

**D 6987  
Mack T-10 EGR Engine Oil Test**

**Report Packet Version No.**

**Conducted For**

<b>T-10:</b>	<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>T-10A:</b>	<b>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>

Test Number			
<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>Alternate Codes</b>			

<p><b>In my opinion this test _____ been conducted in a valid manner in accordance with the Test Method D 6987 and the appropriate amendments through the information letter system. The remarks included in this report describe the anomalies associated with this test.</b></p>
--

**Submitted By:** \_\_\_\_\_

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

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

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

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

**D 6987**  
**Mack T-10 EGR Engine Oil Test**  
**Form 2**

**Table of Contents**

<b>1.</b>	<b>Final Report Cover Sheet</b>	<b>Form 1</b>
<b>2.</b>	<b>Table of Contents</b>	<b>Form 2</b>
<b>3.</b>	<b>Summary of Test Method</b>	<b>Form 3</b>
<b>4.</b>	<b>Test Results Summary</b>	<b>Form 4</b>
<b>5.</b>	<b>Operational Summary</b>	<b>Form 5</b>
<b>6.</b>	<b>Rod Bearing Weight Loss</b>	<b>Form 6</b>
<b>7.</b>	<b>Ring Weight Loss</b>	<b>Form 7</b>
<b>8.</b>	<b>Oil Analysis Summary</b>	<b>Form 8</b>
<b>9.</b>	<b>Liner Surface Roughness &amp; Bore Diameter</b>	<b>Form 9</b>
<b>10.</b>	<b>Liner Wear Summary</b>	<b>Form 10</b>
<b>11.</b>	<b>Unscheduled Downtime &amp; Maintenance Summary</b>	<b>Form 11</b>
<b>12.</b>	<b>Test Fuel Analysis (Last Batch)</b>	<b>Form 12</b>
<b>13.</b>	<b>Characteristics of the Data Acquisition System</b>	<b>Form 13</b>
<b>14.</b>	<b>Build-up and Hardware Information</b>	<b>Form 14</b>
<b>15.</b>	<b>Rating Summary: Piston 1</b>	<b>Form 15</b>
<b>16.</b>	<b>Rating Summary: Piston 2</b>	<b>Form 16</b>
<b>17.</b>	<b>Rating Summary: Piston 3</b>	<b>Form 17</b>
<b>18.</b>	<b>Rating Summary: Piston 4</b>	<b>Form 18</b>
<b>19.</b>	<b>Rating Summary: Piston 5</b>	<b>Form 19</b>
<b>20.</b>	<b>Rating Summary: Piston 6</b>	<b>Form 20</b>
<b>21.</b>	<b>Main Bearing Weight Loss</b>	<b>Form 21</b>
<b>22.</b>	<b>ACC Conformance Statement</b>	<b>Form 22</b>

**D 6987**  
**Mack T-10 EGR Engine Oil Test**  
**Form 3**

The Mack T-10 EGR Engine Oil Test is a fuel engine-dynamometer test which evaluates the ability of a lubricant to minimize piston ring wear, cylinder liner wear, lead corrosion, oil consumption, and oxidation. This test is a two-phase, steady state test (constant speed and load). The first phase is 75 h and is run with retarded fuel injection timing to produce elevated soot levels in the oil. The second phase is 225 h and is run under heavy load conditions to induce piston ring and cylinder liner wear.

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. A one h break-in is conducted prior to each test since a new engine build is used for each test.

