

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

**Report Packet Version No.**

T10 VERSION 20011031

**Conducted For**

TSTSPON1

TSTSPON2

<b>T-10:</b> LABVALID	<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> LABVT10A	<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>

TSTOIL	NR = Non-Reference Oil Test
	RO = Reference Oil Test

<b>Stand:</b> STAND	<b>Stand Run:</b> STRUN	<b>Engine:</b> ENGINE	<b>Engine Hours:</b> ENHOURS
<b>End Of Test Date:</b> DTCOMP		<b>End Of Test Time:</b> EOTIME	
<b>Oil Code:</b> OILCODE		<b>Formulation/Stand Code:</b> FORM	
<b>Alternate Codes</b>	ALTCODE1	ALTCODE2	ALTCODE3

<p><b>In my opinion this test   OPVALID   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:**

SUBLAB

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

SUBSIGIM

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

SUBNAME

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

SUBTITLE

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

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

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**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>tbd</b>	<b>tbd</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>

**Mack T-10  
EGR Engine Oil Test  
Form 4  
Test Results Summary**

<b>Laboratory:</b>	LAB	<b>EOT Date:</b>	DTCOMP	<b>EOT Time:</b>	EOTTIME
<b>Test Number:</b>	STAND	STRUN	ENGINE	ENHOURS	
<b>Oil Code:</b>	OILCODE				
<b>Formulation/Stand Code:</b>	FORM				

Test Results						
<b>Date Test Started:</b>	DTSTRT	<b>Start Time:</b>	STRTTIME	<b>Test Length:</b>	TESTLEN	
<b>TMC Oil Code:</b> <sup>A</sup>	IND	<b>Laboratory Oil Code:</b>	LABOCODE	<b>SAE Viscosity:</b>	SAEVisc	
<b>Average TGA Soot % at 75 h</b>			TGA AVG			
<b>Centrifugal Oil Filter Mass Gain, g</b>			MASSG			
<b>Oil Filter Delta P, kPa (138 maximum)</b>			XOILDP			
<b>EOT TBN</b>			TBNEOT			
<b>MRV Yield Stress (Pa) <sup>C</sup></b>			MRVYS			
	<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>	DPBEOT	ALW	ATRWL	OILCON	DPB2530	MRV75
<b>Transformed Result <sup>B</sup></b>	TRNDPB	TRNALW	TRNATRWL	TRNOC	TRNDPB2	TRNM RV
<b>Correction Factor <sup>B</sup></b>	DPBCF	ALWCF	ATRWLCF	OCCF	DPB2CF	MRVCF
<b>Corrected Transformed Result <sup>B</sup></b>	DPBCOR	ALWCOR	ATRWLCOR	OCCOR	DPB2COR	MRVCOR
<b>Severity Adjustment <sup>B</sup></b>	DPB_SA	CLW_SA	ATRWL_SA	OC_SA	DPB2_SA	MRV_SA
<b>Final Transformed Result <sup>B</sup></b>	TDPBFNL	TCLWFNL	TTRWLFNL	TOCFNL	TDP2FNL	TMRVFNL
<b>Final Original Unit Result <sup>B</sup></b>	DPBFNL	CLWFNL	ATRWLFNL	OCFNL	DPB2FNL	MRVFNL
<b>Mack Merits <sup>D</sup></b>	DPBMER	CLWMER	TRWLMER	OCMER	DPB2MER	
<b>Total Mack Merits <sup>D</sup></b>	MACKMER					

Last Stand Reference Results						
<b>Test Number:</b>	RSTAND	RSTRUN	RENGINE	RENHOURS		
<b>Oil Code:</b>	ROILCODE					
<b>Test Length:</b>	RTESTLEN	<b>TMC Oil Code:</b>	RIND			
<b>EOT Date:</b>	RDTCOMP	<b>EOT Time:</b>	REOTTIME			
<b>Stand Calibration Expiration Date:</b>	DTCALEXP					
<b>Average TGA Soot % at 75 h</b>			RTGA AVG			
	<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>	RDPBEOT	RALW	RATRWL	ROILCON	RDPB2530	RMRV75
<b>Transformed Result <sup>B</sup></b>	RTRNDPB	RTRNALW	RTRNTRWL	RTRNOC	RTRNDPB2	RTRNM RV
<b>Correction Factor <sup>B</sup></b>	RDPBCF	RALWCF	RATRWLCF	ROCCF	RDPB2CF	RMRVCF
<b>Corrected Transformed Result <sup>B</sup></b>	RDPBCOR	RALWCOR	RTRWLCOR	ROCCOR	RDPB2COR	RMRVCOR
<b>Final Transformed Result <sup>B</sup></b>	RTDPBFNL	RTCLWFNL	RTTRWLFNL	RTOCFNL	RTDP2FNL	RTMRVFNL
<b>Final Original Unit Result <sup>B</sup></b>	RDPBFNL	RCLWFNL	RTRWLFNL	ROCFNL	RDPB2FNL	RMRVFNL

<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.

