

**Mack T-11**  
**D 7156 - EGR Engine Oil Test**

**Report Packet Version No.**

T11 VERSION 20050623 BETA

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: CCCCC	Engine Hours: CCCCC
End Of Test Date: YYYYMMDD		End Of Test Time: HH:MM	
Oil Code: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC			
Formulation/Stand Code: CC-CCCCCCCC-C-C-CCCC-CC-CC-CCCC			
Altcode1: CCCCCCCCCCCCC	Altcode2: CCCCCCCCCCCCC	Altcode3: CCCCCCCCCCCCC	

In my opinion this test CCCCCC been conducted in a valid manner in accordance with the Test Method D 7156 and the appropriate amendments through the information letter system. The remarks included in this report describe the anomalies associated with this test.

Submitted By: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC

Testing Laboratory

Signature Image

Signature

CC

Typed Name

CC

Title

**Mack T-11**  
**D 7156 - EGR Engine Oil 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.	Oil Analysis Summary	Form 6
7.	Oil Analysis Summary	Form 7
8.	Oil Analysis Summary	Form 8
9.	Test Fuel Analysis (Last Batch)	Form 9
10.	Characteristics of the Data Acquisition System	Form 10
11.	Build-up and Hardware Information	Form 11
12.	Unscheduled Downtime & Maintenance Summary	Form 12
13.	ACC Conformance Statement	Form 13

**Mack T-11**  
**D 7156 - EGR Engine Oil Test**  
**Form 3**  
**Summary of Test Method**

The Mack T-11 EGR Engine oil Test is a fuel engine-dynamometer test which evaluates diesel engine oils for performance characteristics including viscosity increase and soot concentrations (loading). This test is a single-phase, steady state test (constant speed and load). The test is 252 hours and is run with retarded fuel injection timing to produce elevated soot levels in the oil.

The test engine is a Mack E-TECH V-MAC III diesel engine with EGR. It is an in-line six-cylinder, four stroke, turbocharged engine. It has electronically controlled fuel injection with six individual electronic pumps.

**Mack T-11 Test Conditions**

Parameter	Value
Time, h	252
Injection Timing, °BTDC	Variable
Speed, r/min	1800
Fuel Flow, kg/h	53.5
Intake CO <sub>2</sub> , %	1.5
Exhaust CO <sub>2</sub> , %	Record
Inlet Manifold Temp., °C	70
Coolant Out Temp., °C	66
Fuel In Temp., °C	40
Oil Gallery Temp., °C	88
Intake Air Temp., °C	25
Intake Air Restriction, kPa	3.5 – 4.0
Inlet Manifold Pressure, kPa	Tbd
Exhaust Back Pressure, kPa	2.7 – 3.5
Crankcase Pressure, kPa	0.25 – 0.75
Power, kW	Record
Torque, Nm	Record
Pre-Turbine Exhaust Temp., °C	Record
Tailpipe Exhaust Temp., °C	Record
Oil Sump Temp., °C	Record
EGR Pre-Venturi Temp., °C	Record
Inlet Air Dew Point, °C	Record
Fuel Pressure, kPa	Record
Main Gallery Oil Pressure, kPa	Record
Oil Filter Delta P, kPa	Not to exceed 138

**Mack T-11  
D 7156 - EGR Engine Oil Test  
Form 4**

**Test Results Summary**

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

**Test Results**

<b>Date Test Started:</b> YYYYMMDD	<b>Start Time:</b> HH:MM	
<b>SAE Viscosity:</b> CCCCCCC	<b>Test Length:</b> S1234	
<b>TMC Oil Code:<sup>A</sup></b> CCCCCC	<b>Laboratory Oil Code:</b> CCCCCCCCCCCCCCCCCC	
<b>TGA Soot % at 96 h</b>	S123.12	
<b>TGA Soot % at 192 h</b>	S123.12	
<b>TGA Soot % at 228 h</b>	S123.12	
<b>TGA Soot % at 252 h</b>	S123.12	
<b>Centrifugal Oil Filter Mass Gain, g</b>	S123.1	
<b>Oil Filter Delta P, kPa</b>	S123	
<b>EOT TBN</b>	S123.1	
<b>Oil Consumption, g/hr</b>	S123.1	
<b>Viscosity Increase at 6.0% Soot, cSt</b>	S123.12	
<b>MRV Yield Stress, cP</b>	S12345	
	<b>Soot at 12 cSt (%)</b>	<b>MRV (cP)</b>
<b>Original Result</b>	AAAAAAAAA	S1234567
<b>Transformed Result</b>	S12.1234	S1234567
<b>Correction Factor</b>	S12.1234	S1234567
<b>Corrected Transformed Result</b>	S12.1234	S1234567
<b>Severity Adjustment</b>	S12.1234	S1234567
<b>Final Transformed Result</b>	S12.1234	S1234567
<b>Final Original Unit Result</b>	AAAAAAAAA	S1234567