**Mack T-10 Test Conditions**

<b>Parameter</b>	<b>Phase I</b>	<b>Phase II</b>
<b>Time, h</b>	<b>75</b>	<b>225</b>
<b>Injection Timing, °BTDC</b>	<b>Variable</b>	<b>18</b>
<b>Speed, r/min</b>	<b>1800</b>	<b>1200</b>
<b>Fuel Flow, kg/h</b>	<b>59.2</b>	<b>63.5</b>
<b>Exhaust O<sub>2</sub> Level, %</b>	<b>Record</b>	<b>Record</b>
<b>Intake CO<sub>2</sub>, %</b>	<b>1.5</b>	<b>0.2</b>
<b>Exhaust CO<sub>2</sub>, %</b>	<b>Record</b>	<b>Record</b>
<b>Inlet Manifold Temp., °C</b>	<b>70</b>	<b>66</b>
<b>Coolant Out Temp., °C</b>	<b>66</b>	<b>85</b>
<b>Fuel In Temp., °C</b>	<b>40</b>	<b>40</b>
<b>Oil Gallery Temp., °C</b>	<b>88</b>	<b>113</b>
<b>Intake Air Temp., °C</b>	<b>25</b>	<b>25</b>
<b>Intake Air Restriction, kPa</b>	<b>3.5 – 4.0</b>	<b>3.5 – 4.0</b>
<b>Inlet Manifold Pressure, kPa</b>	<b>160 minimum</b>	<b>210 minimum</b>
<b>Exhaust Back Pressure, kPa</b>	<b>2.7 – 3.5</b>	<b>2.7 – 3.5</b>
<b>Crankcase Pressure, kPa</b>	<b>0.25 – 0.75</b>	<b>0.25 – 0.75</b>
<b>Power, kW</b>	<b>~257</b>	<b>~324</b>
<b>Torque, Nm</b>	<b>Record</b>	<b>Record</b>
<b>Pre-Turbine Exhaust Temp., °C</b>	<b>Record</b>	<b>Record</b>
<b>Tailpipe Exhaust Temp., °C</b>	<b>Record</b>	<b>Record</b>
<b>Oil Sump Temp., °C</b>	<b>Record</b>	<b>Record</b>
<b>EGR Pre-Venturi Temp., °C</b>	<b>Record</b>	<b>Record</b>
<b>Inlet Air Dew Point, °C</b>	<b>Record</b>	<b>Record</b>
<b>Inlet Air Humidity, kg/kg</b>	<b>Record</b>	<b>Record</b>
<b>Main Gallery Oil Pressure, kPa</b>	<b>Record</b>	<b>Record</b>
<b>Oil Filter Delta P, kPa</b>	<b>Not to exceed 138</b>	<b>Not to exceed 138</b>

**D 6987**  
**Mack T-10 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>Test Length:</b>	
<b>TMC Oil Code: <sup>A</sup></b>		<b>Laboratory Oil Code:</b>			<b>SAE Viscosity:</b>	
<b>Average TGA Soot % at 75 h</b>						
<b>Centrifugal Oil Filter Mass Gain, g</b>						
<b>Oil Filter Delta P, kPa (138 maximum)</b>						
<b>EOT TBN</b>						
<b>MRV Yield Stress (Pa) <sup>C</sup></b>						
	<b>Delta Pb@ EOT (ppm)</b>	<b>Avg Liner Wear (µm)</b>	<b>Avg Top Ring Weight Loss (mg)</b>	<b>Oil Consumption (g/h)</b>	<b>Delta Pb 250-300h (ppm)</b>	<b>MRV<sup>C</sup> Viscosity @75h (cP)</b>
<b>Original Result</b>						
<b>Transformed Result <sup>B</sup></b>						
<b>Correction Factor <sup>B</sup></b>						
<b>Corrected Transformed Result <sup>B</sup></b>						
<b>Severity Adjustment <sup>B</sup></b>						
<b>Final Transformed Result <sup>B</sup></b>						
<b>Final Original Unit Result <sup>B</sup></b>						
<b>Mack Merits <sup>D</sup></b>						
<b>Total Mack Merits <sup>D</sup></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>Average TGA Soot % at 75 h</b>						
	<b>Delta Pb@ EOT (ppm)</b>	<b>Avg Liner Wear (µm)</b>	<b>Avg Top Ring Weight Loss (mg)</b>	<b>Oil Consumption (g/h)</b>	<b>Delta Pb 250-300h (ppm)</b>	<b>MRV<sup>C</sup> Viscosity @75h (cP)</b>
<b>Original Result</b>						
<b>Transformed Result <sup>B</sup></b>						
<b>Correction Factor <sup>B</sup></b>						
<b>Corrected Transformed Result <sup>B</sup></b>						
<b>Final Transformed Result <sup>B</sup></b>						
<b>Final Original Unit Result <sup>B</sup></b>						

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

<sup>B</sup> Transformed Units for Delta Pb only.

