

**M11 EGR  
Lubricant Performance Test**

**Report Packet Version No.**

11EGR VERSION 20031120 BE1

**Method**

METHOD

**Conducted For:**

TSTSPON1

TSTSPON2

LABVALID	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.

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

Stand:	STAND	Engine:	ENGINE	Engine Run No:	ENRUN
End Of Test Date:	DTCOMP	End Of Test Time:	EOTTIME		
Oil Code:	OILCODE				
Formulation / Stand Code:	FORM				
Alternate Codes:	ALTCODE1	ALTCODE2	ALTCODE3		

In my opinion the test OPVALID 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:

SUBLAB

Testing Laboratory

SUBSIGIM

Signature

SUBNAME

Typed Name

SUBTITLE

Title

**M11 EGR 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.	Crosshead Mass Loss Summary	Form 6
7.	Oil Filter Delta Pressure Plot	Form 7
8.	Sludge Rating Summary	Form 8
9.	Rod Bearing Mass Loss	Form 9
10.	Piston Rating Summary	Form 10
11.	Piston 1 Deposit Rating	Form 11
12.	Piston 2 Deposit Rating	Form 12
13.	Piston 3 Deposit Rating	Form 13
14.	Piston 4 Deposit Rating	Form 14
15.	Piston 5 Deposit Rating	Form 15
16.	Piston 6 Deposit Rating	Form 16
17.	Ring Mass Loss Summary	Form 17
18.	Oil Analysis Summary	Form 18
19.	Test Fuel Analysis	Form 19
20.	Injector Adjusting Screw Mass Loss	Form 20
21.	Unscheduled Downtime & Maintenance Summary	Form 21
22.	Characteristics of the Data Acquisition System	Form 22
23.	ACC Conformance Statement	Form 23

**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**

<b>Parameter</b>	<b>Stage A</b>	<b>Stage B</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: LAB	EOT Date: DTCOMP	EOT Time: EOTTIME
Stand: STAND	Engine: ENGINE	Engine Run No.: ENRUN
Formulation/Stand Code: FORM		
Oil Code: OILCODE	Engine Kit S/N: ENKIT	

Date Test Started	DTSTRT
Start Time	STRTIME
Test Length	TESTLEN
TMC Oil Code <sup>A</sup>	IND
Laboratory Oil Code	LABOCODE
SAE Viscosity	SAEVISC
TGA Soot % At 50 h	TGA050
TGA Soot % At 250 h	TGA250
Average TGA Soot % 0 - 300 h (≥ 4.6)	TGAAVG
Total Oil Consumption, kg	TOTOCON

	Adj. Average Crosshead Mass Loss (mg)	Filter Plugging Delta P (kPa)	Average Sludge Rating (merits)	Avg. Top Ring Weight Loss (mg)
Original Result	ACWL	OILD	ASRT	ARWLT
Transformed Result <sup>B</sup>	TRNACWL	TRNODP	TRNASRT	TRNARWLT
Correction Factor <sup>B</sup>	ACWLCF	OILDPCF	ASRTCF	ARWLTCF
Corrected Transformed Result <sup>B</sup>	ACWLCOR	OILDPCOR	ASRTCOR	ARWLTCOR
Severity Adjustment <sup>B</sup>	ACWL_SA	OILD_SA	ASRT_SA	ARWL_SA
Final Transformed Result <sup>B</sup>	TACWLFNL	TODPFNL	TASRTFNL	TARWLT
<b>Final Result</b>	ACWLFNL	OILDPFNL	ASRTFNL	ARWTFNL

**Last Stand Reference Results**

Test Number: STAND	RENGINE	RENRUN
Oil Code	ROILCODE	
Test Length	RTESTLEN	
TMC Oil Code	RIND	
EOT Date	RDTCOMP	
EOT Time	REOTTIME	
Stand Calibration Expiration Date	DTCALEXP	
TGA Soot % AT 50 h	RTGA050	
TGA Soot % AT 250 h (8.0 - 9.0)	RTGA250	
Average TGA Soot % 0 - 300 h (≥ 4.6)	RTGAAVG	
Total Oil Consumption, kg	RTOTOCON	

	Adj. Average Crosshead Mass Loss (mg)	Filter Plugging Delta P (kPa)	Average Sludge Rating (merits)	Avg. Top Ring Weight Loss (mg)
Original Result	RACWL	ROILD	RASRT	RARWLT
Transformed Result <sup>B</sup>	RTRNACWL	RTRNODP	RTRNASRT	RTRNARWT
Correction Factor <sup>B</sup>	RACWLCF	ROILDPCF	RASRTCF	RARWLTCF
Corrected Transformed Result <sup>B</sup>	RACWLCOR	RTODPCOR	RASRTCOR	RARWTCOR
Final Transformed Result <sup>B</sup>	RTCWLFNL	RTODPFNL	RTSRTFNL	RTARWLT
<b>Final Result</b>	RACWLFNL	RFPDPFNL	RASRTFNL	RARWTFNL

<sup>A</sup> Reference Tests Only

<sup>B</sup> Filter Plugging Delta P Value in Transformed Units

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

Laboratory:	LAB	DTCOMP	EOT Time:	EOTIME
Stand:	STAND	ENGINE	Engine Run No.:	ENRUN
Formulation/Stand Code: FORM				
Oil Code: OILCODE				

Parameter	Units	QI Threshold	EOT QI <sup>A</sup>	Target		Average		Samples <sup>B</sup>	BQD <sup>C</sup>	Over/Under Range <sup>D</sup>
				1800	1600	ARPMA	ARPMB			
Speed	r/min	0.000	QRPM	58.0	64.4	AFFLOA	AFFLOB	NFFLO	BFFLO	OFFLO
Fuel Flow	kg/h	0.000	QFLO	65.5		ACOLOUT		NCOLOUT	BCOLOUT	OCOLOUT
Coolant Out	°C	0.000	QCLOUT	40		AFUEL		NFUEL	BFUEL	OFUEL
Fuel In	°C	0.000	QFUEL	115		AOILTEM		NOILTEM	BOILTEM	OILTEM
Oil Gallery	°C	0.000	QOILTEM	80.0	65.5	AINMANTA	AINMANTB	NINMANT	BINMANT	OINMANT
Intake Manifold	°C	0.000	QINMANT	107		AEXHSTP		NEXHSTP	BEXHSTP	OEXHSTP
Exhaust	kPa	0.000	QEXHSTP							
<b>Parameter</b>	<b>Units</b>	<b>Typical Values<sup>E</sup></b>								
Torque	N-m	TBD	TBD	ALOADA		ALOADB				
Power	kW	TBD	TBD	APWRA		APWRB				
Intake CO	%	0.97 - 1.09 <sup>F</sup>	0.78 - 0.85 <sup>F</sup>		AICO2A		AICO2B			
Blowby	L/min	TBD	ABLOBY							
Coolant In	°C	TBD	ACOLIN							
Intake Air	°C	TBD	AINAIRT							
Pre-Turbine (F)	°C	TBD	APTURFT							
Pre-Turbine (R)	°C	TBD	APTURRT							
Tailpipe	°C	TBD	ATAILPT							
Fuel	kPa	TBD	AFPMP							
Oil Gallery	kPa	TBD	AOILPRS							
Coolant	kPa	99 - 107	ACOLOUP							
Intake Manifold	kPa	TBD	AINMANP							
Crankcase	kPa	TBD	ACCASEP							
Intake Air	kPa	TBD	AINAIRR							

<sup>A</sup> 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.