**Mack T-10  
EGR Engine Oil Test  
Form 5  
Operational Summary**

<b>Laboratory:</b> LAB	<b>EOT Date:</b> DTCOMP	<b>EOT Time:</b> EOTTIME
<b>Test Number:</b> STAND STRUN ENGINE ENHOURS	<b>Oil Code:</b> OILCODE	
<b>Formulation/Stand Code:</b> FORM		

	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	QRPM	1800	1800	ARPM1	ARPM2	NRPM	BRPM
Fuel Flow		kg/h	0.000	QFFLO	59.2	59.2	AFFLO1	AFFLO2	NFFLO	BFFLO	OFFLO
Inlet Manifold Temp.		°C	0.000	QINMANT	70	66	AINMANT1	AINMANT2	NINMANT	BINMANT	OINMANT
Coolant Out Temp.		°C	0.000	QCOLOUT	66	85	ACOLOUT1	ACOLOUT2	NCOLOUT	BCOLOUT	OCOLOUT
Fuel In Temp.		°C	0.000	QFUEL	40		AFUEL		NFUEL	BFUEL	OFUEL
Oil Gallery Temp.		°C	0.000	QOILGT	88	113	AOILGT1	AOILGT2	NOILGT	BOILGT	OILGT
Inlet Air Temp.		°C	0.000	QINAIRT	25		AINAIRT		NINAIRT	BINAIRT	OINAIRT
Inlet Air Restriction		kPa			3.5 – 4.0		AINAIRR		NINAIRR	BINAIRR	OINAIRR
Inlet Man. Pressure		kPa			TBD	TBD	AINMANP1	AINMANP2	NINMANP	BINMANP	OINMANP
Exh. Back Pressure		kPa			2.7 – 3.5		AEXHSTP		NEXHSTP	BEXHSTP	OEXHSTP
Crankcase Pressure		kPa			0.25 – 0.75		ACCASEP		NCCASEP	BCCASEP	OCCASEP
Intake CO <sub>2</sub>		%			1.5±.05	0.2±.05	AICO21	AICO22			
<b>Non-controlled Parameters</b>	Parameter	Units	Typical Values <sup>E</sup>		Average						
	Power	KW	230 – 255	308 – 326	APWR1	APWR2					
	Torque	Nm	1223 – 1351	2456 – 2593	ALOAD1	ALOAD2					
	Exhaust O <sub>2</sub>	%	7.0 – 8.5	5.5 – 6.8	AO2L1	AO2L2					
	Exhaust CO <sub>2</sub>	%	7.18 – 9.97	9.60 – 11.09	AECO2L1	AECO2L2					
	Pre-Turbine Temp. (L)	°C	518 – 655	547 – 730	APTURFT1	APTURFT2					
	Pre-Turbine Temp. (R)	°C	572 – 674	540 – 726	APTURRT1	APTURRT2					
	Tailpipe Temp.	°C	421 – 464	477 – 510	ATAILPT1	ATAILPT2					
	Oil Sump Temp.	°C	91 – 101	117 – 127	AOILST1	AOILST2					
	EGR Pre-Venturi Temp.	°C	210 – 253	91 – 111	AEGRPVT1	AEGRPVT2					
	Blowby	L/min	53 – 120	70 – 200	ABLOBY1	ABLOBY2					
	Inlet Air Dew Point	°C	6 – 25	8 – 28	AINADP1	AINADP2					
Inlet Air Humidity	g/kg	4.5 – 20.3	3.5 – 24.1	AHUMID1	AHUMID2						
Main Gallery Oil Pressure	kPa	398 – 489	174 – 263	AOILPRS1	AOILPRS2						

<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

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

<b>Laboratory:</b> LAB	<b>EOT Date:</b> DTCOMP	<b>EOT Time:</b> EOTTIME
<b>Test Number:</b> STAND STRUN	ENGINE	ENHOURS
<b>Oil Code:</b>		OILCODE
<b>Formulation/Stand Code:</b>		FORM

Cylinder #	Location	SOT Weight, g	EOT Weight, g	Weight Change, mg
1	Upper	BWSOTU1	BWEOTU1	BWLU1
2	Upper	BWSOTU2	BWEOTU2	BWLU2
3	Upper	BWSOTU3	BWEOTU3	BWLU3
4	Upper	BWSOTU4	BWEOTU4	BWLU4
5	Upper	BWSOTU5	BWEOTU5	BWLU5
6	Upper	BWSOTU6	BWEOTU6	BWLU6