<sup>C</sup> For T-10A use only.

<sup>D</sup> Non-reference Tests only.

**D 6987**  
**Mack T-10 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		EOT QI <sup>A</sup>	Target		Average	Samples <sup>B</sup>	BQD <sup>C</sup>	Over/Under Range <sup>D</sup>
		Threshold	QI		1800	1800				
<b>Speed</b>	r/min	0.000			1800	1800				
<b>Fuel Flow</b>	kg/h	0.000			59.2	59.2				
<b>Inlet Manifold Temp.</b>	°C	0.000			70	66				
<b>Coolant Out Temp.</b>	°C	0.000			66	85				
<b>Fuel In Temp.</b>	°C	0.000			40					
<b>Oil Gallery Temp.</b>	°C	0.000			88	113				
<b>Inlet Air Temp.</b>	°C	0.000			25					
<b>Inlet Air Restriction</b>	kPa				3.5 – 4.0					
<b>Inlet Man. Pressure</b>	kPa				160 min	210 min				
<b>Exh. Back Pressure</b>	kPa				2.7 – 3.5					
<b>Crankcase Pressure</b>	kPa				0.25 – 0.75					
<b>Intake CO<sub>2</sub></b>	%				1.5±.05	0.2±.05				
<b>Parameter</b>	<b>Units</b>	<b>Typical Values<sup>E</sup></b>		<b>Average</b>						
<b>Power</b>	<b>KW</b>	230 – 255		308 – 326						
<b>Torque</b>	<b>Nm</b>	1223 – 1351		2456 – 2593						
<b>Exhaust O<sub>2</sub></b>	<b>%</b>	7.0 – 8.5		5.5 – 6.8						
<b>Exhaust CO<sub>2</sub></b>	<b>%</b>	7.18 – 9.97		9.60 – 11.09						
<b>Pre-Turbine Temp. (L)</b>	<b>°C</b>	518 – 655		547 – 730						
<b>Pre-Turbine Temp. (R)</b>	<b>°C</b>	572 – 674		540 - 726						
<b>Tailpipe Temp.</b>	<b>°C</b>	421 – 464		477 – 510						
<b>Oil Sump Temp.</b>	<b>°C</b>	91 – 101		117 – 127						
<b>EGR Pre-Venturi Temp.</b>	<b>°C</b>	210 – 253		91 – 111						
<b>Blowby</b>	<b>L/min</b>	53 – 120		70 – 200						
<b>Inlet Air Dew Point</b>	<b>°C</b>	6 – 25		8 – 28						
<b>Inlet Air Humidity</b>	<b>g/kg</b>	4.5 – 20.3		3.5 – 24.1						
<b>Main Gallery Oil Pressure</b>	<b>kPa</b>	398 – 489		174 – 263						

<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 6987**  
**Mack T-10 EGR Engine Oil Test**  
**Form 6**  
**Rod Bearing Weight Loss**

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

Cylinder #	Location	SOT Weight, g	EOT Weight, g	Weight Change, mg
1	Upper			
2	Upper			
3	Upper			
4	Upper			
5	Upper			
6	Upper			

Summary	As Measured	Outlier Screened
Upper Bearing Average Weight Loss, mg		
Upper Bearing Weight Loss Std. Dev., mg		
Upper Bearing Minimum Weight Loss, mg		
Upper Bearing Maximum Weight Loss, mg		
Outlier Upper Rod Bearing <sup>A</sup>		

