

# MACK T-10 EGR ENGINE OIL TEST

REPORT PACKET VERSION NO. 20010102

CONDUCTED FOR

	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.

	NR = Non Reference Oil Test
	RO = Reference Oil Test

STAND:	STAND RUN NO.:	ENGINE NO.:	ENGINE HOURS:
END OF TEST DATE:		END OF TEST TIME:	
OIL CODE:			
FORMULATION/STAND CODE:			
ALTCODE1:	ALTCODE2:	ALTCODE3:	

<p>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.</p>
---

SUBMITTED BY: \_\_\_\_\_

Testing Laboratory

Signature

Typed Name

Title

**MACK T-10  
EGR Engine Oil Test  
Form 10  
Liner Wear Summary**

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

POSITION	WEAR STEP ( $\mu\text{m}$ )					
	Cylinder Number					
	1	2	3	4	5	6
1:00						
2:00						
3:00 (Thrust)						
4:00						
5:00						
6:00 (Rear)						
7:00						
8:00						
9:00 (Anti-Thrust)						
10:00						
11:00						
12:00 (Front)						
Average						

Summary	As Measured	Outlier Screened <sup>A</sup>	Adjusted to X.XX% Soot <sup>A</sup>
Average, $\mu\text{m}$			
Std. Dev., $\mu\text{m}$			
Minimum, $\mu\text{m}$			
Maximum, $\mu\text{m}$			
Outlier Liners <sup>A</sup>			

<sup>A</sup> Wear results are not currently outlier screened or adjusted for soot. Wear results may eventually be screened and/or adjusted pending the results of the T-10 test matrix.

FIG A1.10 - Liner Wear Summary



**MACK T-10**  
**EGR Engine Oil Test**  
**Form 12**  
**Test Fuel Analysis (Last Batch)**

Laboratory	EOT Date	EOT Time
Test Number - - -		
Oil Code		
Formulation/Stand Code		
Supplier	Batch Identifiers	

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

**MACK T-10**  
**EGR Engine Oil Test**  
**Form 13**  
**Characteristics of the Data Acquisition System**

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

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

**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-10  
EGR Engine Oil Test  
Form 14  
Build-up and Hardware Information**

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

**INJECTION TIMING**

Timing Hours	Timing (Deg)
	Total Timing Changes

**HARDWARE**

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

Cylinder Kit Location	CPD ID Number
Cylinder 1	
Cylinder 2	
Cylinder 3	
Cylinder 4	
Cylinder 5	
Cylinder 6	

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

Laboratory	EOT Date	EOT Time
Test Number - -		
Oil Code		
Formulation/Stand Code		
Date Rated	Rater Initials	Verified By

<b>TOTAL PISTON RATINGS SUMMARY</b>																					
	DEP. FACTOR	GROOVES				LANDS				DEP. FACTOR	GROOVE		LANDS				OIL COOLING		UNDER CROWN		
		NO. 1		NO. 2		NO. 1		NO. 2			NO. 3		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.	
C A R B O N	HC - 1.0																				
	MC - 0.5																				
	LC - .25																				
	TOTAL																				
V A R N I S H	8 - 9									7.5											
	7 - 7.9																				
	6 - 6.9																				
	5 - 5.9									4.5											
	4 - 4.9																				
	3 - 3.9																				
	2 - 2.9									1.5											
	1 - 1.9																				
	>0 - 0.9																				
	CLEAN		0		0		0		0	0	0						0		0		0
TOTAL																					
RATING																					
LOCATION FACTOR		2		3		1		3		20		20		60		0.5		1			
IND RATING																					
WDP				TGC				TLC				UNWEIGHTED DEP.				T.L. FLAKED CARBON %					

FIG A1.15 - Rating Summary: Piston #1

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

Laboratory	EOT Date	EOT Time
Test Number - -		
Oil Code		
Formulation/Stand Code		
Date Rated	Rater Initials	Verified By

<b>TOTAL PISTON RATINGS SUMMARY</b>																					
	DEP. FACTOR	GROOVES				LANDS				DEP. FACTOR	GROOVE		LANDS				OIL COOLING		UNDER CROWN		
		NO. 1		NO. 2		NO. 1		NO. 2			NO. 3		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.	
C A R B O N	HC - 1.0																				
	MC - 0.5																				
	LC - .25																				
	TOTAL																				
V A R N I S H	8 - 9									7.5											
	7 - 7.9																				
	6 - 6.9																				
	5 - 5.9									4.5											
	4 - 4.9																				
	3 - 3.9																				
	2 - 2.9									1.5											
	1 - 1.9																				
	>0 - 0.9																				
	CLEAN		0		0		0		0	CLEAN		0		0		0		0		0	
TOTAL																					
RATING																					
LOCATION FACTOR		2		3		1		3		20		20		60		0.5		1			
IND RATING																					
WDP				TGC				TLC				UNWEIGHTED DEP.				T.L. FLAKED CARBON %					