Summary	As Measured	Outlier Screened
Upper Bearing Average Weight Loss, mg	ABWLU	OABWLU
Upper Bearing Weight Loss Std. Dev., mg	SBWLU	OSBWLU
Upper Bearing Minimum Weight Loss, mg	IBWLU	OIBWLU
Upper Bearing Maximum Weight Loss, mg	XBWLU	OXBWLU
Outlier Upper Rod Bearing <sup>A</sup>	BWLOUT	

<sup>A</sup> Cylinder number

Cylinder #	Location	SOT Weight, g	EOT Weight, g	Weight Change, mg
1	Lower	BWSOTL1	BWEOTL1	BWLL1
2	Lower	BWSOTL2	BWEOTL2	BWLL2
3	Lower	BWSOTL3	BWEOTL3	BWLL3
4	Lower	BWSOTL4	BWEOTL4	BWLL4
5	Lower	BWSOTL5	BWEOTL5	BWLL5
6	Lower	BWSOTL6	BWEOTL6	BWLL6
Upper Bearing Average Weight Loss, mg				ABWLL
Upper Bearing Weight Loss Std. Dev., mg				SBWLL
Upper Bearing Minimum Weight Loss, mg				IBWLL
Upper Bearing Maximum Weight Loss, mg				XBWLL

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

<b>Laboratory:</b> LAB	<b>EOT Date:</b> DTCOMP	<b>EOT Time:</b> EOTTIME
<b>Test Number:</b> STAND STRUN	ENGINE	ENHOURS
<b>Oil Code:</b> OILCODE		
<b>Formulation/Stand Code:</b>		FORM

Cylinder #	Top Ring SOT Weight, g	Top Ring EOT Weight, g	Weight Loss, mg
1	TRWSOT1	TRWEOT1	TRWL1
2	TRWSOT2	TRWEOT2	TRWL2
3	TRWSOT3	TRWEOT3	TRWL3
4	TRWSOT4	TRWEOT4	TRWL4
5	TRWSOT5	TRWEOT5	TRWL5
6	TRWSOT6	TRWEOT6	TRWL6

Summary	As Measured	Outlier Screened
<b>Top Ring Average Weight Loss, mg</b>	AMATRWL	ATRWL
<b>Top Ring Weight Loss Std. Dev., mg</b>	AMSTRWL	STRWL
<b>Top Ring Minimum Weight Loss, mg</b>	AMITRWL	ITRWL
<b>Top Ring Maximum Weight Loss, mg</b>	AMXTRWL	XTRWL
<b>Outlier Ring<sup>B</sup></b>	OUTTR	

<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	R2WSOT1	R2WEOT1	R2WL1
2	R2WSOT2	R2WEOT2	R2WL2
3	R2WSOT3	R2WEOT3	R2WL3
4	R2WSOT4	R2WEOT4	R2WL4
5	R2WSOT5	R2WEOT5	R2WL5
6	R2WSOT6	R2WEOT6	R2WL6
<b>2<sup>nd</sup> Ring Average Weight Loss, mg</b>			AR2WL
<b>2<sup>nd</sup> Ring Weight Loss Std. Dev., mg</b>			SR2WL
<b>2<sup>nd</sup> Ring Min. Weight Loss, mg</b>			IR2WL
<b>2<sup>nd</sup> Ring Max. Weight Loss, mg</b>			XR2WL

Cylinder #	Oil Ring SOT Weight, g	Oil Ring EOT Weight, g	Weight Loss, mg
1	ORWSOT1	ORWEOT1	ORWL1
2	ORWSOT2	ORWEOT2	ORWL2
3	ORWSOT3	ORWEOT3	ORWL3
4	ORWSOT4	ORWEOT4	ORWL4
5	ORWSOT5	ORWEOT5	ORWL5
6	ORWSOT6	ORWEOT6	ORWL6
<b>Oil Ring Average Weight Loss, mg</b>			AORWL
<b>Oil Ring Weight Loss Std. Dev., mg</b>			SORWL
<b>Oil Ring Minimum Weight Loss, mg</b>			IORWL
<b>Oil Ring Maximum Weight Loss, mg</b>			XORWL

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

<b>Laboratory:</b>	LAB	DTCOMP	EOT Date:	EOT Time:	EOTTIME
<b>Test Number:</b>	STAND	STRUN	ENGINE	ENHOURS	OILCODE
<b>Formulation/Stand Code:</b>	Oil Code: FORM				