<sup>B</sup> Total number of data points taken

<sup>C</sup> Number of Bad Quality Data points not used in the calculation of the statistical measures

<sup>D</sup> Number of points clipped by over/under range limits

<sup>E</sup> Typical values determined from reference oil test database

<sup>F</sup> Intake CO<sub>2</sub> rates must be within specified range

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

Laboratory: LAB	EOT Date: DTCOMP	EOT Time: EOTTIME
<b>Test Number</b>		
Stand: STAND	Engine: ENGINE	Engine Run No.: ENRUN
Formulation / Stand Code: FORM		
Oil Code: OILCODE		

Location	Serial No.	Pretest Mass (g)	EOT Mass (g)	Mass Loss (mg)
1E	CHDSN1E	CHDPTW1E	CHDEW1E	CHDEWL1E
1I	CHDSN1I	CHDPTW1I	CHDEW1I	CHDEWL1I
2I	CHDSN2I	CHDPTW2I	CHDEW2I	CHDEWL2I
2E	CHDSN2E	CHDPTW2E	CHDEW2E	CHDEWL2E
3E	CHDSN3E	CHDPTW3E	CHDEW3E	CHDEWL3E
3I	CHDSN3I	CHDPTW3I	CHDEW3I	CHDEWL3I
4I	CHDSN4I	CHDPTW4I	CHDEW4I	CHDEWL4I
4E	CHDSN4E	CHDPTW4E	CHDEW4E	CHDEWL4E
5E	CHDSN5E	CHDPTW5E	CHDEW5E	CHDEWL5E
5I	CHDSN5I	CHDPTW5I	CHDEW5I	CHDEWL5I
6I	CHDSN6I	CHDPTW6I	CHDEW6I	CHDEWL6I
6E	CHDSN6E	CHDPTW6E	CHDEW6E	CHDEWL6E

Intake / Exhaust Summary	Intake		Exhaust	
	As Measured	Outlier Screened	As Measured	Outlier Screened
Average Crosshead Mass Loss (mg)	ACHDWLI	OACHDWLI	ACHDWLE	OACHDWLE
Minimum Crosshead Mass Loss (mg)	ICHDWLI	OICHDWLI	ICHDWLE	OICHDWLE
Maximum Crosshead Mass Loss (mg)	XCHDWLI	OXCHDWLI	XCHDWLE	OXCHDWLE
Standard Deviation (mg)	SCHDWLI	OSCHDWLI	SCHDWLE	OSCHDWLE
Outlier Crossheads Locations <sup>4</sup>	CHDOUTI		CHDOUTE	

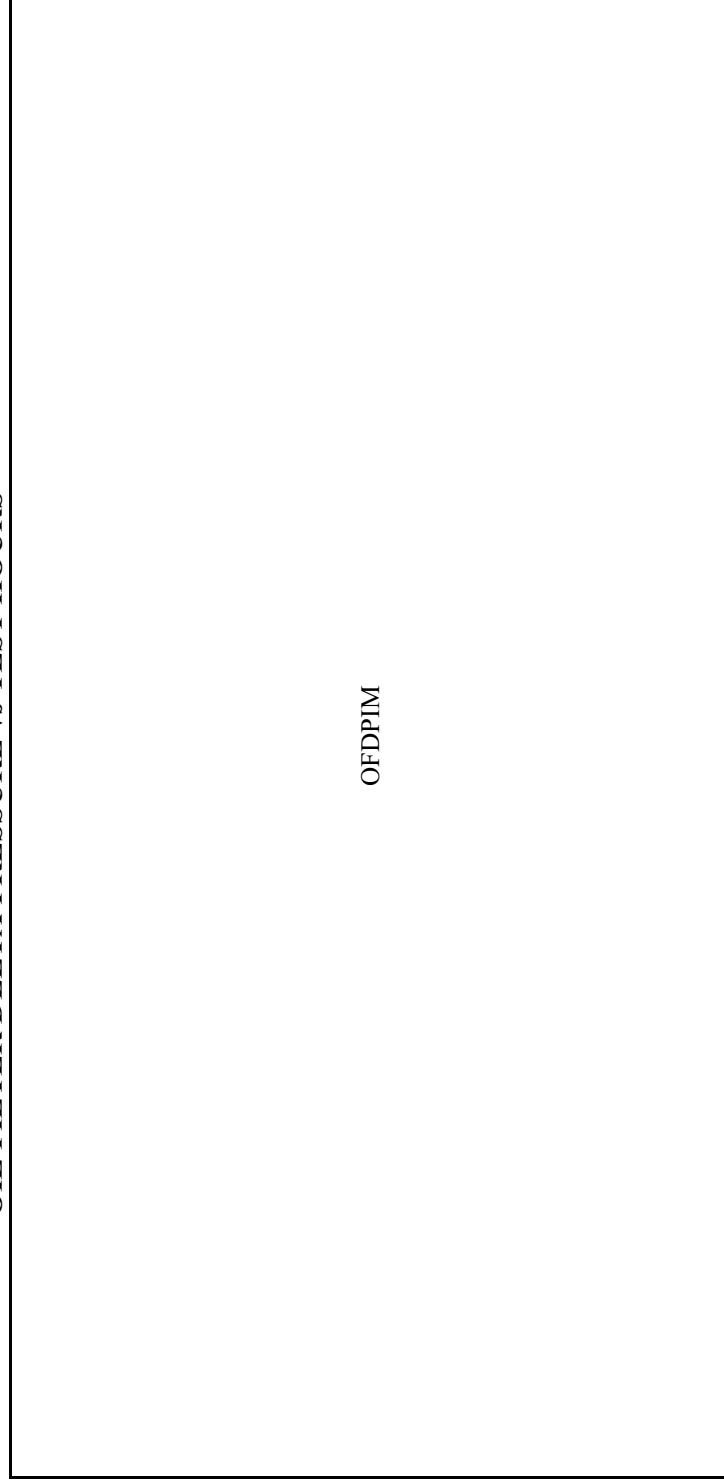
<sup>4</sup> Location Designation. Example: 3E

Overall Summary	As Measured	Outlier Screened	Adjusted to 4.6% Soot
Average Crosshead Mass Loss (mg)	AMACAWL	CAWL	ACWL
Minimum Crosshead Mass Loss (mg)	AMICAWL	ICHDEWL	
Maximum Crosshead Mass Loss (mg)	AMXCAWL	XCHDEWL	
Standard Deviation (mg)	AMSCAWL	SCHDEWL	

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

Laboratory:	LAB	EOT Date:	DTCOMP	EOT Time:	EOTTIME
Stand:	STAND	Engine:	ENGINE	Engine Run No.:	ENRUN
Formulation / Stand Code:	FORM				
Oil code:	OILCODE				

**OIL FILTER DELTA PRESSURE vs TEST HOURS**



OFDPIM

**OIL FILTER DELTA P (kPa)**

**TEST HOURS**

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

Laboratory: LAB	EOT Date: DTCOMP	EOT Time: EOTTIME
<b>Test Number</b>		
Stand: STAND	Engine: ENGINE	Engine Run No.: ENRUN
Formulation / Stand Code:		FORM
Oil Code:		OILCODE

**Sludge Rating Summary**

Sludge Depth	Valve Cover % of Area	Valve Cover Volume Factor	Oil Pan % of Area	Oil Pan Volume Factor
1/4A	RCSEA01	RCSEV01	OILPSA01	OILPSV01
1/2A	RCSEA02	RCSEV02	OILPSA02	OILPSV02
3/4A	RCSEA03	RCSEV03	OILPSA03	OILPSV03
A	RCSEA04	RCSEV04	OILPSA04	OILPSV04
AB	RCSEA05	RCSEV05	OILPSA05	OILPSV05
B	RCSEA06	RCSEV06	OILPSA06	OILPSV06
BC	RCSEA07	RCSEV07	OILPSA07	OILPSV07
C	RCSEA08	RCSEV08	OILPSA08	OILPSV08
D	RCSEA09	RCSEV09	OILPSA09	OILPSV09
E	RCSEA10	RCSEV10	OILPSA10	OILPSV10
F	RCSEA11	RCSEV11	OILPSA11	OILPSV11
G	RCSEA12	RCSEV12	OILPSA12	OILPSV12
H	RCSEA13	RCSEV13	OILPSA13	OILPSV13
I	RCSEA14	RCSEV14	OILPSA14	OILPSV14
J	RCSEA15	RCSEV15	OILPSA15	OILPSV15
	Total Volume Factor:	RCSEVT	Total Volume Factor:	OILPSVT
	Merit Rating:	RCSEMRT	Merit Rating:	OILPSMRT
			<b>Average Sludge Rating:</b>	ASRT



