	S12.12	S12	S1.123									
5-5.9	S12	S12.12	S12	S12.12	S12	S12.12																		
4-4.9	S12	S12.12	S12	S12.12	S12	S12.12																		
3-3.9	S12	S12.12	S12	S12.12	S12	S12.12																		
2-2.9	S12	S12.12	S12	S12.12	S12	S12.12	4.5	S12	S12.12	S12	S12.12	S12	S12.12	S12	S1.123									
1-1.9	S12	S12.12	S12	S12.12	S12	S12.12																		
>0-0.9	S12	S12.12	S12	S12.12	S12	S12.12	1.5	S12	S12.12	S12	S12.12	S12	S12.12	S12	S1.123									
Clean	0	0	0	0	0	0	Clean	0	0	0	0	0	0	0	0									
Total	S12	S12.12	S12	S12.12	S12	S12.12																		
Rating	S12.12			S12.12				S12.12			S12.12			S12.12										
TGC	S12.12						Unweighted Deposits						Top Land Carbon						T.L. Flaked Carbon %					
	S12.12						S12.123						S12.12						S123.12					

**M11 EGR Lubricant Performance Test
Form 17
Ring Mass Loss Summary**

Laboratory:	CC	EOT Date:	YYYYMMDD	EOT Time:	HH:MM
Test Number					
Stand:	CCCC	Engine:	CCCCCCCC	Engine Run No.:	CCCC
Formulation / Stand Code:	CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC				
Oil Code:	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC				

Cylinder	Top Ring			Second Ring			Oil Ring		
	Mass (g)		Mass Loss (mg)	Mass (g)		Mass Loss (mg)	Mass (g)		Mass Loss (mg)
	Pretest	EOT		Pretest	EOT		Pretest	EOT	
1	S12.1234	S12.1234	S123.1	S12.1234	S12.1234	S123.1	S12.1234	S12.1234	S123.1
2	S12.1234	S12.1234	S123.1	S12.1234	S12.1234	S123.1	S12.1234	S12.1234	S123.1
3	S12.1234	S12.1234	S123.1	S12.1234	S12.1234	S123.1	S12.1234	S12.1234	S123.1
4	S12.1234	S12.1234	S123.1	S12.1234	S12.1234	S123.1	S12.1234	S12.1234	S123.1
5	S12.1234	S12.1234	S123.1	S12.1234	S12.1234	S123.1	S12.1234	S12.1234	S123.1
6	S12.1234	S12.1234	S123.1	S12.1234	S12.1234	S123.1	S12.1234	S12.1234	S123.1

As Measured Results

Average Mass Loss (mg)	S123.1		S123.1		S123.1
Std. Dev. Mass Loss (mg)	S12.12		S12.12		S12.12
Maximum Mass Loss (mg)	S123.1		S123.1		S123.1
Minimum Mass Loss (mg)	S123.1		S123.1		S123.1
Outlier Crosshead (cylinder number)	S1				
Outlier Screened Results					
Average Mass Loss (mg)	S123.1				

M11 EGR Lubricant Performance Test

Form 19

Test Fuel Analysis (Last Batch)

Laboratory:	CC	EOT Date:	YYYYMMDD	EOT Time:	HH:MM
Test Number					
Stand:	CCCCC	Engine:	CCCCCCCC	Engine Run No.:	CCCC
Formulation / Stand Code:	CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC				
Oil Code:	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC				

