

**D 6838  
M11  
High Soot Lubricant Performance Test**

**Version**

**Conducted For:**

	<b>V</b> =Valid; The Reference Oil/Non-Reference Oil Was Evaluated In Accordance With The Test Procedure.
	<b>I</b> = Invalid; The Reference Oil/Non-Reference Oil Was Not Evaluated In Accordance With The Test Procedure.
	<b>N</b> = Not interpretable; The Non-Reference Oil Results Cannot Be Interpreted And Shall Not Be Used For Multiple Test Acceptance.

Stand	Engine No.	Engine Run No.
End Of Test Date		End Of Test Time
Oil Code/CMIR: <sup>A</sup>		
Formulation/Stand Code		
Altcode1	Altcode2	Altcode3

<p>In my opinion this test _____ been conducted in a valid manner in accordance with ASTM Test Method D 6838 and the appropriate amendments through the information letter system. The remarks included in this report describe the anomalies associated with this test.</p>
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<sup>A</sup> CMIR or Non-Reference Oil Code

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

\_\_\_\_\_ Signature

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

\_\_\_\_\_ Title

**D6838**  
**M11 High Soot Lubricant Performance Test**  
**Non-Reference Oil Test Summary**  
**Form 1**

Formulation/Stand Code			Test Length
Oil Code No.			
<b>Test Lab</b>	<b>Test Stand No.</b>	<b>Engine Block Serial No.</b>	<b>Engine Run Number</b>
Date Test Started			
Start Time			
Date Test Completed			
EOT Time			
Stand Calibration Expiration Date			
Total Test Hours On Engine			
Engine Kit Serial Number			
Laboratory Oil Code			
SAE Viscosity			
Total Oil Consumption, kg			
TGA Soot % At 150 Hours			

	Adjusted Average Crosshead Mass Loss, (mg)	+ Filter Plugging Delta P, (kPa)	Average Sludge Rating, (merits)
Original Result			
Transformed Result <sup>A</sup>			
Industry Correction Factor <sup>A</sup>			
Corrected Result <sup>A</sup>			
Severity Adjustment (Lab Based) <sup>A</sup>			
Severity Adjustment Result <sup>A</sup>			
Final Original Unit Result			

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

**D6838**  
**M11 High Soot Lubricant Performance Test**  
**Reference Oil Test Summary**  
**Form 1A**

CMIR Code No.		Test Length	
TMC Oil No.			
<b>Test Lab</b>	<b>Test Stand No.</b>	<b>Engine Block Serial No.</b>	<b>Engine Run Number</b>
Date Test Started			
Start Time			
Date Test Completed			
EOT Time			
Stand Calibration Expiration Date			
Total Test Hours On Engine			
Engine Kit Serial Number			
Laboratory Oil Code			
SAE Viscosity			
Total Oil Consumption, kg			
TGA Soot % At 150 Hours (4.5 – 5.5)			

	<b>Adjusted Average Crosshead Mass Loss, (mg)</b>	<b>Filter Plugging Delta P, (kPa)</b>	<b>Average Sludge Rating, -(merits)</b>
Original Result			
Transformed Result <sup>A</sup>			
Industry Correction Factor <sup>A</sup>			
Corrected Result <sup>A</sup>			
Final Original Unit Result			

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

**D 6838 M11 High Soot Lubricant Performance Test  
Form 2**

**Operational Summary**

Laboratory	EOT Date	EOT Time
Stand	Engine	Engine Run No.
Formulation/Stand Code		
Oil Code/CMIR		
<b>Test Number</b>		

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				
Speed	R/min	0.000		1800	1600				
Fuel Flow	kg/h	0.000		53					
Coolant Out	°C	0.000		88					
Fuel In	°C	0.000		40					
Oil Gallery	°C	0.000		115					
Intake Manifold	°C	0.000		46					
Exhaust	kPa	0.000		107					
<b>Parameter</b>	<b>Units</b>	<b>QI Threshold</b>	<b>EOT QI<sup>A</sup></b>	<b>Target</b>		<b>Average</b>	<b>Samples<sup>B</sup></b>	<b>BQD<sup>C</sup></b>	<b>Over/Under Range<sup>D</sup></b>
<b>Typical Values<sup>E</sup></b>									
Torque	N-m	1262 – 1360	1505 - 1688						
Power	kW	236 – 257	247 - 283						
Blowby	L/min		73 – 195						
Coolant In	°C		81 – 87						
Intake Air	°C		29 – 37						
Pre-Turbine (F)	°C		536 – 629						
Pre-Turbine (R)	°C		548 – 628						
Tailpipe	°C		406 – 498						
Fuel	kPa		1048 – 1132						
Oil Gallery	kPa		217 – 300						
Coolant	kPa		99 – 107						
Intake Manifold	kPa		163 – 291						
Crankcase	kPa		0.5 – 3.4						
Intake Air	kPa		92 – 99						
<b>Non-controlled Parameters</b>									