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

Laboratory:	LAB	EOT Date:	DTCOMP	EOT Time:	EOTTIME
<b>Test Number</b>					
Stand:	STAND	Engine	ENGINE	Engine Run No.:	ENRUN
Formulation / Stand Code:			FORM		
Oil Code:			OILCODE		

Cylinder Number	Bearing Location	Pretest Mass (g)	Post-Test Mass (g)	Mass Loss (mg)
1	Upper	BWCYL1TP	BWCYL1TE	BWL1T
	Lower	BWCYL1BP	BWCYL1BE	BWL1B
2	Upper	BWCYL2TP	BWCYL2TE	BWL2T
	Lower	BWCYL2BP	BWCYL2BE	BWL2B
3	Upper	BWCYL3TP	BWCYL3TE	BWL3T
	Lower	BWCYL3BP	BWCYL3BE	BWL3B
4	Upper	BWCYL4TP	BWCYL4TE	BWL4T
	Lower	BWCYL4BP	BWCYL4BE	BWL4B
5	Upper	BWCYL5TP	BWCYL5TE	BWL5T
	Lower	BWCYL5BP	BWCYL5BE	BWL5B
6	Upper	BWCYL6TP	BWCYL6TE	BWL6T
	Lower	BWCYL6BP	BWCYL6BE	BWL6B

	Bearing Mass Loss
Average (mg)	ASBWL
Minimum (mg)	ISBWL
Maximum (mg)	XSBWL
Standard Deviation (mg)	SSBWL

**M11 EGR Performance Test  
Form 10  
Piston Rating Summary**

Laboratory: LAB	EOT Date: DTCOMP	EOT Time: EOTTIME
<b>Test Number</b>		
Stand: STAND	Engine: ENGINE	Engine Run No.: ENRUN
Formulation / Stand Code:		FORM
Oil Code:		OILCODE

Unweighted Demerits											
Piston Number	Lands				Grooves			Under Crown	Oil Cooling Gallery	Total Demerits	
	1	2	3	4	1	2	3				
1	L1UWD1	L2UWD1	L3UWD1	L4UWD1	G1UWD1	G2UWD1	G3UWD1	UCUWD1	OGUWD1	UWD1	
2	L1UWD2	L2UWD2	L3UWD2	L4UWD2	G1UWD2	G2UWD2	G3UWD2	UCUWD2	OGUWD2	UWD2	
3	L1UWD3	L2UWD3	L3UWD3	L4UWD3	G1UWD3	G2UWD3	G3UWD3	UCUWD3	OGUWD3	UWD3	
4	L1UWD4	L2UWD4	L3UWD4	L4UWD4	G1UWD4	G2UWD4	G3UWD4	UCUWD4	OGUWD4	UWD4	
5	L1UWD5	L2UWD5	L3UWD5	L4UWD5	G1UWD5	G2UWD5	G3UWD5	UCUWD5	OGUWD5	UWD5	
6	L1UWD6	L2UWD6	L3UWD6	L4UWD6	G1UWD6	G2UWD6	G3UWD6	UCUWD6	OGUWD6	UWD6	
<b>Average Demerits</b>	AL1UWD	AL2UWD	AL3UWD	AL4UWD	AG1UWD	AG2UWD	AG3UWD	AUCUWD	AOGUWD		
									<b>Average Total Unweighted Demerits</b>		TOTUWD

Parameter	Piston Number						Average
	1	2	3	4	5	6	
<b>TGC</b>	TGC1	TGC2	TGC3	TGC4	TGC5	TGC6	ATGC
<b>TLC</b>	TLC1	TLC3	TLC4	TLC4	TLC5	TLC6	ATLC

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

Laboratory:	LAB	DTCOMP	EOT Time:	EOTIME
<b>Test Number</b>				
Stand:	STAND	ENGINE	Engine Run No.:	ENRUN
Formulation / Stand Code:	FORM			
Oil Code:	OILCODE			

Total Piston Ratings Summary																				
Dep. Factor	Grooves					Lands					Dep. Factor	Lands				Oil Cooling		Under Crown		
	No. 1 A, % Dem.	No. 2 A, % Dem.	No. 1 A, % Dem.	No. 2 A, % Dem.	No. 1 A, % Dem.	No. 2 A, % Dem.	No. 1 A, % Dem.	No. 2 A, % Dem.	No. 1 A, % Dem.	No. 2 A, % Dem.		No. 3 A, % Dem.	No. 4 A, % Dem.	No. 3 A, % Dem.	No. 4 A, % Dem.	A, %	Dem.	A, %	Dem.	
<b>HC-1.0</b>	G1HCA1	G1HCD1	G2HCA1	G2HCD1	L1HCA1	L1HCD1	L2HCA1	L2HCD1					L3HCA1	L3HCD1	L4HCA1	L4HCD1				
<b>MC-0.5</b>	G1MCA1	G1MCD1																		
<b>LC-2.5</b>	G1LCA1	G1LCD1	G2LCA1	G2LCD1	L1LCA1	L1LCD1	L2LCA1	L2LCD1					L3LCA1	L3LCD1	L4LCA1	L4LCD1	UGLCA1	UGLCD1		
<b>Total</b>	J1ACTOT	J1DCTOT	J2ACTOT	J2DCTOT	J1ACTOT	J1DCTOT	J2ACTOT	J2DCTOT	J1ACTOT	J1DCTOT	J2ACTOT	J2DCTOT	J3ACTOT	J3DCTOT	J4ACTOT	J4DCTOT	JGACTOT	JGDCTOT	J1ACTOT	J1DCTOT
<b>8-9</b>	G1L9A1	G1L9D1	G2L9A1	G2L9D1	L1L9A1	L1L9D1	L2L9A1	L2L9D1												
<b>7-7.9</b>	G1L8A1	G1L8D1	G2L8A1	G2L8D1	L1L8A1	L1L8D1	L2L8A1	L2L8D1												
<b>6-6.9</b>	G1L7A1	G1L7D1	G2L7A1	G2L7D1	L1L7A1	L1L7D1	L2L7A1	L2L7D1												
<b>5-5.9</b>	G1L6A1	G1L6D1	G2L6A1	G2L6D1	L1L6A1	L1L6D1	L2L6A1	L2L6D1												
<b>4-4.9</b>	G1L5A1	G1L5D1	G2L5A1	G2L5D1	L1L5A1	L1L5D1	L2L5A1	L2L5D1												
<b>3-3.9</b>	G1L4A1	G1L4D1	G2L4A1	G2L4D1	L1L4A1	L1L4D1	L2L4A1	L2L4D1												
<b>2-2.9</b>	G1L3A1	G1L3D1	G2L3A1	G2L3D1	L1L3A1	L1L3D1	L2L3A1	L2L3D1												
<b>1-1.9</b>	G1L2A1	G1L2D1	G2L2A1	G2L2D1	L1L2A1	L1L2D1	L2L2A1	L2L2D1												
<b>&gt;0-0.9</b>	G1L1A1	G1L1D1	G2L1A1	G2L1D1	L1L1A1	L1L1D1	L2L1A1	L2L1D1												
<b>Clean</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
<b>Total</b>	J1ALTOT	J1DLTOT	J2ALTOT	J2DLTOT	J1ALTOT	J1DLTOT	J2ALTOT	J2DLTOT	J1ALTOT	J1DLTOT	J2ALTOT	J2DLTOT	J3ALTOT	J3DLTOT	J4ALTOT	J4DLTOT	JGAVTOT	JGDVTOT	J1ALTOT	J1DLTOT
<b>Rating</b>	G1UWD1	G1UWD1	G2UWD1	G2UWD1	L1UWD1	L1UWD1	L2UWD1	L2UWD1					G3UWD1	G3UWD1	L4UWD1	L4UWD1	OGUWD1	OGUWD1	UCUWD1	UCUWD1
<b>TGC</b>	<b>Unweighted Deposits</b>										<b>Top Land Carbon</b>					<b>T.L. Flaked Carbon %</b>				
TGC1	UWD1										TLCI					TLFC1				