Fuel Supplier	Fuel Batch Identifier
CCCCCCCCCCCCCCCCCCCC	CCCCCCCCCCCCCCCCCCCC

Measurement	Specifications	Analysis		Test Method
		New	EOT	
Total Sulfur, % Weight	0.04 - 0.05	S1.12	S1.12	D 2662
Gravity, °API	34.5 - 36.5	S1.1	S1.1	D 1298
Hydrocarbon Composition				
Aromatics % Volume	28 – 33	S1.1		D 1319
Olefin	Report	S12.1		D 1319
Cetane Index	Report	S1.1		D 4737
Cetane Number	42 – 48	S1.1		D 613
Copper Strip Corrosion	1 Maximum	AAAA		D 130
Flash Point, °C	54 Maximum	S123		D 93
Pour Point, °C	-18 Maximum	S123		D 97
Carbon Residue on 10% Residuum, %	0.35 Maximum	S1.12		D 524 (10% Bottoms)
Water & Sediment, % Volume	0.05 Maximum	AAAAAA		D 2709
Viscosity, cSt @ 40 °C	2.4 - 3.0	S1.1		D 445
Total Acid Number	0.05 Maximum	S1.123		D 664
Strong Acid Number	0.00 Maximum	S1.1		D 664
Accelerated Stability	Tbd	S1.1		D 2274
Saturates, %	Report	S12.1		D 1319
Cloud Point, °C	Report	S123		D 2500
Distillation, °C				
IBP	Report	S1234		D 86
10%	Report	S1234		D 86
50%	Report	S1234		D 86
90%	282 – 338	S1234		D 86
EP	Report	S1234		D 86

**M11 EGR Lubricant Performance Test
Form 20
Injector Adjusting Screw Mass Loss**

Laboratory:	CC	EOT Date:	YYYYMMDD	EOT Time:	HH:MM
Test Number					
Stand:	CCCCC	Engine:	CCCCCCCC	Engine Run No.:	CCCC
Formulation / Stand Code:	CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC				
Oil Code:	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC				

Screw #	Pretest Mass, g	Post-Test Mass, g	Mass Loss, mg
1	S12.1234	S12.1234	S123.1
2	S12.1234	S12.1234	S123.1
3	S12.1234	S12.1234	S123.1
4	S12.1234	S12.1234	S123.1
5	S12.1234	S12.1234	S123.1
6	S12.1234	S12.1234	S123.1
Total			S123.1
Average			S123.1

**M11 EGR Lubricant Performance Test
Form 22
Characteristics Of The Data Acquisition System**

Laboratory: CC	EOT Date: YYYYMMDD	EOT Time: HH:MM
Test Number		
Stand: CCCCC	Engine: CCCCCCCC	Engine Run No.: CCCC
Formulation / Stand Code: CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC		
Oil Code: CCC		

Parameter (1)	Sensing Device (2)	Calibration Frequency (3)	Record Device (4)	Observation Frequency (5)	Record Frequency (6)	Log Frequency (7)	System Response (8)
Temperatures							
Oil @ Filt.	CCCCCCCCCC	CCCCCCCCCC	CCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC
Fuel In.	CCCCCCCCCC	CCCCCCCCCC	CCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC
Intake Air	CCCCCCCCCC	CCCCCCCCCC	CCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC
Intake Man.	CCCCCCCCCC	CCCCCCCCCC	CCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC
Pre-Turb.	CCCCCCCCCC	CCCCCCCCCC	CCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC
Cool. Out	CCCCCCCCCC	CCCCCCCCCC	CCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC
Pressure							
Inlet Air	CCCCCCCCCC	CCCCCCCCCC	CCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC
Exhaust	CCCCCCCCCC	CCCCCCCCCC	CCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC
Oil Gallery	CCCCCCCCCC	CCCCCCCCCC	CCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC
Other							
Fuel Flow	CCCCCCCCCC	CCCCCCCCCC	CCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC
Speed	CCCCCCCCCC	CCCCCCCCCC	CCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC
Load	CCCCCCCCCC	CCCCCCCCCC	CCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC

Legend:

- (1) Operating Parameter
- (2) The type of device used to measure temperature, pressure, or flow
- (3) Frequency at which the measurement system is calibrated
- (4) The type of device where data is recorded
DL – Automatic data logger
C/D – Computer, using direct I/O entry
- (5) Data are observed but only recorded if off spec.
- (6) Data are recorded but are not retained at EOT
- (7) Data are logged as permanent record, note specify if:
SS – snapshot taken at specified frequency
AG/X – Average of X data points at specified frequency
- (8) Time for the output to reach 63.2% of final value for step change at input