<sup>A</sup> Cylinder number

Cylinder #	Location	SOT Weight, g	EOT Weight, g	Weight Change, mg
1	Lower			
2	Lower			
3	Lower			
4	Lower			
5	Lower			
6	Lower			
Lower Bearing Average Weight Loss, mg				
Lower Bearing Weight Loss Std. Dev., mg				
Lower Bearing Minimum Weight Loss, mg				
Lower Bearing Maximum Weight Loss, mg				

<b>Conrod Bearing Batch ID</b>	
--------------------------------	--

**D 6987**  
**Mack T-10 EGR Engine Oil Test**  
**Form 7**  
**Ring Weight Loss**

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

Cylinder #	Top Ring SOT Weight, g	Top Ring EOT Weight, g	Weight Loss, mg
1			
2			
3			
4			
5			
6			

Summary	As Measured	Outlier Screened
Top Ring Average Weight Loss, mg		
Top Ring Weight Loss Std. Dev., mg		
Top Ring Minimum Weight Loss, mg		
Top Ring Maximum Weight Loss, mg		
Outlier Ring <sup>B</sup>		

<sup>A</sup> Results calculated without rings with plasma flanking.

<sup>B</sup> Ring number wear results are not currently outlier screened.

Cylinder #	2nd Ring SOT Weight, g	2 <sup>nd</sup> Ring EOT Weight, g	Weight Loss, mg
1			
2			
3			
4			
5			
6			
2 <sup>nd</sup> Ring Average Weight Loss, mg			
2 <sup>nd</sup> Ring Weight Loss Std. Dev., mg			
2 <sup>nd</sup> Ring Min. Weight Loss, mg			
2 <sup>nd</sup> Ring Max. Weight Loss, mg			

Cylinder #	Oil Ring SOT Weight, g	Oil Ring EOT Weight, g	Weight Loss, mg
1			
2			
3			
4			
5			
6			
Oil Ring Average Weight Loss, mg			
Oil Ring Weight Loss Std. Dev., mg			
Oil Ring Minimum Weight Loss, mg			
Oil Ring Maximum Weight Loss, mg			

D 6987  
MACK T-10 EGR Engine Oil Test  
Form 8  
Oil Analysis Summary

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

Hours	Soot Wt.% TGA	Viscosity At 100°C cSt	Viscosity Increase cSt	TBN	TAN	Integrated IR Oxidation	Metal Elements (ppm)										
							Fe	Pb	Cu	Cr	Al	Si	Sn	Na			
75 (2nd)																	
75 AVG.																	

Summary	As Measured	Outlier Bearing Adjusted
Delta Pb @ EOT, ppm		
Delta Pb @ 250-300h, ppm		
75-h MRV		



**D 6987**  
**Mack T-10 EGR Engine Oil Test**  
**Form 9**  
**Liner Surface Roughness & Bore Diameter**

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

Liner No.	Location	Ra (µm)	Bore Diameter (mm)	Avg.	Std. Dev.	Dia. (mm)
1	Top Ring Travel @ 0°C			Avg.		
	Top Ring Travel @ 90°C			Std. Dev.		
	Top Ring Travel @ 180°C			Min.		
	Top Ring Travel @ 270°C			Max.		
2	Top Ring Travel @ 0°C			Avg.		
	Top Ring Travel @ 90°C			Std.Dev.		
	Top Ring Travel @ 180°C			Min.		
	Top Ring Travel @ 270°C			Max.		
3	Top Ring Travel @ 0°C			Avg.		
	Top Ring Travel @ 90°C			Std. Dev.		
	Top Ring Travel @ 180°C			Min.		
	Top Ring Travel @ 270°C			Max.		
4	Top Ring Travel @ 0°C			Avg.		
	Top Ring Travel @ 90°C			Std.Dev.		
	Top Ring Travel @ 180°C			Min.		
	Top Ring Travel @ 270°C			Max.		
5	Top Ring Travel @ 0°C			Avg.		
	Top Ring Travel @ 90°C			Std. Dev.		
	Top Ring Travel @ 180°C			Min.		
	Top Ring Travel @ 270°C			Max.		
6	Top Ring Travel @ 0°C			Avg.		
	Top Ring Travel @ 90°C			Std. Dev.		
	Top Ring Travel @ 180°C			Min.		
	Top Ring Travel @ 270°C			Max.		