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
TST_H000	TGA_H000	V100H000		TBN_H000	TAN_H000	IRINH000	FEWMH000	PBWMH000	CUWMH000	CRWMH000	ALWMH000	SIWMH000	SNWMH000	NAWMH000
TST_H025	TGA_H025	V100H025	IVISH025	TBN_H025	TAN_H025	IRINH025	FEWMH025	PBWMH025	CUWMH025	CRWMH025	ALWMH025	SIWMH025	SNWMH025	NAWMH025
TST_H050	TGA_H050	V100H050	IVISH050	TBN_H050	TAN_H050	IRINH050	FEWMH050	PBWMH050	CUWMH050	CRWMH050	ALWMH050	SIWMH050	SNWMH050	NAWMH050
TST_H075	TGA_H075	V100H075	IVISH075	TBN_H075	TAN_H075	IRINH075	FEWMH075	PBWMH075	CUWMH075	CRWMH075	ALWMH075	SIWMH075	SNWMH075	NAWMH075
75 (2nd)	TGA75_2													
75 AVG.	TGAAVG													
TST_H100	TGA_H100	V100H100	IVISH100	TBN_H100	TAN_H100	IRINH100	FEWMH100	PBWMH100	CUWMH100	CRWMH100	ALWMH100	SIWMH100	SNWMH100	NAWMH100
TST_H125	TGA_H125	V100H125	IVISH125	TBN_H125	TAN_H125	IRINH125	FEWMH125	PBWMH125	CUWMH125	CRWMH125	ALWMH125	SIWMH125	SNWMH125	NAWMH125
TST_H150	TGA_H150	V100H150	IVISH150	TBN_H150	TAN_H150	IRINH150	FEWMH150	PBWMH150	CUWMH150	CRWMH150	ALWMH150	SIWMH150	SNWMH150	NAWMH150
TST_H175	TGA_H175	V100H175	IVISH175	TBN_H175	TAN_H175	IRINH175	FEWMH175	PBWMH175	CUWMH175	CRWMH175	ALWMH175	SIWMH175	SNWMH175	NAWMH175
TST_H200	TGA_H200	V100H200	IVISH200	TBN_H200	TAN_H200	IRINH200	FEWMH200	PBWMH200	CUWMH200	CRWMH200	ALWMH200	SIWMH200	SNWMH200	NAWMH200
TST_H225	TGA_H225	V100H225	IVISH225	TBN_H225	TAN_H225	IRINH225	FEWMH225	PBWMH225	CUWMH225	CRWMH225	ALWMH225	SIWMH225	SNWMH225	NAWMH225
TST_H250	TGA_H250	V100H250	IVISH250	TBN_H250	TAN_H250	IRINH250	FEWMH250	PBWMH250	CUWMH250	CRWMH250	ALWMH250	SIWMH250	SNWMH250	NAWMH250
TST_H275	TGA_H275	V100H275	IVISH275	TBN_H275	TAN_H275	IRINH275	FEWMH275	PBWMH275	CUWMH275	CRWMH275	ALWMH275	SIWMH275	SNWMH275	NAWMH275
TST_H300	TGA_H300	V100H300	IVISH300	TBN_H300	TAN_H300	IRINH300	FEWMH300	PBWMH300	CUWMH300	CRWMH300	ALWMH300	SIWMH300	SNWMH300	NAWMH300

Summary		As Measured	Outlier Bearing Adjusted
<b>Delta Pb @ EOT, ppm</b>		AMDPBEOT	DPBEOT
<b>Delta Pb @ 250-300h, ppm</b>		DPB2530	
<b>75-h MRV</b>		MRV75	



**Mack T-10  
EGR Engine Oil Test  
Form 9**

**Liner Surface Roughness & Bore Diameter**

<b>Laboratory:</b> LAB	<b>EOT Date:</b> DTCOMP	<b>EOT Time:</b>	EOTTIME
<b>Test Number:</b> STAND	STRUN	ENGINE	ENHOURS
<b>Oil Code:</b>		OILCODE	
<b>Formulation/Stand Code:</b>		FORM	