FIG A1.16 - Rating Summary: Piston #2

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

Laboratory	EOT Date	EOT Time
Test Number - -		
Oil Code		
Formulation/Stand Code		
Date Rated	Rater Initials	Verified By

<b>TOTAL PISTON RATINGS SUMMARY</b>																					
	DEP. FACTOR	GROOVES				LANDS				DEP. FACTOR	GROOVE		LANDS				OIL COOLING		UNDER CROWN		
		NO. 1		NO. 2		NO. 1		NO. 2			NO. 3		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.	
C A R B O N	HC - 1.0																				
	MC - 0.5																				
	LC - .25																				
	TOTAL																				
V A R N I S H	8 - 9									7.5											
	7 - 7.9																				
	6 - 6.9																				
	5 - 5.9									4.5											
	4 - 4.9																				
	3 - 3.9																				
	2 - 2.9									1.5											
	1 - 1.9																				
	>0 - 0.9																				
	CLEAN		0		0		0		0	CLEAN		0		0		0		0		0	
TOTAL																					
RATING																					
LOCATION FACTOR		2		3		1		3		20		20		60		0.5		1			
IND RATING																					
WDP				TGC				TLC				UNWEIGHTED DEP.				T.L. FLAKED CARBON %					

FIG A1.17 - Rating Summary: Piston #3

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

Laboratory	EOT Date	EOT Time
Test Number - -		
Oil Code		
Formulation/Stand Code		
Date Rated	Rater Initials	Verified By

<b>TOTAL PISTON RATINGS SUMMARY</b>																					
	DEP. FACTOR	GROOVES				LANDS				DEP. FACTOR	GROOVE		LANDS				OIL COOLING		UNDER CROWN		
		NO. 1		NO. 2		NO. 1		NO. 2			NO. 3		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.	
C A R B O N	HC - 1.0																				
	MC - 0.5																				
	LC - .25																				
	TOTAL																				
V A R N I S H	8 - 9									7.5											
	7 - 7.9																				
	6 - 6.9																				
	5 - 5.9									4.5											
	4 - 4.9																				
	3 - 3.9																				
	2 - 2.9									1.5											
	1 - 1.9																				
	>0 - 0.9																				
	CLEAN		0		0		0		0	CLEAN		0		0		0		0		0	
TOTAL																					
RATING																					
LOCATION FACTOR		2		3		1		3			20		20		60		0.5		1		
IND RATING																					
WDP				TGC				TLC				UNWEIGHTED DEP.				T.L. FLAKED CARBON %					

FIG A1.18 - Rating Summary: Piston #4

**MACK T-10**  
**EGR Engine Oil Test**  
**Form 19**  
**Rating Summary: Piston #5**

Laboratory	EOT Date	EOT Time
Test Number - -		
Oil Code		
Formulation/Stand Code		
Date Rated	Rater Initials	Verified By

<b>TOTAL PISTON RATINGS SUMMARY</b>																					
	DEP. FACTOR	GROOVES				LANDS				DEP. FACTOR	GROOVE		LANDS				OIL COOLING		UNDER CROWN		
		NO. 1		NO. 2		NO. 1		NO. 2			NO. 3		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.	
C A R B O N	HC - 1.0																				
	MC - 0.5																				
	LC - .25																				
	TOTAL																				
V A R N I S H	8 - 9									7.5											
	7 - 7.9																				
	6 - 6.9																				
	5 - 5.9									4.5											
	4 - 4.9																				
	3 - 3.9																				
	2 - 2.9									1.5											
	1 - 1.9																				
	>0 - 0.9																				
	CLEAN		0		0		0		0	CLEAN		0		0		0		0		0	
TOTAL																					
RATING																					
LOCATION FACTOR		2		3		1		3		20		20		60		0.5		1			
IND RATING																					
WDP				TGC				TLC				UNWEIGHTED DEP.				T.L. FLAKED CARBON %					