	Ra (µm)	Bore Diameter (mm)
<b>Average Surface Roughness &amp; Bore Diameter</b>		
<b>Standard Deviation Surface Roughness &amp; Bore Diameter</b>		
<b>Minimum Surface Roughness &amp; Bore Diameter</b>		
<b>Maximum Surface Roughness &amp; Bore Diameter</b>		

**D 6987**  
**Mack T-10 EGR Engine Oil Test**  
**Form 10**  
**Liner Wear 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>		

<b>Position</b>	<b>Wear Step (µm)</b>					
	<b>Cylinder Number</b>					
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<b>1:00</b>						
<b>2:00</b>						
<b>3:00 (Thrust)</b>						
<b>4:00</b>						
<b>5:00</b>						
<b>6:00 (Rear)</b>						
<b>7:00</b>						
<b>8:00</b>						
<b>9:00 (Anti-Thrust)</b>						
<b>10:00</b>						
<b>11:00</b>						
<b>12:00 (Front)</b>						
<b>Average</b>						

<b>Summary</b>	<b>As Measured</b>	<b>Outlier Screened</b>
<b>Average, µm</b>		
<b>Std. Dev., µm</b>		
<b>Minimum, µm</b>		
<b>Maximum, µm</b>		
<b>Outlier Liners<sup>A</sup></b>		

<sup>A</sup> Cylinder Number.







**D 6987**  
**Mack T-10 EGR Engine Oil Test**  
**Form 12**  
**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% Residuum, %</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>

**D 6987**  
**Mack T-10 EGR Engine Oil Test**  
**Form 13**  
**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**

**D 6987**  
**Mack T-10 EGR Engine Oil Test**  
**Form 14**  
**Build-up and Hardware Information**

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

**Injection Timing**

Timing Hours	Timing (Deg)
<b>Total Timing Changes</b>	

**Hardware**

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

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



**D 6987  
Mack T-10 EGR Engine Oil Test  
Form 15  
Rating Summary: Piston #1**

<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>Date Rated:</b>	<b>Rater Initials:</b>	<b>Verified By:</b>

Total Piston Ratings Summary																		
Dep. Factor	Grooves				Lands	Dep. Factor	Groove				Lands		Oil Cooling		Under Crown			
	A, %	Dem.	No. 1	No. 2			A, %	Dem.	No. 3	No. 4	A, %	Dem.	A, %	Dem.	A, %	Dem.	A, %	Dem.
Carbocation																		
HC-1.0																		
MC-0.5																		
LC-25																		
Total																		
8-9																		
7-7.9																		
6-6.9						7.5												
5-5.9																		
4-4.9																		
3-3.9																		
2-2.9																		
1-1.9																		
>0-0.9																		
Clean	0	0	0	0	Clean		0	0	0	0	0	0	0	0	0	0	0	0
Total																		
Rating																		
Location Factor	2	3	1	3			20	20	20	60			0.5				1	
Ind Rating	WDP				TGC				TLC				Unweighted Deposits		T. L. Flaked Carbon %			

**D 6987**  
**Mack T-10 EGR Engine Oil Test**  
**Form 16**  
**Rating Summary: Piston #2**

<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>Date Rated:</b>	<b>Rater Initials:</b>	<b>Verified By:</b>