Liner No.	Location	Ra (µm)	Bore Diameter (mm)		Ra (µm)	Dia. (mm)
1	Top Ring Travel @ 0°C	LIN1RAA	LIN1IDA	<b>Avg.</b>	ALIN1RA	ALIN1ID
	Top Ring Travel @ 90°C	LIN1RAB	LIN1IDB	<b>Std. Dev.</b>	SLIN1RA	
	Top Ring Travel @ 180°C	LIN1RAC		<b>Min.</b>	ILIN1RA	
	Top Ring Travel @ 270°C	LIN1RAD		<b>Max.</b>	XLIN1RA	
2	Top Ring Travel @ 0°C	LIN2RAA	LIN2IDA	<b>Avg.</b>	ALIN2RA	ALIN2ID
	Top Ring Travel @ 90°C	LIN2RAB	LIN2IDB	<b>Std.Dev.</b>	SLIN2RA	
	Top Ring Travel @ 180°C	LIN2RAC		<b>Min.</b>	ILIN2RA	
	Top Ring Travel @ 270°C	LIN2RAD		<b>Max.</b>	XLIN2RA	
3	Top Ring Travel @ 0°C	LIN3RAA	LIN3IDA	<b>Avg.</b>	ALIN3RA	ALIN3ID
	Top Ring Travel @ 90°C	LIN3RAB	LIN3IDB	<b>Std. Dev.</b>	SLIN3RA	
	Top Ring Travel @ 180°C	LIN3RAC		<b>Min.</b>	ILIN3RA	
	Top Ring Travel @ 270°C	LIN3RAD		<b>Max.</b>	XLIN3RA	
4	Top Ring Travel @ 0°C	LIN4RAA	LIN4IDA	<b>Avg.</b>	ALIN4RA	ALIN4ID
	Top Ring Travel @ 90°C	LIN4RAB	LIN4IDB	<b>Std.Dev.</b>	SLIN4RA	
	Top Ring Travel @ 180°C	LIN4RAC		<b>Min.</b>	ILIN4RA	
	Top Ring Travel @ 270°C	LIN4RAD		<b>Max.</b>	XLIN4RA	
5	Top Ring Travel @ 0°C	LIN5RAA	LIN5IDA	<b>Avg.</b>	ALIN5RA	ALIN5ID
	Top Ring Travel @ 90°C	LIN5RAB	LIN5IDB	<b>Std. Dev.</b>	SLIN5RA	
	Top Ring Travel @ 180°C	LIN5RAC		<b>Min.</b>	ILIN5RA	
	Top Ring Travel @ 270°C	LIN5RAD		<b>Max.</b>	XLIN5RA	
6	Top Ring Travel @ 0°C	LIN6RAA	LIN6IDA	<b>Avg.</b>	ALIN6RA	ALIN6ID
	Top Ring Travel @ 90°C	LIN6RAB	LIN6IDB	<b>Std. Dev.</b>	SLIN6RA	
	Top Ring Travel @ 180°C	LIN6RAC		<b>Min.</b>	ILIN6RA	
	Top Ring Travel @ 270°C	LIN6RAD		<b>Max.</b>	XLIN6RA	

	Ra (µm)	Bore Diameter (mm)
<b>Average Surface Roughness &amp; Bore Diameter</b>	ALINRA	ALINID
<b>Standard Deviation Surface Roughness &amp; Bore Diameter</b>	SLINRA	SLINID
<b>Minimum Surface Roughness &amp; Bore Diameter</b>	ILINRA	ILINID
<b>Maximum Surface Roughness &amp; Bore Diameter</b>	XLINRA	XLINID

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

<b>Laboratory:</b>	LAB	<b>EOT Date:</b>	DTCOMP	<b>EOT Time:</b>	EOTTIME
<b>Test Number:</b>	STAND	STRUN	ENGINE	ENHOURS	
<b>Oil Code:</b>	OILCODE				
<b>Formulation/Stand Code:</b>	FORM				

Position	Wear Step (µm)					
	Cylinder Number					
	1	2	3	4	5	6
<b>1:00</b>	C1LW1	C2LW1	C3LW1	C4LW1	C5LW1	C6LW1
<b>2:00</b>	C1LW2	C2LW2	C3LW2	C4LW2	C5LW2	C6LW2
<b>3:00 (Thrust)</b>	C1LW3	C2LW3	C3LW3	C4LW3	C5LW3	C6LW3
<b>4:00</b>	C1LW4	C2LW4	C3LW4	C4LW4	C5LW4	C6LW4
<b>5:00</b>	C1LW5	C2LW5	C3LW5	C4LW5	C5LW5	C6LW5
<b>6:00 (Rear)</b>	C1LW6	C2LW6	C3LW6	C4LW6	C5LW6	C6LW6
<b>7:00</b>	C1LW7	C2LW7	C3LW7	C4LW7	C5LW7	C6LW7
<b>8:00</b>	C1LW8	C2LW8	C3LW8	C4LW8	C5LW8	C6LW8
<b>9:00 (Anti-Thrust)</b>	C1LW9	C2LW9	C3LW9	C4LW9	C5LW9	C6LW9
<b>10:00</b>	C1LW10	C2LW10	C3LW10	C4LW10	C5LW10	C6LW10
<b>11:00</b>	C1LW11	C2LW11	C3LW11	C4LW11	C5LW11	C6LW11
<b>12:00 (Front)</b>	C1LW12	C2LW12	C3LW12	C4LW12	C5LW12	C6LW12
<b>Average</b>	C1ALW	C2ALW	C3ALW	C4ALW	C5ALW	C6ALW

Summary	As Measured	Outlier Screened
<b>Average, µm</b>	AMACLW	ALW
<b>Std. Dev., µm</b>	AMSCLW	SCLW
<b>Minimum, µm</b>	AMICLW	ICLW
<b>Maximum, µm</b>	AMXCLW	XCLW
<b>Outlier Liners<sup>A</sup></b>	OUTLIN	

<sup>A</sup> Cylinder Number.