<sup>A</sup> QI values above the threshold are acceptable by the Mack Surveillance Panel. QI values below the threshold may not be considered acceptable based on an engineering review. Refer to Annex A5

<sup>B</sup> Total number of data points taken. Minimum acceptable value is 3000

<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

**D 6838**  
**M11 High Soot Lubricant Performance Test**  
**Form 3**  
**200 h Crosshead Mass Loss Summary**

Laboratory	EOT Date	EOT Time
<b>Test Number</b>		
Stand	Engine	Engine Run No.
Formulation/Stand Code		
Oil Code/CMIR		

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

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

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

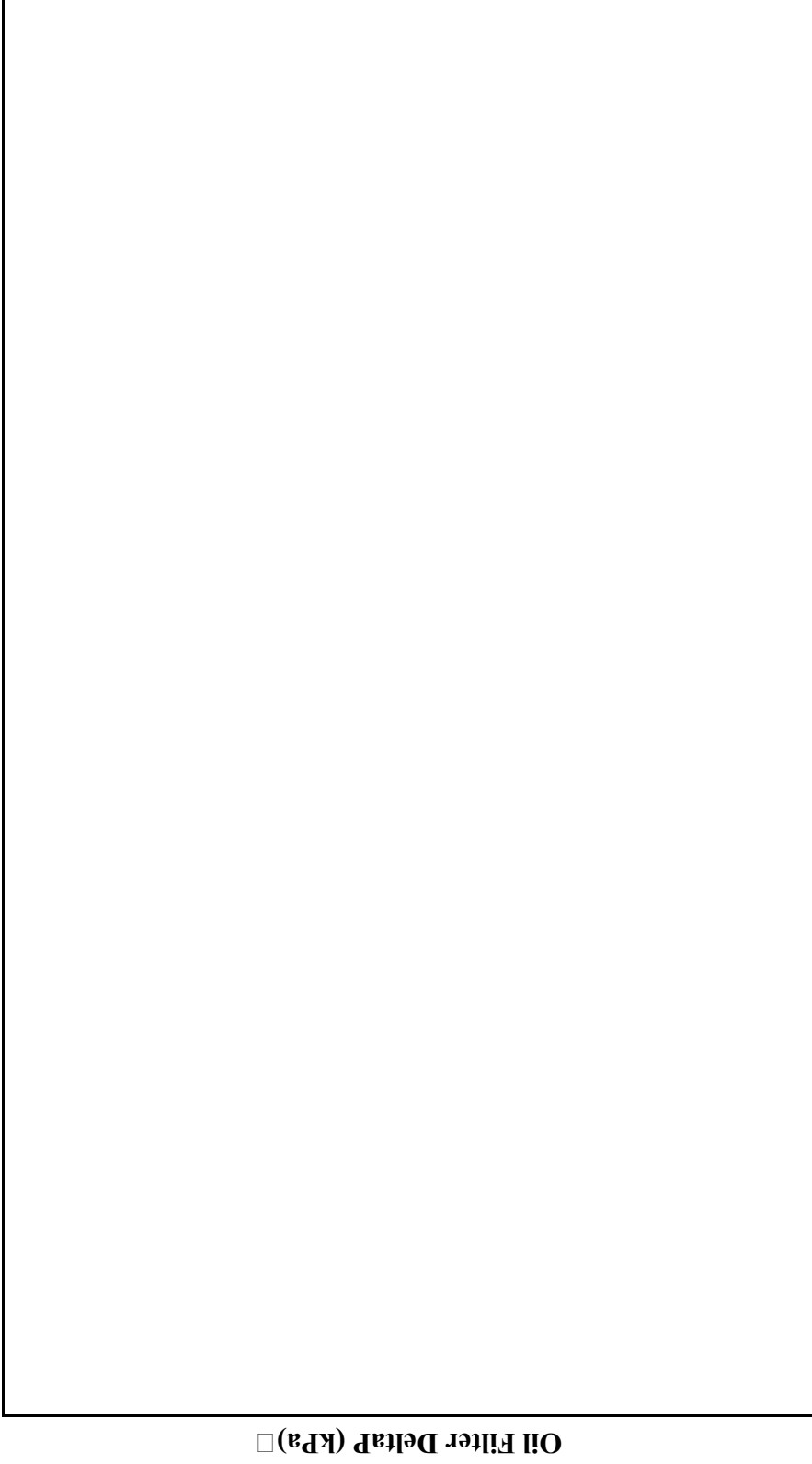
Overall Summary	As Measured	Outlier Screened	Adjusted to 4.5% Soot
Average Crosshead Mass Loss (mg)			
Minimum Crosshead Mass Loss (mg)			
Maximum Crosshead Mass Loss (mg)			
Standard Deviation (mg)			

