

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

**Report Packet Version No.**

**Conducted For**

	<b>V = Valid; The reference oil/non-reference oil was evaluated in accordance with the test procedure.</b>
	<b>I = Invalid; The reference oil/non-reference oil was not evaluated in accordance with the test procedure.</b>
	<b>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.</b>

	<b>NR = Non Reference Oil Test</b>
	<b>RO = Reference Oil Test</b>

<b>Stand:</b>	<b>Stand Run:</b>	<b>Engine:</b>	<b>Engine Hours:</b>
<b>End Of Test Date:</b>		<b>End Of Test Time:</b>	
<b>Oil Code:</b>			
<b>Formulation/Stand Code:</b>			
<b>Altcode1:</b>	<b>Altcode2:</b>	<b>Altcode3:</b>	

<p><b>In my opinion this test _____ been conducted in a valid manner in accordance with the Test Method Dxxx and the appropriate amendments through the information letter system. The remarks included in this report describe the anomalies associated with this test.</b></p>
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**Submitted By:**

\_\_\_\_\_ **Testing Laboratory**

\_\_\_\_\_ **Signature**

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

\_\_\_\_\_ **Title**

**Mack T-11  
EGR Engine Oil Test  
Form 2**

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**Mack T-11  
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
Inlet Air Humidity, kg/kg	Record
Main Gallery Oil Pressure, kPa	Record
Oil Filter Delta P, kPa	Not to exceed 138

**Mack T-11  
EGR Engine Oil Test  
Form 4  
Test Results Summary**

<b>Laboratory:</b>	<b>EOT Date:</b>	<b>EOT Time:</b>
<b>Test Number:</b>		
<b>Oil Code:</b>		
<b>Formulation/Stand Code:</b>		

Test Results		
<b>Date Test Started:</b>	<b>Start Time:</b>	
<b>SAE Viscosity:</b>	<b>Test Length:</b>	
<b>TMC Oil Code:<sup>A</sup></b>	<b>Laboratory Oil Code:</b>	
<b>TGA Soot % at 96 h</b>		
<b>TGA Soot % at 192 h</b>		
<b>TGA Soot % at 252 h</b>		
<b>Centrifugal Oil Filter Mass Gain, g</b>		
<b>Oil Filter Delta P, kPa</b>		
<b>EOT TBN</b>		
<b>Oil Consumption, g/hr</b>		
<b>Viscosity Increase at 6.0% Soot, cSt</b>		
	<b>Soot at 12 cSt (%)</b>	<b>MRV</b>
<b>Original Result</b>		
<b>Transformed Result</b>		
<b>Correction Factor</b>		
<b>Corrected Transformed Result</b>		
<b>Severity Adjustment</b>		
<b>Final Transformed Result</b>		
<b>Final Original Unit Result</b>		

Last Stand Reference Results		
<b>Test Number:</b>		
<b>Oil Code:</b>		
<b>Test Length:</b>	<b>TMC Oil Code:</b>	
<b>EOT Date:</b>	<b>EOT Time:</b>	
<b>Stand Calibration Expiration Date:</b>		
<b>TGA Soot % at 96 h</b>		
<b>TGA Soot % at 192h</b>		
<b>TGA Soot % at 252 h</b>		
<b>Oil Consumption, g/hr</b>		
<b>Viscosity at 6.0% Soot, cSt</b>		
	<b>Soot at 12 cSt (%)</b>	<b>MRV</b>
<b>Final Original Unit Result</b>		

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

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

<b>Laboratory:</b>	<b>EOT Date:</b>	<b>EOT Time:</b>
<b>Test Number:</b>		
<b>Oil Code:</b>		
<b>Formulation/Stand Code:</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>
	<b>Controlled Parameters</b>	Speed	r/min	0.000		1800			
Fuel Flow		kg/h	0.000		53.5				
Inlet Manifold Temp.		°C	0.000		70				
Coolant Out Temp.		°C	0.000		66				
Fuel In Temp.		°C	0.000		40				
Oil Gallery Temp.		°C	0.000		88				
Inlet Air Temp.		°C	0.000		25				
Inlet Air Restriction		kPa			3.5 – 4.0				
Inlet Man. Pressure		kPa			TBD				
Exh. Back Pressure		kPa			2.7 – 3.5				
Crankcase Pressure		kPa			0.25 – 0.75				
Intake CO <sub>2</sub>		%			1.5+0.5				
<b>Non-controlled Parameters</b>	Parameter	Units	Typical Values <sup>E</sup>		Average				
	Power	kW	TBD						
	Torque	Nm	TBD						
	Exhaust CO <sub>2</sub>	%	TBD						
	Pre-Turbine Temp. (F)	°C	TBD						
	Pre-Turbine Temp. (R)	°C	TBD						
	Tailpipe Temp.	°C	TBD						
	Oil Sump Temp.	°C	TBD						
	EGR Pre-Venturi Temp.	°C	TBD						
	Blowby	L/min	TBD						
	Inlet Air Dew Point	°C	TBD						
	Inlet Air Humidity	g/kg	TBD						
	Main Gallery Oil Press.	kPa	TBD						

<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  
EGR Engine Oil Test  
Form 9  
Test Fuel Analysis (Last Batch)**

<b>Laboratory:</b>	<b>EOT Date:</b>	<b>EOT Time:</b>
<b>Test Number:</b>		
<b>Oil Code:</b>		
<b>Formulation/Stand Code:</b>		
<b>Supplier:</b>		<b>Batch Identifiers:</b>

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

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

**Characteristics of the Data Acquisition System**

<b>Laboratory:</b>	<b>EOT Date:</b>	<b>EOT Time:</b>
<b>Test Number:</b>		
<b>Oil Code:</b>		
<b>Formulation/Stand Code:</b>		

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>							
<b>Fuel In.</b>							
<b>Intake Air</b>							
<b>Intake Man.</b>							
<b>Pre-Turb.</b>							
<b>Cool. Out</b>							
<b>Other</b>							
<b>Fuel Flow</b>							
<b>Engine RPM</b>							
<b>Load</b>							
<b>Inlet Restr.</b>							
<b>Exh. Press.</b>							
<b>Oil Gal. Press.</b>							

**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