**Mack T-10  
EGR Engine Oil Test  
Form 11  
Unscheduled Downtime and Maintenance Summary**

<b>Laboratory:</b> LAB	<b>EOT Date:</b> DTCOMP	<b>EOT Time:</b> EOTTIME
<b>Test Number:</b> STAND	STRUN	ENGINE ENHOURS
<b>Oil Code:</b>		OILCODE
<b>Formulation/Stand Code:</b>		FORM

Number of Downtime Occurrences			DWNOCR
Test Hours	Date	Downtime	Reasons
DOWNR001	DDATR001	DTIMR001	DREAR001
DOWNR002	DDATR002	DTIMR002	DREAR002
DOWNR003	DDATR003	DTIMR003	DREAR003
DOWNR004	DDATR004	DTIMR004	DREAR004
DOWNR005	DDATR005	DTIMR005	DREAR005
DOWNR006	DDATR006	DTIMR006	DREAR006
DOWNR007	DDATR007	DTIMR007	DREAR007
DOWNR008	DDATR008	DTIMR008	DREAR008
DOWNR009	DDATR009	DTIMR009	DREAR009
DOWNR010	DDATR010	DTIMR010	DREAR010
DOWNR011	DDATR011	DTIMR011	DREAR011
DOWNR012	DDATR012	DTIMR012	DREAR012
DOWNR013	DDATR013	DTIMR013	DREAR013
DOWNR014	DDATR014	DTIMR014	DREAR014
DOWNR015	DDATR015	DTIMR015	DREAR015
TOTLDOWN			<b>Total Downtime</b>

Other Comments	Number of Comment Lines	TOTCOM
		OCOMR001
		OCOMR002
		OCOMR003
		OCOMR004
		OCOMR005
		OCOMR006
		OCOMR007
		OCOMR008
		OCOMR009
		OCOMR010
		OCOMR011
		OCOMR012
		OCOMR013
		OCOMR014
		OCOMR015

**Mack T-10  
EGR Engine Oil Test  
Form 11A  
Unscheduled Downtime and Maintenance Summary**

<b>Laboratory:</b> LAB	<b>EOT Date:</b> DTCOMP	<b>EOT Time:</b> EOTTIME
<b>Test Number:</b> STAND	STRUN	ENGINE ENHOURS
<b>Oil Code:</b>		OILCODE
<b>Formulation/Stand Code:</b>		FORM

Number of Downtime Occurrences			DWNOCR
Test Hours	Date	Downtime	Reasons
DOWNR016	DDATR016	DTIMR016	DREAR016
DOWNR017	DDATR017	DTIMR017	DREAR017
DOWNR018	DDATR018	DTIMR018	DREAR018
DOWNR019	DDATR019	DTIMR019	DREAR019
DOWNR020	DDATR020	DTIMR020	DREAR020
DOWNR021	DDATR021	DTIMR021	DREAR021
DOWNR022	DDATR022	DTIMR022	DREAR022
DOWNR023	DDATR023	DTIMR023	DREAR023
DOWNR024	DDATR024	DTIMR024	DREAR024
DOWNR025	DDATR025	DTIMR025	DREAR025
DOWNR026	DDATR026	DTIMR026	DREAR026
DOWNR027	DDATR027	DTIMR027	DREAR027
DOWNR028	DDATR028	DTIMR028	DREAR028
DOWNR029	DDATR029	DTIMR029	DREAR029
DOWNR030	DDATR030	DTIMR030	DREAR030
TOTLDOWN			<b>Total Downtime</b>

Other Comments	TOTCOM
Number of Comment Lines	
	OCOMR016
	OCOMR017
	OCOMR018
	OCOMR019
	OCOMR020
	OCOMR021
	OCOMR022
	OCOMR023
	OCOMR024
	OCOMR025
	OCOMR026
	OCOMR027
	OCOMR028
	OCOMR029
	OCOMR030

**Mack T-10  
EGR Engine Oil Test  
Form 11B  
Unscheduled Downtime and Maintenance Summary**

<b>Laboratory:</b> LAB	<b>EOT Date:</b> DTCOMP	<b>EOT Time:</b> EOTTIME
<b>Test Number:</b> STAND	STRUN	ENGINE ENHOURS
<b>Oil Code:</b>		OILCODE
<b>Formulation/Stand Code:</b>		FORM