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

Laboratory:	LAB	DTCOMP	EOT Time:	EOTIME
<b>Test Number</b>				
Stand:	STAND	ENGINE	Engine Run No.:	ENRUN
Formulation / Stand Code:	FORM			
Oil Code:	OILCODE			

Total Piston Ratings Summary																								
Dep. Factor	Grooves					Lands					Dep. Factor	Groove			Lands			Oil Cooling		Under Crown				
	No. 1	A, %	Dem.	No. 2	A, %	Dem.	No. 1	A, %	Dem.	No. 2		A, %	Dem.	No. 3	A, %	Dem.	No. 4	A, %	Dem.	A, %	Dem.	A, %	Dem.	
<b>HC-1.0</b>	G1HCA2	G1HCD2	G2HCA2	G2HCD2	L1HCA2	L1HCD2	L2HCA2	L2HCD2					G3HCA2	G3HCD2	L3HCA2	L3HCD2	L4HCA2	L4HCD2						
<b>MC-0.5</b>	G1MCA2	G1MCD2											G3MCA2	G3MCD2										
<b>LC-25</b>	G1LCA2	G1LCD2	G2LCA2	G2LCD2	L1LCA2	L1LCD2	L2LCA2	L2LCD2					G3LCA2	G3LCD2	L3LCA2	L3LCD2	L4LCA2	L4LCD2						
<b>Total</b>	∑1ACTOT	∑1DCTOT	∑2ACTOT	∑2DCTOT	∑1ACTOT	∑1DCTOT	∑2ACTOT	∑2DCTOT					∑3ACTOT	∑3DCTOT	∑3ACTOT	∑3DCTOT	∑4ACTOT	∑4DCTOT	∑GACTOT	∑GDCTOT	∑1ACTOT	∑1DCTOT	∑1ACTOT	∑1DCTOT
<b>8-9</b>	G1L9A2	G1L9D2	G2L9A2	G2L9D2	L1L9A2	L1L9D2	L2L9A2	L2L9D2																
<b>7-7.9</b>	G1L8A2	G1L8D2	G2L8A2	G2L8D2	L1L8A2	L1L8D2	L2L8A2	L2L8D2																
<b>6-6.9</b>	G1L7A2	G1L7D2	G2L7A2	G2L7D2	L1L7A2	L1L7D2	L2L7A2	L2L7D2																
<b>5-5.9</b>	G1L6A2	G1L6D2	G2L6A2	G2L6D2	L1L6A2	L1L6D2	L2L6A2	L2L6D2																
<b>4-4.9</b>	G1L5A2	G1L5D2	G2L5A2	G2L5D2	L1L5A2	L1L5D2	L2L5A2	L2L5D2																
<b>3-3.9</b>	G1L4A2	G1L4D2	G2L4A2	G2L4D2	L1L4A2	L1L4D2	L2L4A2	L2L4D2																
<b>2-2.9</b>	G1L3A2	G1L3D2	G2L3A2	G2L3D2	L1L3A2	L1L3D2	L2L3A2	L2L3D2																
<b>1-1.9</b>	G1L2A2	G1L2D2	G2L2A2	G2L2D2	L1L2A2	L1L2D2	L2L2A2	L2L2D2																
<b>&gt;0-0.9</b>	G1L1A2	G1L1D2	G2L1A2	G2L1D2	L1L1A2	L1L1D2	L2L1A2	L2L1D2																
<b>Clean</b>	0	0	0	0	0	0	0	0					0	0	0	0	0	0			0	0	0	0
<b>Total</b>	∑1ALTOT	∑1DLTOT	∑2ALTOT	∑2DLTOT	∑1ALTOT	∑1DLTOT	∑2ALTOT	∑2DLTOT					∑3ALTOT	∑3DLTOT	∑3ALTOT	∑3DLTOT	∑4ALTOT	∑4DLTOT	∑GAVTOT	∑GDVTOT	∑1ALTOT	∑1DLTOT	∑1ALTOT	∑1DLTOT
<b>Rating</b>	G1UWD2	G1UWD2	G2UWD2	G2UWD2	L1UWD2	L1UWD2	L2UWD2	L2UWD2					G3UWD2	G3UWD2	L3UWD2	L3UWD2	L4UWD2	L4UWD2	OGUWD2	OGUWD2	UCUWD2	UCUWD2	UCUWD2	UCUWD2
<b>TGC</b>	<b>Unweighted Deposits</b>												<b>Top Land Carbon</b>			<b>T.L. Flaked Carbon %</b>								
TGC2	UWD2												TLC2			TLFC2								

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

Laboratory:	LAB	EOT Date:	EOT Time:
Stand:	STAND	Engine:	ENGINE
Formulation / Stand Code:	FORM		
Oil Code:	OILCODE		