Total Piston Ratings Summary																		
Dep. Factor	Grooves				Dep. Factor	Lands				Groove		Lands		Oil Cooling		Under Crown		
	A, %	Dem.	No. 1	No. 2		A, %	Dem.	No. 1	No. 2	A, %	Dem.	A, %	Dem.	A, %	Dem.	A, %	Dem.	
Carbocation																		
8-9					7.5													
7-7.9																		
6-6.9																		
5-5.9																		
4-4.9																		
3-3.9																		
2-2.9																		
1-1.9																		
>0-0.9																		
Clean	0	0	0	0	Clean	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>																		
<b>Rating</b>																		
<b>Location Factor</b>	2	3	1	3					20	20	20	60					0.5	1
<b>Ind Rating</b>																		
<b>WDP</b>																		
<b>TLC</b>																		
<b>TGC</b>																		
<b>Unweighted Deposits</b>																		
<b>T. L. Flaked Carbon %</b>																		

**D 6987**  
**Mack T-10 EGR Engine Oil Test**  
**Form 17**  
**Rating Summary: Piston #3**

<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>Date Rated:</b>	<b>Rater Initials:</b>	<b>Verified By:</b>	

Total Piston Ratings Summary																				
Dep. Factor	Grooves				Dep. Factor	Lands				Groove		Lands		Oil Cooling		Under Crown				
	A, %	Dem.	No. 1	No. 2		A, %	Dem.	No. 1	No. 2	A, %	Dem.	No. 3	Dem.	A, %	Dem.	A, %	Dem.	A, %	Dem.	
Carbocation																				
8-9					7.5															
7-7.9																				
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																				
Clean	0	0	0	0	Clean	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>																				
<b>Rating</b>																				
<b>Location Factor</b>	2	3	1	3					20	20	20	60			0.5				1	
<b>Ind Rating</b>																				
<b>WDP</b>					<b>TLC</b>															
<b>TGC</b>																				
<b>Unweighted Deposits</b>																				
<b>T. L. Flaked Carbon %</b>																				

**D 6987**  
**Mack T-10 EGR Engine Oil Test**  
**Form 18**  
**Rating Summary: Piston #4**

<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>Date Rated:</b>	<b>Rater Initials:</b>	<b>Verified By:</b>

Total Piston Ratings Summary																		
Dep. Factor	Grooves				Dep. Factor	Lands				Groove		Lands		Oil Cooling		Under Crown		
	A, %	Dem.	No. 1	No. 2		A, %	Dem.	No. 1	No. 2	A, %	Dem.	No. 3	Dem.	A, %	Dem.	A, %	Dem.	
Carbocation																		
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																		
Clean	0	0	0	0	Clean	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>																		
<b>Rating</b>																		
<b>Location Factor</b>	2	3	1	3					20	20	20	60			0.5			1
<b>Ind Rating</b>																		
<b>WDP</b>																		
<b>TGC</b>																		
<b>TLC</b>																		
<b>Unweighted Deposits</b>																		
<b>T. L. Flaked Carbon %</b>																		





**D 6987**  
**Mack T-10 EGR Engine Oil Test**  
**Form 21**  
**Main Bearing Weight Loss**

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

Position #	Location	SOT Weight, g	EOT Weight, g	Weight Change, mg
1	Upper			
2	Upper			
3	Upper			
4	Upper			
5	Upper			
6	Upper			
7	Upper			
<b>Upper Bearing Average Weight Loss, mg</b>				
<b>Upper Bearing Weight Loss Std. Dev., mg</b>				
<b>Upper Bearing Minimum Weight Loss, mg</b>				
<b>Upper Bearing Maximum Weight Loss, mg</b>				

Position #	Location	SOT Weight, g	EOT Weight, g	Weight Change, mg
1	Lower			
2	Lower			
3	Lower			
4	Lower			
5	Lower			
6	Lower			
7	Lower			
<b>Lower Bearing Average Weight Loss, mg</b>				
<b>Lower Bearing Weight Loss Std. Dev., mg</b>				
<b>Lower Bearing Minimum Weight Loss, mg</b>				
<b>Lower Bearing Maximum Weight Loss, mg</b>				

<b>Main Bearing Batch ID</b>	
------------------------------	--

**D 6987**  
**Mack T-10 EGR Engine Oil Test**  
**Form 22**  
**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

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

\_\_\_\_\_  
Date

\_\_\_\_\_  
Title