Number of Downtime Occurrences			DWNOCR
Test Hours	Date	Downtime	Reasons
DOWNR031	DDATR031	DTIMR031	DREAR031
DOWNR032	DDATR032	DTIMR032	DREAR032
DOWNR033	DDATR033	DTIMR033	DREAR033
DOWNR034	DDATR034	DTIMR034	DREAR034
DOWNR035	DDATR035	DTIMR035	DREAR035
DOWNR036	DDATR036	DTIMR036	DREAR036
DOWNR037	DDATR037	DTIMR037	DREAR037
DOWNR038	DDATR038	DTIMR038	DREAR038
DOWNR039	DDATR039	DTIMR039	DREAR039
DOWNR030	DDATR040	DTIMR040	DREAR040
DOWNR041	DDATR041	DTIMR041	DREAR041
DOWNR042	DDATR042	DTIMR042	DREAR042
DOWNR043	DDATR043	DTIMR043	DREAR043
DOWNR044	DDATR044	DTIMR044	DREAR044
DOWNR045	DDATR045	DTIMR045	DREAR045
TOTLDOWN			<b>Total Downtime</b>

Other Comments	TOTCOM
Number of Comment Lines	
	OCOMR031
	OCOMR032
	OCOMR033
	OCOMR034
	OCOMR035
	OCOMR036
	OCOMR037
	OCOMR038
	OCOMR039
	OCOMR040
	OCOMR041
	OCOMR042
	OCOMR043
	OCOMR044
	OCOMR045

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

<b>Laboratory:</b> LAB	<b>EOT Date:</b> DTCOMP	<b>EOT Time:</b> EOTTIME
<b>Test Number:</b> STAND STRUN	ENGINE	ENHOURS
<b>Oil Code:</b> OILCODE		
<b>Formulation/Stand Code:</b> FORM		
<b>Supplier:</b> FUELSUP	<b>Batch Identifiers:</b> FUELBTID	

Measurement	Specs.	Analysis		Test Method
		New	EOT	
Total Sulfur, % Weight	0.04 – 0.05	FUELSNEW	FUELSEOT	D 2622
Gravity, °API	34.5 – 36.5	APIGRNEW	APIGREOT	D 287 or D 4052
<b>Hydrocarbon Composition</b>				
Aromatics % Vol.	28 – 33	FUELAROM		D 1319
Olefin	Report	FUELOLEF		D 1319
Cetane Index	Report	CETANEIN		D 976 & D 4737
Cetane No.	42 – 48	CETANENO		D 613
Copper Strip Corrosion	1 Maximum	FUELCU		D 130
Flash Point, °C	54 Minimum	FLASHPT		D 93
Pour Point, °C	-18 Maximum	FUELPOUR		D 97
Carbon Residue on 10% Residuum, %	0.35 Maximum	FUELGRES		D 524 (10% Bottoms)
Water & Sediment, % Vol.	0.05 Maximum	FUELH2O		D 2709
Viscosity, cSt @ 40°C	2.4 – 5.0	KINVIS		D 445
Total Acid Number	0.05 Maximum	FUEL TAN		D 664
Strong Acid Number	0.00 Maximum	FUELSAN		D 664
Accelerated Stability	Tbd	FUELACS		D 2274
<b>Distillation, °C</b>				
IBP	Report	FUELIBP		D 86
10%	Report	FUEL10		D 86
50%	Report	FUEL50		D 86
90%	282 – 338	FUEL90		D 86
EP	Report	FUELEP		D 86

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

<b>Laboratory:</b>	LAB	<b>EOT Date:</b>	DTCOMP	<b>EOT Time:</b>	EOTTIME
<b>Test Number:</b>	STAND	STRUN	ENGINE	ENHOURS	
<b>Oil Code:</b>	OILCODE				
<b>Formulation/Stand Code:</b>	FORM				

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>	OTEMSENS	OTEMCALF	OTEMRECD	OTEMOBSF	OTEMRECF	OTEMLOGF	OTEMSYSR
<b>Fuel In.</b>	FTESENS	FTEMCALF	FTEMRECD	FTEMOBSF	FTEMRECF	FTEMLOGF	FTEMSYSR
<b>Intake Air</b>	AITSENS	AITCALF	AITRECD	AITOBSF	AITRECF	AITLOGF	AITSYSR
<b>Intake Man.</b>	IMANSENS	IMANCALF	IMANRECD	IMANOBSF	IMANRECF	IMANLOGF	IMANSYSR
<b>Pre-Turb.</b>	PTURSENS	PTURCALF	PTURRECD	PTUROBSF	PTURRECF	PTURLOGF	PTURSYSR
<b>Cool. Out</b>	COTSENS	COTCALF	COTRECD	COTOBSF	COTRECF	COTLOGF	COTSYSR
<b>Other</b>							
<b>Fuel Flow</b>	FFLOSENS	FFLOCALF	FFLORECD	FFLOOBSF	FFLORECF	FFLOLOGF	FFLOSYSR
<b>Engine RPM</b>	RPMSSENS	RPMCALF	RPMRECD	RPMOBSF	RPMRECF	RPMLOGF	RPMSYSR
<b>Load</b>	LOADSENS	LOADCALF	LOADRECD	LOADOBSF	LOADRECF	LOADLOGF	LOADSYSR
<b>Inlet Restr.</b>	INRESENS	INRECALF	INREREC	INREOBSF	INRERECF	INRELOGF	INRESYSR
<b>Exh. Press.</b>	EXPRSENS	EXPRCALF	EXPRRECD	EXPROBSF	EXPRRECF	EXPRLOGF	EXPRSYSR
<b>Oil Gal. Press.</b>	OILGSENS	OILGCALF	OILGRECD	OILGOBSF	OILGRECF	OILGLOGF	OILGSYSR