**D6838 M11 High Soot Lubricant Performance Test  
Form 4**

**Oil Filter Delta Pressure Plot**

Laboratory	EOT Date	EOT Time
Stand	Engine	Test Number
Formulation/Stand Code		
Oil Code/CMIR		

**Oil Filter Delta Pressure vs Test Hours**



Test Hours

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**M11 High Soot Lubricant Performance Test**  
**Form 5**  
**Sludge Rating Summary**

Laboratory	EOT Date	EOT Time
<b>Test Number</b>		
Stand	Engine	Engine Run No.
Formulation/Stand Code		
Oil Code/CMIR		

**Sludge Rating Summary**

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

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**M11 High Soot Lubricant Performance Test**  
**Form 6**  
**Rod Bearing Mass Loss**

Laboratory	EOT Date	EOT Time
<b>Test Number</b>		
Stand	Engine	Engine Run No.
Formulation/Stand Code		
Oil Code/CMIR		

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

	Bearing Mass Loss
Average	
Minimum	
Maximum	
Standard Deviation (mg)	



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**Form 7**  
**Piston Rating Summary**

Laboratory	EOT Date	EOT Time
<b>Test Number</b>		
Stand	Engine	Engine Run No.
Formulation/Stand Code		
Oil Code/CMIR		

Unweighted Demerits											
Piston Number	Lands				Grooves			Under Crown	Oil Cooling Gallery	Total Demerits	
	1	2	3	4	1	2	3				
1											
2											
3											
4											
5											
6											
Average Demerits											
									Average Total Unweighted Demerits		

Parameter	Piston Number						Average
	1	2	3	4	5	6	
TGC							
TLC							

**D 6838 M11 High Soot Lubricant Performance Test**  
**Form 8**  
**Piston 1 Deposit Ratings**

Laboratory	EOT Date	EOT Time	
Stand	Test Number		
Formulation/Stand Code	Engine	Engine Run No.	
Oil Code/CMIR			

Dep. Factor	Grooves		Lands				Dep. Factor	Grooves		Lands				Oil Cooling Gallery(2)		Under Crown(1)	
	No. 1		No. 2		No. 1			No. 2		No. 3		No. 4		A, %		Dem.	
	A, %	Dem.	A, %	Dem.	A, %	Dem.		A, %	Dem.	A, %	Dem.	A, %	Dem.	A, %	Dem.	A, %	Dem.
<b>CARBON</b>																	
HC - 1.0																	
MC - 0.5																	
LC - .25																	
Total																	
<b>VARNISH</b>																	
8 - 9																	
7 - 7.9									7.5								
6 - 6.9																	
5 - 5.9																	
4 - 4.9									4.5								
3 - 3.9																	
2 - 2.9																	
1 - 1.9									1.5								
>0 - 0.9																	
Total																	
Rating																	
TGC%	Unweighted Dep.			T.L. Carbon				T.L. Flaked Carbon		T.L. Flaked Carbon %							



**D6838 M11 High Soot Lubricant Performance Test  
Form 10  
Piston 3 Deposit Ratings**

Laboratory		EOT Date		EOT Time
<b>Test Number</b>				
Stand			Engine Run No.	
Formulation/Stand Code				
Oil Code/CMIR				