FIG A1.19 - Rating Summary: Piston #5

**Form 2**  
**T10**  
**EGR ENGINE OIL TEST**

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FIG. A1.2 Table of Contents

**MACK T-10**  
**EGR Engine Oil Test**  
**Form 20**  
**Rating Summary: Piston #6**

Laboratory	EOT Date	EOT Time
Test Number - -		
Oil Code		
Formulation/Stand Code		
Date Rated	Rater Initials	Verified By

<b>TOTAL PISTON RATINGS SUMMARY</b>																					
	DEP. FACTOR	GROOVES				LANDS				DEP. FACTOR	GROOVE		LANDS				OIL COOLING		UNDER CROWN		
		NO. 1		NO. 2		NO. 1		NO. 2			NO. 3		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.	
C A R B O N	HC - 1.0																				
	MC - 0.5																				
	LC - .25																				
	TOTAL																				
V A R N I S H	8 - 9									7.5											
	7 - 7.9																				
	6 - 6.9																				
	5 - 5.9									4.5											
	4 - 4.9																				
	3 - 3.9																				
	2 - 2.9									1.5											
	1 - 1.9																				
	>0 - 0.9																				
	CLEAN		0		0		0		0	CLEAN		0		0		0		0		0	
TOTAL																					
RATING																					
LOCATION FACTOR		2		3		1		3		20		20		60		0.5		1			
IND RATING																					
WDP				TGC				TLC				UNWEIGHTED DEP.				T.L. FLAKED CARBON %					

FIG A1.20 - Rating Summary: Piston #6

# MACK T-10 EGR Engine Oil Test Form 3

## Summary of Test Method

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, and lead corrosion. 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 unit 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

Parameter	Phase I	Phase II
Time, h	75	225
Injection Timing, °BTDC	Variable	18
Speed, r/min	1800	1200
Fuel Flow, kg/h	59.2	63.5
O <sub>2</sub> Level, %	8.1	6.1
Inlet Manifold Temp., °C	66	66
Coolant Out Temp., °C	66	85
Fuel In Temp., °C	40	40
Oil Gallery Temp., °C	88	104
Intake Air Temp., °C	25	25
Inlet Air Restriction, kPa	3.5 - 4.0	3.5 - 4.0
Inlet Manifold Pressure, kPa	tbd	tbd
Exhaust Back Pressure, kPa	2.7 - 3.5	2.7 - 3.5
Crankcase Pressure, kPa	0.25 - 0.75	0.25 - 0.75
Power, kW	~257	~324
Torque, Nm	Record	Record
Pre-Turbine Exhaust Temp., °C	Record	Record
Tailpipe Exhaust Temp., °C	Record	Record
Oil Sump Temp., °C	Record	Record
EGR Pre-Venturi Temp., °C	Record	Record
Inlet Air Dew Point, °C	Record	Record
Inlet Air Humidity, kg/kg	Record	Record
Main Gallery Oil Pressure, kPa	Record	Record
Oil Cooler Delta P, kPa	Record	Record
Oil Filter Delta P, kPa	Not to exceed 138	Not to exceed 138

FIG. A1.3 Summary of Test Method

**MACK T-10  
EGR ENGINE OIL TEST  
FORM 4  
TEST RESULTS SUMMARY**

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

TEST RESULTS			
Date Test Started	Start Time	Test Length	
TMC Oil Code <sup>A</sup>	Laboratory Oil Code	SAE Viscosity	
Average TGA Soot % at 75 h			
Average Oil Consumption g/kWh (0.304 maximum)			
Centrifugal Oil Filter Mass Gain, g			
Oil Filter Delta P, kPa (138 maximum)			
EOT TBN			
	DELTA Pb @ EOT (ppm)	AVG. LINER WEAR (µm)	AVG. TOP RING WEIGHT LOSS (mg)
Original Result			
Transformed Result <sup>B</sup>			
Correction Factor <sup>B</sup>			
Corrected Transformed Result <sup>B</sup>			
Severity Adjustment <sup>B</sup>			
Final Transformed Result <sup>B</sup>			
Final Original Unit Result			

LAST STAND REFERENCE RESULTS			
Test Number - - -			
Oil Code			
Test Length		TMC Oil Code	
EOT Date		EOT Time	
Stand Calibration Expiration Date			
Average TGA Soot % at 75 h			
	DELTA Pb @ EOT (ppm)	AVG. LINER WEAR (µm)	AVG. TOP RING WEIGHT LOSS (mg)
Original Result			
Transformed Result <sup>B</sup>			
Correction Factor <sup>B</sup>			
Corrected Transformed Result <sup>B</sup>			
Final Transformed Result <sup>B</sup>			
Final Original Unit Result			