**Last Stand Reference Results**

<b>Test Number:</b> CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
<b>Oil Code:</b> CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
<b>Test Length:</b> S1234	<b>TMC Oil Code:</b> CCCCCC	
<b>EOT Date:</b> YYYYMMDD	<b>EOT Time:</b> HH:MM	
<b>Stand Calibration Expiration Date:</b> YYYYMMDD		
<b>TGA Soot % at 96 h</b>	S123.12	
<b>TGA Soot % at 192h</b>	S123.12	
<b>TGA Soot % at 228h</b>	S123.12	
<b>TGA Soot % at 252 h</b>	S123.12	
<b>Oil Consumption, g/hr</b>	S123.1	
<b>Viscosity at 6.0% Soot, cSt</b>	S123.12	
	<b>Soot at 12 cSt (%)</b>	<b>MRV</b>
<b>Final Original Unit Result</b>	AAAAAAAAA	S1234567

<sup>A</sup> Reference Tests only.

**Mack T-11  
D 7156 - EGR Engine Oil Test  
Form 5  
Operational Summary**

<b>Laboratory:</b> CC	<b>EOT Date:</b> YYYYMMDD	<b>EOT Time:</b> HH:MM
<b>Test Number:</b> CCC		
<b>Oil Code:</b> CCC		
<b>Formulation/Stand Code:</b> CC-CCCCCCCCCC-C-C-CCCCCC-CC-CC-CCCC		

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>
<b>Controlled Parameters</b>								
Speed	r/min	0.000	S12.123	1800	S12345	S1234	S1234	S1234
Fuel Flow	kg/h	0.000	S12.123	53.5	S12.12	S1234	S1234	S1234
Inlet Manifold Temp.	°C	0.000	S12.123	70	S1234	S1234	S1234	S1234
Coolant Out Temp.	°C	0.000	S12.123	66	S1234	S1234	S1234	S1234
Fuel In Temp.	°C	0.000	S12.123	40	S1234	S1234	S1234	S1234
Oil Gallery Temp.	°C	0.000	S12.123	88	S1234	S1234	S1234	S1234
Inlet Air Temp.	°C	0.000	S12.123	25	S1234	S1234	S1234	S1234
Inlet Air Restriction	kPa			3.5 – 4.0	S12.12	S1234	S1234	S1234
Inlet Man. Pressure	kPa			140 minimum	S123	S1234	S1234	S1234
Exh. Back Pressure	kPa			2.7 – 3.5	S12.1	S1234	S1234	S1234
Crankcase Pressure	kPa			0.25 – 0.75	S12.12	S1234	S1234	S1234
Intake CO <sub>2</sub>	%			1.5±.05	S12.12	S1234	S1234	S1234
<b>Non-controlled Parameters</b>								
Parameter	Units	Typical Values <sup>E</sup>		Average				
Power	kW		TBD	S12.1				
Torque	Nm		TBD	S1234				
Exhaust CO <sub>2</sub>	%		TBD	S12.12				
Pre-Turbine Temp. (F)	°C		TBD	S1234				
Pre-Turbine Temp. (R)	°C		TBD	S1234				
Tailpipe Temp.	°C		TBD	S1234				
Oil Sump Temp.	°C		TBD	S1234				
EGR Pre-Venturi Temp.	°C		TBD	S1234				
Blowby	L/min		TBD	S12.1				
Inlet Air Dew Point	°C		TBD	S1234				
Fuel Pressure	kPa		TBD	S1234				
Main Gallery Oil Press.	kPa		TBD	S1234				

<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 A3  
<sup>B</sup> Total number of data points taken. Minimum acceptable value is 2520  
<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









**Mack T-11**  
**D 7156 - EGR Engine Oil Test**  
**Form 9**  
**Test Fuel Analysis (Last Batch)**

<b>Laboratory:</b> CC	<b>EOT Date:</b> YYYYMMDD	<b>EOT Time:</b> HH:MM
<b>Test Number:</b> CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
<b>Oil Code:</b> CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
<b>Formulation/Stand Code:</b> CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC		
<b>Supplier:</b> CCCCCCCCCCCCCCCCC		<b>Batch Identifiers:</b> CCCCCCCCCCCCC