Total Piston Ratings Summary																	
Dep. Factor	Grooves				Lands				Dep. Factor	Lands				Oil Cooling		Under Crown	
	No. 1	No. 2		No. 1		No. 2		No. 3		No. 3		No. 4		A, %	Dem.	A, %	Dem.
<b>HC-1.0</b>	G1HCA3	G1HCD3	G2HCA3	G2HCD3	L1HCA3	L1HCD3	L2HCA3	L2HCD3									
<b>MC-0.5</b>	G1MCA3	G1MCD3															
<b>LC-25</b>	G1LCA3	G1LCD3	G2LCA3	G2LCD3	L1LCA3	L1LCD3	L2LCA3	L2LCD3									
<b>Total</b>	33ACTOT 33DCTOT 32ACTOT 32DCTOT 31ACTOT 31DCTOT 30ACTOT 30DCTOT 29ACTOT 29DCTOT 28ACTOT 28DCTOT 27ACTOT 27DCTOT 26ACTOT 26DCTOT 25ACTOT 25DCTOT 24ACTOT 24DCTOT 23ACTOT 23DCTOT 22ACTOT 22DCTOT 21ACTOT 21DCTOT 20ACTOT 20DCTOT 19ACTOT 19DCTOT 18ACTOT 18DCTOT 17ACTOT 17DCTOT 16ACTOT 16DCTOT 15ACTOT 15DCTOT 14ACTOT 14DCTOT 13ACTOT 13DCTOT 12ACTOT 12DCTOT 11ACTOT 11DCTOT 10ACTOT 10DCTOT 9ACTOT 9DCTOT 8ACTOT 8DCTOT 7ACTOT 7DCTOT 6ACTOT 6DCTOT 5ACTOT 5DCTOT 4ACTOT 4DCTOT 3ACTOT 3DCTOT 2ACTOT 2DCTOT 1ACTOT 1DCTOT 0ACTOT 0DCTOT		33ALTOT 33DLTOT 32ALTOT 32DLTOT 31ALTOT 31DLTOT 30ALTOT 30DLTOT 29ALTOT 29DLTOT 28ALTOT 28DLTOT 27ALTOT 27DLTOT 26ALTOT 26DLTOT 25ALTOT 25DLTOT 24ALTOT 24DLTOT 23ALTOT 23DLTOT 22ALTOT 22DLTOT 21ALTOT 21DLTOT 20ALTOT 20DLTOT 19ALTOT 19DLTOT 18ALTOT 18DLTOT 17ALTOT 17DLTOT 16ALTOT 16DLTOT 15ALTOT 15DLTOT 14ALTOT 14DLTOT 13ALTOT 13DLTOT 12ALTOT 12DLTOT 11ALTOT 11DLTOT 10ALTOT 10DLTOT 9ALTOT 9DLTOT 8ALTOT 8DLTOT 7ALTOT 7DLTOT 6ALTOT 6DLTOT 5ALTOT 5DLTOT 4ALTOT 4DLTOT 3ALTOT 3DLTOT 2ALTOT 2DLTOT 1ALTOT 1DLTOT 0ALTOT 0DLTOT														
<b>8 - 9</b>	G1L9A3	G1L9D3	G2L9A3	G2L9D3	L1L9A3	L1L9D3	L2L9A3	L2L9D3									
<b>7 - 7.9</b>	G1L8A3	G1L8D3	G2L8A3	G2L8D3	L1L8A3	L1L8D3	L2L8A3	L2L8D3									
<b>6 - 6.9</b>	G1L7A3	G1L7D3	G2L7A3	G2L7D3	L1L7A3	L1L7D3	L2L7A3	L2L7D3									
<b>5 - 5.9</b>	G1L6A3	G1L6D3	G2L6A3	G2L6D3	L1L6A3	L1L6D3	L2L6A3	L2L6D3									
<b>4 - 4.9</b>	G1L5A3	G1L5D3	G2L5A3	G2L5D3	L1L5A3	L1L5D3	L2L5A3	L2L5D3									
<b>3 - 3.9</b>	G1L4A3	G1L4D3	G2L4A3	G2L4D3	L1L4A3	L1L4D3	L2L4A3	L2L4D3									
<b>2 - 2.9</b>	G1L3A3	G1L3D3	G2L3A3	G2L3D3	L1L3A3	L1L3D3	L2L3A3	L2L3D3									
<b>1 - 1.9</b>	G1L2A3	G1L2D3	G2L2A3	G2L2D3	L1L2A3	L1L2D3	L2L2A3	L2L2D3									
<b>&gt;0 - 0.9</b>	G1L1A3	G1L1D3	G2L1A3	G2L1D3	L1L1A3	L1L1D3	L2L1A3	L2L1D3									
<b>Clean</b>		<b>0</b>		<b>0</b>		<b>0</b>		<b>0</b>					<b>0</b>				<b>0</b>
<b>Total</b>	33ALTOT 33DLTOT 32ALTOT 32DLTOT 31ALTOT 31DLTOT 30ALTOT 30DLTOT 29ALTOT 29DLTOT 28ALTOT 28DLTOT 27ALTOT 27DLTOT 26ALTOT 26DLTOT 25ALTOT 25DLTOT 24ALTOT 24DLTOT 23ALTOT 23DLTOT 22ALTOT 22DLTOT 21ALTOT 21DLTOT 20ALTOT 20DLTOT 19ALTOT 19DLTOT 18ALTOT 18DLTOT 17ALTOT 17DLTOT 16ALTOT 16DLTOT 15ALTOT 15DLTOT 14ALTOT 14DLTOT 13ALTOT 13DLTOT 12ALTOT 12DLTOT 11ALTOT 11DLTOT 10ALTOT 10DLTOT 9ALTOT 9DLTOT 8ALTOT 8DLTOT 7ALTOT 7DLTOT 6ALTOT 6DLTOT 5ALTOT 5DLTOT 4ALTOT 4DLTOT 3ALTOT 3DLTOT 2ALTOT 2DLTOT 1ALTOT 1DLTOT 0ALTOT 0DLTOT		33ALTOT 33DLTOT 32ALTOT 32DLTOT 31ALTOT 31DLTOT 30ALTOT 30DLTOT 29ALTOT 29DLTOT 28ALTOT 28DLTOT 27ALTOT 27DLTOT 26ALTOT 26DLTOT 25ALTOT 25DLTOT 24ALTOT 24DLTOT 23ALTOT 23DLTOT 22ALTOT 22DLTOT 21ALTOT 21DLTOT 20ALTOT 20DLTOT 19ALTOT 19DLTOT 18ALTOT 18DLTOT 17ALTOT 17DLTOT 16ALTOT 16DLTOT 15ALTOT 15DLTOT 14ALTOT 14DLTOT 13ALTOT 13DLTOT 12ALTOT 12DLTOT 11ALTOT 11DLTOT 10ALTOT 10DLTOT 9ALTOT 9DLTOT 8ALTOT 8DLTOT 7ALTOT 7DLTOT 6ALTOT 6DLTOT 5ALTOT 5DLTOT 4ALTOT 4DLTOT 3ALTOT 3DLTOT 2ALTOT 2DLTOT 1ALTOT 1DLTOT 0ALTOT 0DLTOT														
<b>Rating</b>	G1UWD3		G2UWD3		L1UWD3		L2UWD3										
<b>TGC</b>					<b>Unweighted Deposits</b>				<b>Top Land Carbon</b>				<b>T.L. Flaked Carbon %</b>				
TGC3					UWD3				TLC3				TLFC3				

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

Laboratory:	LAB	EOT Date:	EOT Time:
Stand:	STAND	Engine:	ENGINE
Formulation / Stand Code:	FORM		
Oil Code:	OILCODE		

<b>Test Number</b>			
EOT Time:	DTCOMP	EOT Time:	EOTIME
Engine Run No.:	ENRUN		

Total Piston Ratings Summary																	
Dep. Factor	Grooves				Lands				Dep. Factor	Lands				Oil Cooling		Under Crown	
	No. 1 A, % Dem.	No. 2 A, % Dem.	No. 1 A, % Dem.	No. 2 A, % Dem.	No. 1 A, % Dem.	No. 1 A, % Dem.	No. 2 A, % Dem.	No. 1 A, % Dem.		No. 2 A, % Dem.	No. 3 A, % Dem.	No. 3 A, % Dem.	No. 4 A, % Dem.	A, %	Dem.	A, %	Dem.
<b>HC-1.0</b>	G1HCA4	G1HCD4	G2HCA4	G2HCD4	L1HCA4	L1HCD4	L2HCA4	L2HCD4									
<b>MC-0.5</b>	G1MCA4	G1MCD4															
<b>LC-2.5</b>	G1LCA4	G1LCD4	G2LCA4	G2LCD4	L1LCA4	L1LCD4	L2LCA4	L2LCD4									
<b>Total</b>	11ACTOT	11DCTOT	12ACTOT	12DCTOT	11ACTOT	11DCTOT	12ACTOT	12DCTOT									
<b>8-9</b>	G1L9A4	G1L9D4	G2L9A4	G2L9D4	L1L9A4	L1L9D4	L2L9A4	L2L9D4									
<b>7-7.9</b>	G1L8A4	G1L8D4	G2L8A4	G2L8D4	L1L8A4	L1L8D4	L2L8A4	L2L8D4									
<b>6-6.9</b>	G1L7A4	G1L7D4	G2L7A4	G2L7D4	L1L7A4	L1L7D4	L2L7A4	L2L7D4									
<b>5-5.9</b>	G1L6A4	G1L6D4	G2L6A4	G2L6D4	L1L6A4	L1L6D4	L2L6A4	L2L6D4									
<b>4-4.9</b>	G1L5A4	G1L5D4	G2L5A4	G2L5D4	L1L5A4	L1L5D4	L2L5A4	L2L5D4									
<b>3-3.9</b>	G1L4A4	G1L4D4	G2L4A4	G2L4D4	L1L4A4	L1L4D4	L2L4A4	L2L4D4									
<b>2-2.9</b>	G1L3A4	G1L3D4	G2L3A4	G2L3D4	L1L3A4	L1L3D4	L2L3A4	L2L3D4									
<b>1-1.9</b>	G1L2A4	G1L2D4	G2L2A4	G2L2D4	L1L2A4	L1L2D4	L2L2A4	L2L2D4									
<b>&gt;0-0.9</b>	G1L1A4	G1L1D4	G2L1A4	G2L1D4	L1L1A4	L1L1D4	L2L1A4	L2L1D4									
<b>Clean</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>Clean</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Total</b>	11ALTOT	11DLTOT	12ALTOT	12DLTOT	11ALTOT	11DLTOT	12ALTOT	12DLTOT									
<b>Rating</b>	G1UWD4	G1UWD4	G2UWD4	G2UWD4	L1UWD4	L1UWD4	L2UWD4	L2UWD4									
<b>TGC</b>					<b>Unweighted Deposits</b>				<b>Top Land Carbon</b>				<b>T.L. Flaked Carbon %</b>				
TGC4					UWD4				TLC4				TLFC4				

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

Laboratory:	LAB	EOT Date:	DTCOMP	EOT Time:	EOTIME
<b>Test Number</b>					
Stand:	STAND	Engine:	ENGINE	Engine Run No.:	ENRUN
Formulation / Stand Code:	FORM				
Oil Code:	OILCODE				