<sup>A</sup> Reference Tests Only

<sup>B</sup> Transformed Units

**MACK T-10**  
**Operational Summary**  
**FORM 5**

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

	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>
	Controlled Parameters	Speed	r/min	0.000		1800	1200				
Fuel Flow		kg/h	0.000		59.2	63.5					
O <sub>2</sub> Level		%	0.000		8.1	6.1					
Inlet Manifold Temp.		°C	0.000		66						
Coolant Out Temp.		°C	0.000		66	85					
Fuel In Temp.		°C	0.000		40						
Oil Gallery Temp.		°C	0.000		88	104					
Intake Air Temp.		°C	0.000		25						
Inlet Air Restriction		kPa			3.5 - 4.0						
Inlet Man. Pressure		kPa			TBD	TBD					
Exh. Back Pressure		kPa			2.7 - 3.5						
Crankcase Pressure		kPa			0.25 - 0.75						
		Parameter	Units	Typical Values		Average					
Non-controlled Parameters	Power	kW	TBD	TBD							
	Torque	Nm	TBD	TBD							
	Pre-Turbine Temp. (L)	°C	TBD	TBD							
	Pre-Turbine Temp. (R)	°C	TBD	TBD							
	Tailpipe Temp.	°C	TBD	TBD							
	Oil Sump Temp.	°C	TBD	TBD							
	EGR Pre-Venturi Temp.	°C	TBD	TBD							
	Blowby	L/min	TBD	TBD							
	Inlet Air Dew Point	°C	TBD	TBD							
	Inlet Air Humidity	g/kg	TBD	TBD							
Main Gallery Oil Pressure	kPa	TBD	TBD								
Oil Cooler Delta P	kPa	TBD	TBD								

*A* 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.

*B* Total number of data points taken. Minimum acceptable value is 3000.

*C* Number of Bad Quality Data points not used in the calculation of the statistical measures.

*D* Number of points clipped by over/under range limits.

FIG A1.5 - Operational Summary

**MACK T-10  
EGR Engine Oil Test  
Form 6  
Rod Bearing Weight Loss**

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

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				

FIG A1.6 - Rod Bearing Weight Loss

**MACK T-10  
EGR Engine Oil Test  
Form 7  
Ring Weight Loss**

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

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

Summary	As Measured <sup>A</sup>	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 flaking.

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

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

FIG A1.7 - Ring Weight Loss

**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	Metals in Parts per Millions							
							Elements							
							Fe	Pb	Cu	Cr	Al	Si	Sn	Na
75 (2nd)														
75 AVG.														

Summary	As Measured	Outlier Bearing Adjusted
Delta Pb @ EOT, ppm		

FIG A1.8 - Oil Analysis Summary

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

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

LINER NO.	LOCATION	Ra (µm)	BORE DIAMETER (mm)		Ra (µm)	DIA. (mm)
1	Top Ring Travel @ 0°			AVG		
	Top Ring Travel @ 90°			STD DEV		
	Top Ring Travel @ 180°			MIN		
	Top Ring Travel @ 270°			MAX		

2	Top Ring Travel @ 0°			AVG		
	Top Ring Travel @ 90°			STD DEV		
	Top Ring Travel @ 180°			MIN		
	Top Ring Travel @ 270°			MAX		

3	Top Ring Travel @ 0°			AVG		
	Top Ring Travel @ 90°			STD DEV		
	Top Ring Travel @ 180°			MIN		
	Top Ring Travel @ 270°			MAX		

4	Top Ring Travel @ 0°			AVG		
	Top Ring Travel @ 90°			STD DEV		
	Top Ring Travel @ 180°			MIN		
	Top Ring Travel @ 270°			MAX		

5	Top Ring Travel @ 0°			AVG		
	Top Ring Travel @ 90°			STD DEV		
	Top Ring Travel @ 180°			MIN		
	Top Ring Travel @ 270°			MAX		

6	Top Ring Travel @ 0°			AVG		
	Top Ring Travel @ 90°			STD DEV		
	Top Ring Travel @ 180°			MIN		
	Top Ring Travel @ 270°			MAX		

	Ra (µm)	BORE DIAMETER (mm)
Average Surface Roughness & Bore Diameter		
Standard Deviation Surface Roughness & Bore Diameter		
Minimum Surface Roughness & Bore Diameter		
Maximum Surface Roughness & Bore Diameter		

FIG A1.9 - Liner Surface Roughness & Bore Diameter