Measurement	Specs.	Analysis		Test Method
		NEW	EOT	
<b>Total Sulfur, % Weight</b>	<b>0.04 – 0.05</b>	S12.12	S12.12	<b>D 2622</b>
<b>Gravity, °API</b>	<b>34.5 – 36.5</b>	S12.1	S12.1	<b>D 287 or D 4052</b>
<b>Hydrocarbon Composition</b>				
<b>Aromatics % Vol.</b>	<b>28 – 33</b>	S12.1		<b>D 1319</b>
<b>Olefin</b>	<b>Report</b>	S12.1		<b>D 1319</b>
<b>Cetane Index</b>	<b>Report</b>	S12.1		<b>D 976 &amp; D 4737</b>
<b>Cetane No.</b>	<b>42 – 48</b>	S12.1		<b>D 613</b>
<b>Copper Strip Corrosion</b>	<b>1 Maximum</b>	CCCC		<b>D 130</b>
<b>Flash Point, °C</b>	<b>54 Minimum</b>	S123		<b>D 93</b>
<b>Pour Point, °C</b>	<b>-18 Maximum</b>	S123		<b>D 97</b>
<b>Carbon Residue on 10% Residuam, %</b>	<b>0.35 Maximum</b>	S12.12		<b>D 524 (10% Bottoms)</b>
<b>Water &amp; Sediment, % Vol.</b>	<b>0.05 Maximum</b>	AAAAAA		<b>D 2709</b>
<b>Viscosity, cSt @ 40°C</b>	<b>2.4 – 5.0</b>	S12.1		<b>D 445</b>
<b>Total Acid Number</b>	<b>0.05 Maximum</b>	S12.1		<b>D 664</b>
<b>Strong Acid Number</b>	<b>0.00 Maximum</b>	S12.1		<b>D 664</b>
<b>Accelerated Stability</b>	<b>tbd</b>	S12.1		<b>D 2274</b>
<b>Distillation, °C</b>				
<b>IBP</b>	<b>Report</b>	S1234		<b>D 86</b>
<b>10%</b>	<b>Report</b>	S1234		<b>D 86</b>
<b>50%</b>	<b>Report</b>	S1234		<b>D 86</b>
<b>90%</b>	<b>282 – 338</b>	S1234		<b>D 86</b>
<b>EP</b>	<b>Report</b>	S1234		<b>D 86</b>

**Mack T-11  
D 7156 - EGR Engine Oil Test  
Form 10**

**Characteristics of the Data Acquisition System**

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

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>							
<b>Oil @ Filt.</b>	CCCCCCCCCC	CCCCCCCCCC	CCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC
<b>Fuel In.</b>	CCCCCCCCCC	CCCCCCCCCC	CCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC
<b>Intake Air</b>	CCCCCCCCCC	CCCCCCCCCC	CCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC
<b>Intake Man.</b>	CCCCCCCCCC	CCCCCCCCCC	CCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC
<b>Pre-Turb.</b>	CCCCCCCCCC	CCCCCCCCCC	CCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC
<b>Cool. Out</b>	CCCCCCCCCC	CCCCCCCCCC	CCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC
<b>Other</b>							
<b>Fuel Flow</b>	CCCCCCCCCC	CCCCCCCCCC	CCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC
<b>Engine RPM</b>	CCCCCCCCCC	CCCCCCCCCC	CCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC
<b>Load</b>	CCCCCCCCCC	CCCCCCCCCC	CCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC
<b>Inlet Restr.</b>	CCCCCCCCCC	CCCCCCCCCC	CCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC
<b>Exh. Press.</b>	CCCCCCCCCC	CCCCCCCCCC	CCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC	CCCCCCCCCC
<b>Oil Gal. Press.</b>	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  
 LG - Handlog Sheet  
 DL - Automatic Data Logger  
 SC - Strip Chart Recorder  
 C/M - Computer, Using Manual Data Entry  
 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

**Mack T-11  
D 7156 - EGR Engine Oil Test  
Form 11  
Build-up and Hardware Information**

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

**Injection Timing**

Timing Hours	Timing (Deg)
CCC	CCCCCC
CCC	CCCCCC
CCC	CCCCCC
CCC	CCCCCC
CCC	CCCCCC
CCC	CCCCCC
CCC	CCCCCC
CCC	CCCCCC
CCC	CCCCCC
CCC	CCCCCC
CCC	CCCCCC
CCC	CCCCCC
CCC	CCCCCC
CCC	CCCCCC
CCC	CCCCCC
CCC	CCCCCC
CCC	CCCCCC
CCC	CCCCCC
CCC	CCCCCC
CCC	CCCCCC
S12	<b>Total Timing Changes</b>

**Hardware**

Part	Part Number	Serial Number
<b>Primary Turbocharger</b>	CCCCCCCCCCCCCCCCCCCC	
<b>Secondary Charger</b>	CCCCCCCCCCCCCCCCCCCC	
<b>Cylinder Head (front)</b>	CCCCCCCCCCCCCCCCCCCC	CCCCCCCCCCCCCCCCCCCC
<b>Cylinder Head (rear)</b>	CCCCCCCCCCCCCCCCCCCC	CCCCCCCCCCCCCCCCCCCC
<b>Pistons</b>	CCCCCCCCCCCCCCCCCCCC	
<b>Injection Nozzles</b>	CCCCCCCCCCCCCCCCCCCC	
<b>Rod Bearings</b>	CCCCCCCCCCCCCCCCCCCC	
<b>Liners</b>	CCCCCCCCCCCCCCCCCCCC	
<b>Ring Set</b>	CCCCCCCCCCCCCCCCCCCC	

Cylinder Kit Location	CPD ID Number
<b>Cylinder 1</b>	CCCCCCCCCCCCCCCCCCCC
<b>Cylinder 2</b>	CCCCCCCCCCCCCCCCCCCC
<b>Cylinder 3</b>	CCCCCCCCCCCCCCCCCCCC
<b>Cylinder 4</b>	CCCCCCCCCCCCCCCCCCCC
<b>Cylinder 5</b>	CCCCCCCCCCCCCCCCCCCC
<b>Cylinder 6</b>	CCCCCCCCCCCCCCCCCCCC