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. 1	No. 2		No. 3	No. 4	No. 3	No. 4	A, %	Dem.	A, %	Dem.	A, %	Dem.	
<b>HC-1.0</b>	G1HCA5	G1HCD5	G2HCA5	G2HCD5	L1HCA5	L1HCD5	L2HCA5	L2HCD5														
<b>MC-0.5</b>	G1MCA5	G1MCD5																				
<b>LC-2.5</b>	G1LCA5	G1LCD5	G2LCA5	G2LCD5	L1LCA5	L1LCD5	L2LCA5	L2LCD5														
<b>Total</b>	11ACTOT	11DCTOT	12ACTOT	12DCTOT	11ACTOT	11DCTOT	2ACTOT	2DCTOT	11ACTOT	11DCTOT	13ACTOT	13DCTOT	14ACTOT	14DCTOT	13ACTOT	13DCTOT	14ACTOT	14DCTOT	11ACTOT	11DCTOT	11DCTOT	
<b>8-9</b>	G1L9A5	G1L9D5	G2L9A5	G2L9D5	L1L9A5	L1L9D5	L2L9A5	L2L9D5														
<b>7-7.9</b>	G1L8A5	G1L8D5	G2L8A5	G2L8D5	L1L8A5	L1L8D5	L2L8A5	L2L8D5														
<b>6-6.9</b>	G1L7A5	G1L7D5	G2L7A5	G2L7D5	L1L7A5	L1L7D5	L2L7A5	L2L7D5														
<b>5-5.9</b>	G1L6A5	G1L6D5	G2L6A5	G2L6D5	L1L6A5	L1L6D5	L2L6A5	L2L6D5														
<b>4-4.9</b>	G1L5A5	G1L5D5	G2L5A5	G2L5D5	L1L5A5	L1L5D5	L2L5A5	L2L5D5														
<b>3-3.9</b>	G1L4A5	G1L4D5	G2L4A5	G2L4D5	L1L4A5	L1L4D5	L2L4A5	L2L4D5														
<b>2-2.9</b>	G1L3A5	G1L3D5	G2L3A5	G2L3D5	L1L3A5	L1L3D5	L2L3A5	L2L3D5														
<b>1-1.9</b>	G1L2A5	G1L2D5	G2L2A5	G2L2D5	L1L2A5	L1L2D5	L2L2A5	L2L2D5														
<b>&gt;0-0.9</b>	G1L1A5	G1L1D5	G2L1A5	G2L1D5	L1L1A5	L1L1D5	L2L1A5	L2L1D5														
<b>Clean</b>	0	0	0	0	0	0	0	0	Clean	0	0	0	0	0	0	0	0	0	0	0	0	
<b>Total</b>	11ALTOT	11DLTOT	12ALTOT	12DLTOT	11ALTOT	11DLTOT	2ALTOT	2DLTOT														
<b>Rating</b>	G1UWD5	G2UWD5	L1UWD5	L2UWD5	G3UWD5	L3UWD5	L4UWD5	L4UWD5	G3UWD5	L3UWD5	L4UWD5	L4UWD5	L4UWD5	L4UWD5	OGUWD5	OGUWD5	OGUWD5	OGUWD5	OGUWD5	OGUWD5	UCUWD5	
<b>TGC</b>	Unweighted Deposits										Top Land Carbon										T.L. Flaked Carbon %	
TGC5	UWD5										TLC5										TLFC5	

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

Laboratory:	LAB	EOT Date:	DTCOMP	EOT Time:	EOTIME
<b>Test Number</b>					
Stand:	STAND	Engine:	ENGINE	Engine Run No.:	ENRUN
Formulation / Stand Code:	FORM				
Oil Code:	OILCODE				

Total Piston Ratings Summary																										
Dep. Factor	Grooves						Lands						Dep. Factor	Groove	Lands			Oil Cooling		Under Crown						
	No. 1	No. 2		No. 1		No. 2		No. 1	No. 1		No. 2				No. 3	No. 3		No. 4		A, %	Dem.	A, %	Dem.	A, %	Dem.	
<b>HC-1.0</b>	G1HCA6	G1HCD6	G2HCA6	G2HCD6	L1HCA6	L1HCD6	L2HCA6	L2HCD6																		
<b>MC-0.5</b>	G1MCA6	G1MCD6																								
<b>LC-2.5</b>	G1LCA6	G1LCD6	G2LCA6	G2LCD6	L1LCA6	L1LCD6	L2LCA6	L2LCD6																		
<b>Total</b>	31ACTOT	31DCTOT	32ACTOT	32DCTOT	31ACTOT	31DCTOT	32ACTOT	32DCTOT	33ACTOT	33DCTOT	33ACTOT	33DCTOT	34ACTOT	34DCTOT	34ACTOT	34DCTOT	35ACTOT	35DCTOT	35ACTOT	35DCTOT	36ACTOT	36DCTOT	36ACTOT	36DCTOT	36ACTOT	36DCTOT
<b>8-9</b>	G1L9A6	G1L9D6	G2L9A6	G2L9D6	L1L9A6	L1L9D6	L2L9A6	L2L9D6																		
<b>7-7.9</b>	G1L8A6	G1L8D6	G2L8A6	G2L8D6	L1L8A6	L1L8D6	L2L8A6	L2L8D6																		
<b>6-6.9</b>	G1L7A6	G1L7D6	G2L7A6	G2L7D6	L1L7A6	L1L7D6	L2L7A6	L2L7D6																		
<b>5-5.9</b>	G1L6A6	G1L6D6	G2L6A6	G2L6D6	L1L6A6	L1L6D6	L2L6A6	L2L6D6																		
<b>4-4.9</b>	G1L5A6	G1L5D6	G2L5A6	G2L5D6	L1L5A6	L1L5D6	L2L5A6	L2L5D6																		
<b>3-3.9</b>	G1L4A6	G1L4D6	G2L4A6	G2L4D6	L1L4A6	L1L4D6	L2L4A6	L2L4D6																		
<b>2-2.9</b>	G1L3A6	G1L3D6	G2L3A6	G2L3D6	L1L3A6	L1L3D6	L2L3A6	L2L3D6																		
<b>1-1.9</b>	G1L2A6	G1L2D6	G2L2A6	G2L2D6	L1L2A6	L1L2D6	L2L2A6	L2L2D6																		
<b>&gt;0-0.9</b>	G1L1A6	G1L1D6	G2L1A6	G2L1D6	L1L1A6	L1L1D6	L2L1A6	L2L1D6																		
<b>Clean</b>	0	0	0	0	0	0	0	0	Clean	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<b>Total</b>	31ALTOT	31DLTOT	32ALTOT	32DLTOT	31ALTOT	31DLTOT	32ALTOT	32DLTOT	33ALTOT	33DLTOT	33ALTOT	33DLTOT	34ALTOT	34DLTOT	34ALTOT	34DLTOT	35ALTOT	35DLTOT	35ALTOT	35DLTOT	36ALTOT	36DLTOT	36ALTOT	36DLTOT	36ALTOT	36DLTOT
<b>Rating</b>	G1UWD6	G1UWD6	G2UWD6	G2UWD6	L1UWD6	L1UWD6	L2UWD6	L2UWD6																		
<b>TGC</b>	Unweighted Deposits												Top Land Carbon			T.L. Flaked Carbon %										
TGC6	UWD6												TLC6			TLFC6										



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

Laboratory:	LAB	EOT Date:	DTCOMP	EOT Time:	EOTTIME
<b>Test Number</b>					
Stand:	STAND	Engine:	ENGINE	Engine Run No.:	ENRUN
Formulation / Stand Code:	FORM				
Oil Code:	OILCODE				