Dep. Factor	Grooves			Lands			Dep. Factor	Grooves			Lands			Oil Cooling Gallery(2)			Under Crown(1)							
	No. 1		No. 2	No. 1		No. 2		No. 3		No. 4	No. 3		No. 4	No. 3		No. 4	A.%, Dem.		A.%, Dem.					
	A.%, Dem.	A.%, Dem.	A.%, Dem.	A.%, Dem.	A.%, Dem.	A.%, Dem.		A.%, Dem.	A.%, Dem.	A.%, Dem.	A.%, Dem.	A.%, Dem.	A.%, Dem.	A.%, Dem.	A.%, Dem.	A.%, Dem.	A.%, Dem.	A.%, Dem.	A.%, Dem.					
<b>CARBON</b>																								
HC - 1.0																								
MC - 0.5																								
LC - .25																								
<b>Total</b>																								
<b>VARNISH</b>																								
8 - 9																								
7 - 7.9																								
6 - 6.9																								
5 - 5.9																								
4 - 4.9																								
3 - 3.9																								
2 - 2.9																								
1 - 1.9																								
>0 - 0.9																								
<b>Total</b>																								
<b>Rating</b>																								
TGC%								Unweighted Dep.								T.L. Carbon								T.L. Flaked Carbon %







**D 6838**  
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**Form 14**  
**Ring Mass Loss Summary**

Laboratory	EOT Date	EOT Time
<b>Test Number</b>		
Stand	Engine	Engine Run No.
Formulation/Stand Code		
Oil Code/CMIR		

Top Ring			
Cylinder No.	Pretest Mass (g)	EOT Mass (g)	Mass Loss (mg)
1			
2			
3			
4			
5			
6			
	Average Top Ring Mass Loss		
	Std. Dev. Top Ring Mass Loss		
	Maximum Top Ring Mass Loss		
	Minimum Top Ring Mass Loss		

Second Ring			
Cylinder No.	Pretest Mass (g)	EOT Mass (g)	Mass Low (mg)
1			
2			
3			
4			
5			
6			
	Average Second Ring Mass Loss		
	Std. Dev. Second Ring Mass Loss		
	Maximum Second Ring Mass Loss		
	Minimum Second Ring Mass Loss		





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**M11 High Soot Lubricant Performance Test**  
**Form 16**  
**Test Fuel Analysis (Last Batch)**

Laboratory	EOT Date	EOT Time
<b>Test Number</b>		
Stand	Engine	Engine Run No.
Formulation/Stand Code		
Oil Code/CMIR		

Fuel Supplier	Fuel Batch Identifier

Measurement	Specifications	Analysis		Test Method
		New	EOT	
Total Sulfur, % Weight	0.03 - 0.05			D 2662
Gravity, °API	32 – 36			D 287 or D 4052
<b>Hydrocarbon Composition</b>				
Aromatics % Volume	28 – 35			D 1319
Olefin	Report			D 1319
Saturates	Report			D 1319
Cetane Index	Report			D 4737
Cetane Number	42 – 48			D 613
Copper Strip Corrosion	3 Maximum			D 130
Flash Point, °C	54 Maximum			D 93
Cloud Point, °C	-12 Maximum			D 2500
Pour Point, °C	-18 Maximum			D 97
Carbon Residue on 10% Residuum, %	0.35 Maximum			D 524 (10% Bottoms)
Water & Sediment, % Volume	0.05 Maximum			D 2709
Ash, % Weight	0.01 Maximum			D 482
Viscosity, cSt @ 40 °C	2.0 - 3.2			D 445
<b>Distillation, °C</b>				
IBP	177 – 199			D 86
10%	210 – 232			D 86
50%	249 – 327			D 86
90%	299 – 327			D 86
EP	327 – 360			D 86







**D 6838**  
**M11 High Soot Lubricant Performance Test**  
**Form 18**  
**Characteristics Of The Data Acquisition System**

Laboratory	EOT Date	EOT Time
<b>Test Number</b>		
Stand	Engine	Engine Run No.
Formulation/Stand Code		
Oil Code/CMIR		

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 Gallery							
Fuel In.							
Intake Air							
Intake Man.							
Pre-Turb.							
Cool. Out							
<b>Pressure</b>							
Inlet Air							
Exhaust							
Oil Gallery							
<b>Other</b>							
Fuel Flow							
Speed							
Load							

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 If Recorded 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

**D 6838**  
**M11 High Soot Lubricant Performance Test**  
**Form 19**  
**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