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	
<b>1</b>	RWCYL1PT	RWCYL1ET	RWLCYL1T	RWCYL1PS	RWCYL1ES	RWLCYL1S	RWCYL1PO	RWCYL1EO	RWLCYL1O
<b>2</b>	RWCYL2PT	RWCYL2ET	RWLCYL2T	RWCYL2PS	RWCYL2ES	RWLCYL2S	RWCYL2PO	RWCYL2EO	RWLCYL2O
<b>3</b>	RWCYL3PT	RWCYL3ET	RWLCYL3T	RWCYL3PS	RWCYL3ES	RWLCYL3S	RWCYL3PO	RWCYL3EO	RWLCYL3O
<b>4</b>	RWCYL4PT	RWCYL4ET	RWLCYL4T	RWCYL4PS	RWCYL4ES	RWLCYL4S	RWCYL4PO	RWCYL4EO	RWLCYL4O
<b>5</b>	RWCYL5PT	RWCYL5ET	RWLCYL5T	RWCYL5PS	RWCYL5ES	RWLCYL5S	RWCYL5PO	RWCYL5EO	RWLCYL5O
<b>6</b>	RWCYL6PT	RWCYL6ET	RWLCYL6T	RWCYL6PS	RWCYL6ES	RWLCYL6S	RWCYL6PO	RWCYL6EO	RWLCYL6O
<b>As Measured Results</b>									
<b>Average Mass Loss (mg)</b>			AMARWLT			ARWLS			ARWLO
<b>Std. Dev. Mass Loss (mg)</b>			SRWLT			SRWLS			SRWLO
<b>Maximum Mass Loss (mg)</b>			XRWLT			XRWLS			XRWLO
<b>Minimum Mass Loss (mg)</b>			IRWLT			IRWLS			IRWLO
<b>Outlier Crosshead (cylinder number)</b>			RINGOUT						
<b>Outlier Screened Results</b>									
<b>Average Mass Loss (mg)</b>			ARWLT						

**M11 EGR Lubricant Performance Test  
Form 18  
Oil Analysis Summary**

Laboratory:	LAB	EOT Date:	DTCOMP	EOT Time:	EOTIME
<b>Test Number</b>					
Stand:	STAND	Engine:	ENGINE	Engine Run No.:	ENRUN
Formulation / Stand Code:	FORM				
Oil Code:	OILCODE				

Test Hours	Viscosity @ 100°C, cSt	TGA % Soot	TBN D4739	TAN D664	Copper (ppm)	Iron (ppm)	Lead (ppm)	Aluminum (ppm)	Chromium (ppm)
NEW	V100NEW	TGANEW	TBNNEW	TANNEW	CUWMNEW	FEWMNEW	PBWNEW	ALWNEW	CRWNEW
TST_H025	V100H025	TGA_H025			CUWMH025	FEWMH025	PBWMH025	ALWMH025	CRWMH025
TST_H050	V100H050	TGA050	TBN_H050	TAN_H050	CUWMH050	FEWMH050	PBWMH050	ALWMH050	CRWMH050
TST_H075	V100H075	TGA_H075			CUWMH075	FEWMH075	PBWMH075	ALWMH075	CRWMH075
TST_H100	V100H100	TGA_H100	TBN_H100	TAN_H100	CUWMH100	FEWMH100	PBWMH100	ALWMH100	CRWMH100
TST_H125	V100H125	TGA_H125	TBN_H125	TAN_H125	CUWMH125	FEWMH125	PBWMH125	ALWMH125	CRWMH125
TST_H150	V100H150	TGA_H150	TBN_H150	TAN_H150	CUWMH150	FEWMH150	PBWMH150	ALWMH150	CRWMH150
TST_H175	V100H175	TGA_H175	TBN_H175	TAN_H175	CUWMH175	FEWMH175	PBWMH175	ALWMH175	CRWMH175
TST_H200	V100H200	TGA_H200	TBN_H200	TAN_H200	CUWMH200	FEWMH200	PBWMH200	ALWMH200	CRWMH200
TST_H225	V100H225	TGA_H225	TBN_H225	TAN_H225	CUWMH225	FEWMH225	PBWMH225	ALWMH225	CRWMH225
TST_H250	V100H250	TGA250	TBN_H250	TAN_H250	CUWMH250	FEWMH250	PBWMH250	ALWMH250	CRWMH250
TST_H275	V100H275	TGA_H275	TBN_H275	TAN_H275	CUWMH275	FEWMH275	PBWMH275	ALWMH275	CRWMH275
TST_H300	V100H300	TGA_H300	TBN_H300	TAN_H300	CUWMH300	FEWMH300	PBWMH300	ALWMH300	CRWMH300

**M11 EGR Lubricant Performance Test**  
**Form 19**  
**Test Fuel Analysis (Last Batch)**

Laboratory:	LAB	EOT Date:	DTCOMP	EOT Time:	EOTTIME
<b>Test Number</b>					
Stand:	STAND	Engine:	ENGINE	Engine Run No.:	ENRUN
Formulation / Stand Code:			FORM		
Oil Code:			OILCODE		

<b>Fuel Supplier</b>	<b>Fuel Batch Identifier</b>
FUELSUP	FUELBTID

Measurement	Specifications	Analysis		Test Method
		New	EOT	
Total Sulfur, % Weight	0.04 - 0.05	FUELSNEW	FUELSEOT	D 2662
Gravity, °API	34.5 - 36.5	APIGRNEW	APIGREOT	D 1298
<b>Hydrocarbon Composition</b>				
Aromatics % Volume	28 – 33	FUELAROM		D 1319
Olefin	Report	FUELOLEF		D 1319
Cetane Index	Report	CETANEIN		D 4737
Cetane Number	42 – 48	CETANENO		D 613
Copper Strip Corrosion	1 Maximum	FUELUCU		D 130
Flash Point, °C	54 Maximum	FLASHPT		D 93
Pour Point, °C	-18 Maximum	FUELPOUR		D 97
Carbon Residue on 10% Residuum, %	0.35 Maximum	FUELGRES		D 524 (10% Bottoms)
Water & Sediment, % Volume	0.05 Maximum	FUELH2O		D 2709
Viscosity, cSt @ 40 °C	2.4 - 3.0	KINVIS		D 445
Total Acid Number	0.05 Maximum	FUELTAN		D 664
Strong Acid Number	0.00 Maximum	FUELSAN		D 664
Accelerated Stability	Tbd	FUELACS		D 2274
Saturates, %	Report	FUELSATU		D 1319
Cloud Point, °C	Report	FUELCLOU		D 2500
<b>Distillation, °C</b>				
IBP	Report	FUELIBP		D 86
10%	Report	FUEL10		D 86
50%	Report	FUEL50		D 86
90%	282 – 338	FUEL90		D 86
EP	Report	FUELEP		D 86

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

Laboratory:	LAB	EOT Date:	DTCOMP	EOT Time:	EOTTIME
<b>Test Number</b>					
Stand:	STAND	Engine:	ENGINE	Engine Run No.:	ENRUN
Formulation / Stand Code:			FORM		
Oil Code:			OILCODE		

Screw #	Pretest Mass, g	Post-Test Mass, g	Mass Loss, mg
<b>1</b>	BOTIAS1	EOTIAS1	IASWL1
<b>2</b>	BOTIAS2	EOTIAS2	IASWL2
<b>3</b>	BOTIAS3	EOTIAS3	IASWL3
<b>4</b>	BOTIAS4	EOTIAS4	IASWL4
<b>5</b>	BOTIAS5	EOTIAS5	IASWL5
<b>6</b>	BOTIAS6	EOTIAS6	IASWL6
<b>Total</b>			IASWLTOT
<b>Average</b>			AVGIAS

**M11 EGR Lubricant Performance Test  
Form 21  
Unscheduled Downtime & Maintenance Summary**

Laboratory: LAB	EOT Date: DTCOMP	EOT Time: EOTTIME
<b>Test Number</b>		
Stand: STAND	Engine: ENGINE	Engine Run No.: ENRUN
Formulation / Stand Code:		FORM
Oil Code:		OILCODE

Number of Downtime Occurrences			DWNOCR
Test Hours	Date	Downtime	Reasons
DOWNR001	DDATR001	DTIMR001	DREAR001
DOWNR002	DDATR002	DTIMR002	DREAR002
DOWNR003	DDATR003	DTIMR003	DREAR003
DOWNR004	DDATR004	DTIMR004	DREAR004
DOWNR005	DDATR005	DTIMR005	DREAR005
DOWNR006	DDATR006	DTIMR006	DREAR006
DOWNR007	DDATR007	DTIMR007	DREAR007
DOWNR008	DDATR008	DTIMR008	DREAR008
DOWNR009	DDATR009	DTIMR009	DREAR009
DOWNR010	DDATR010	DTIMR010	DREAR010
DOWNR011	DDATR011	DTIMR011	DREAR011
DOWNR012	DDATR012	DTIMR012	DREAR012
DOWNR013	DDATR013	DTIMR013	DREAR013
DOWNR014	DDATR014	DTIMR014	DREAR014
DOWNR015	DDATR015	DTIMR015	DREAR015
<b>TOTLDOWN</b>			Total Downtime (hours)

Other Comments	
Number of Comment Lines	TOTCOM
	OCOMR001
	OCOMR002
	OCOMR003
	OCOMR004
	OCOMR005
	OCOMR006
	OCOMR007
	OCOMR008
	OCOMR009
	OCOMR010
	OCOMR011
	OCOMR012
	OCOMR013
	OCOMR014
	OCOMR015

**M11 EGR Lubricant Performance Test  
Form 21a  
Unscheduled Downtime & Maintenance Summary**

Laboratory: LAB	EOT Date: DTCOMP	EOT Time: EOTTIME
<b>Test Number</b>		
Stand: STAND	Engine: ENGINE	Engine Run No.: ENRUN
Formulation / Stand Code:		FORM
Oil Code:		OILCODE

Number of Downtime Occurrences			DWNOCR
Test Hours	Date	Downtime	Reasons
DOWNR016	DDATR016	DTIMR016	DREAR016
DOWNR017	DDATR017	DTIMR017	DREAR017
DOWNR018	DDATR018	DTIMR018	DREAR018
DOWNR019	DDATR019	DTIMR019	DREAR019
DOWNR020	DDATR020	DTIMR020	DREAR020
DOWNR021	DDATR021	DTIMR021	DREAR021
DOWNR022	DDATR022	DTIMR022	DREAR022
DOWNR023	DDATR023	DTIMR023	DREAR023
DOWNR024	DDATR024	DTIMR024	DREAR024
DOWNR025	DDATR025	DTIMR025	DREAR025
DOWNR026	DDATR026	DTIMR026	DREAR026
DOWNR027	DDATR027	DTIMR027	DREAR027
DOWNR028	DDATR028	DTIMR028	DREAR028
DOWNR029	DDATR029	DTIMR029	DREAR029
DOWNR030	DDATR030	DTIMR030	DREAR030
TOTLDOWN			Total Downtime (hours)

Other Comments	
Number of Comment Lines	TOTCOM
	OCOMR016
	OCOMR017
	OCOMR018
	OCOMR019
	OCOMR020
	OCOMR021
	OCOMR022
	OCOMR023
	OCOMR024
	OCOMR025
	OCOMR026
	OCOMR027
	OCOMR028
	OCOMR029
	OCOMR030

**M11 EGR Lubricant Performance Test  
Form 21b  
Unscheduled Downtime & Maintenance Summary**

Laboratory: LAB	EOT Date: DTCOMP	EOT Time: EOTIME
<b>Test Number</b>		
Stand: STAND	Engine: ENGINE	Engine Run No.: ENRUN
Formulation / Stand Code:		FORM
Oil Code:		OILCODE

Number of Downtime Occurrences			DWNOCR
Test Hours	Date	Downtime	Reasons
DOWNR031	DDATR031	DTIMR031	DREAR031
DOWNR032	DDATR032	DTIMR032	DREAR032
DOWNR033	DDATR033	DTIMR033	DREAR033
DOWNR034	DDATR034	DTIMR034	DREAR034
DOWNR035	DDATR035	DTIMR035	DREAR035
DOWNR036	DDATR036	DTIMR036	DREAR036
DOWNR037	DDATR037	DTIMR037	DREAR037
DOWNR038	DDATR038	DTIMR038	DREAR038
DOWNR039	DDATR039	DTIMR039	DREAR039
DOWNR040	DDATR040	DTIMR040	DREAR040
DOWNR041	DDATR041	DTIMR041	DREAR041
DOWNR042	DDATR042	DTIMR042	DREAR042
DOWNR043	DDATR043	DTIMR043	DREAR043
DOWNR044	DDATR044	DTIMR044	DREAR044
DOWNR045	DDATR045	DTIMR045	DREAR045
<b>TOTLDOWN</b>			Total Downtime (hours)

Other Comments	
Number of Comment Lines	TOTCOM
	OCOMR031
	OCOMR032
	OCOMR033
	OCOMR034
	OCOMR035
	OCOMR036
	OCOMR037
	OCOMR038
	OCOMR039
	OCOMR040
	OCOMR041
	OCOMR042
	OCOMR043
	OCOMR044
	OCOMR045

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

Laboratory: LAB	EOT Date: DTCOMP	EOT Time: EOTTIME
<b>Test Number</b>		
Stand: STAND	Engine: ENGINE	Engine Run No.: ENRUN
Formulation / Stand Code:		FORM
Oil Code:		OILCODE

Parameter (1)	Sensing Device (2)	Calibration Frequency (3)	Record Device (4)	Observation Frequency (5)	Record Frequency (6)	Log Frequency (7)	System Response (8)
<b>Temperatures</b>							
Oil @ Filt.	OTEMSENS	OTEMCALF	OTEMRECD	OTEMOBSF	OTEMRECF	OTEMLOGF	OTEMSYSR
Fuel In.	FTEMSSENS	FTEMCALF	FTEMRECD	FTEMOBSF	FTEMRECF	FTEMLOGF	FTEMSYSR
Intake Air	AITSENS	AITCALF	AITRECD	AITOBSF	AITRECF	AITLOGF	AITSYSR
Intake Man.	IMANSENS	IMANCALF	IMANRECD	IMANOBSF	IMANRECF	IMANLOGF	IMANSYSR
Pre-Turb.	PTURSENS	PTURCALF	PTURRECD	PTUROBSF	PTURRECF	PTURLOGF	PTURSYSR
Cool. Out	COTSENS	COTCALF	COTRECD	COTOBSF	COTRECF	COTLOGF	COTSYSR
<b>Pressure</b>							
Inlet Air	INRESENS	INRECALF	INRERECD	INREOBSF	INRERECF	INRELOGF	INRESYSR
Exhaust	EXPRSENS	EXPRCALF	EXPRECD	EXPROBSF	EXPRECF	EXPRLOGF	EXPRSYSR
Oil Gallery	OILGSENS	OILGCALF	OILGRECD	OILGOBSF	OILGRECF	OILGLOGF	OILGSYSR
<b>Other</b>							
Fuel Flow	FFLOSENS	FFLOCALF	FFLORECD	FFLOOBSF	FFLORECF	FFLOLOGF	FFLOSYSR
Speed	RPMSSENS	RPMCALF	RPMRECD	RPMOBSF	RPMRECF	RPMLOGF	RPMSYSR
Load	LOADSENS	LOADCALF	LOADRECD	LOADOBSF	LOADRECF	LOADLOGF	LOADSYSR

**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



**M11EGR Lubricant Performance Test  
Form 23  
American Chemistry Council Code of Practice  
Test Laboratory Conformance Statement**

Test Laboratory		SUBLAB			
Test Sponsor		TSTSPON1			
Formulation / Stand Code		FORM			
Test Number		TESTNUM			
Start Date	DTSTRT	Start Time	STRTIME	Time Zone	TZONE

**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 ESRQME No NORQMET\*

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 YESFULL No NOFULL \*

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 YESNODEC\* No NONODEC

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 YESDEV \* No NODEV (*This currently applies only to specific deviations identified in the ASTM Information Letter System*)

**Check The Appropriate Conclusion**

INCLUDE	Operational review of this test indicates that the results should be included in the Multiple Test Acceptance Criteria calculations.
DONOTINC	*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	
ACCCOMM1	
ACCCOMM2	
ACCCOMM3	
ACCCOMM4	

SUBSIGIM  
Signature

SUBNAME  
Typed Name

SUBDATE  
Date

SUBTITLE  
Title