**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**

<b>Laboratory:</b> LAB	<b>EOT Date:</b> DTCOMP	<b>EOT Time:</b> EOTTIME
<b>Test Number:</b> STAND	STRUN	ENGINE ENHOURS
<b>Oil Code:</b>		OILCODE
<b>Formulation/Stand Code:</b>		FORM

**Injection Timing**

Timing Hours	Timing (Deg)
SITHR001	SIT_R001
SITHR002	SIT_R002
SITHR003	SIT_R003
SITHR004	SIT_R004
SITHR005	SIT_R005
SITHR006	SIT_R006
SITHR007	SIT_R007
SITHR008	SIT_R008
TOTSIT	<b>Total Timing Changes</b>

**Hardware**

Part	Part Number	Serial Number
<b>Primary Turbocharger</b>	TRBCHPPN	
<b>Secondary Charger</b>	TRBCHSPN	
<b>Cylinder Head (front)</b>	CYLHFRPN	CYLHFRSN
<b>Cylinder Head (rear)</b>	CYLHRRPN	CYLHRRSN
<b>Pistons</b>	PISTONPN	
<b>Injection Nozzles</b>	INJNOZPN	
<b>Rod Bearings</b>	RODBRGPN	
<b>Liners</b>	LINERPN	
<b>Ring Set</b>	RINGSTPN	

Cylinder Kit Location	CPD ID Number
<b>Cylinder 1</b>	CPDIDC1
<b>Cylinder 2</b>	CPDIDC2
<b>Cylinder 3</b>	CPDIDC3
<b>Cylinder 4</b>	CPDIDC4
<b>Cylinder 5</b>	CPDIDC5
<b>Cylinder 6</b>	CPDIDC6



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

<b>Laboratory:</b>	LAB	<b>EOT Date:</b>	DTCOMP	<b>EOT Time:</b>	EOTTIME
<b>Test Number:</b>	STAND		STRUN	ENGINE	ENHOURS
<b>Oil Code:</b>	OILCODE				
<b>Formulation/Stand Code:</b>	FORM				
<b>Date Rated:</b>	DTRATE	<b>Rater Initials:</b>	RINIT	<b>Verified By:</b>	VRINIT

Total Piston Ratings Summary																				
Dep. Factor	Grooves						Dep. Factor	Lands												
	No. 1		No. 2		No. 3			No. 4		No. 3		No. 4								
	A,%	Dem.	A,%	Dem.	A,%	Dem.		A,%	Dem.	A,%	Dem.	A,%	Dem.							
<b>HC -1.0</b>	31HCA	31HCD	32HCA	32HCD	11HCA	11HCD	12HCA	12HCD	33HCA	33HCD	33HCA	33HCD	33HCA	33HCD	33HCA	33HCD	33HCA	33HCD		
<b>MC -0.5</b>	31MCA	31MCD							33MCA	33MCD										
<b>LC - .25</b>	31LCA	31LCD	32LCA	32LCD	11LCA	11LCD	12LCA	12LCD	33LCA	33LCD	33LCA	33LCD	33LCA	33LCD	33LCA	33LCD	33LCA	33LCD		
<b>Total</b>	1ACTO	1DCTO	2ACTO	2DCTO	1ACTO	1DCTO	2ACTO	2DCTO	3ACTO	3DCTO	3ACTO	3DCTO	4ACTO	4DCTO	3ACTO	3DCTO	3ACTO	3DCTO		
<b>8 - 9</b>	31V9A	31V9D	32V9A	32V9D	11V9A	11V9D	12V9A	12V9D												
<b>7 - 7.9</b>	31V8A	31V8D	32V8A	32V8D	11V8A	11V8D	12V8A	12V8D												
<b>6 - 6.9</b>	31V7A	31V7D	32V7A	32V7D	11V7A	11V7D	12V7A	12V7D												
<b>5 - 5.9</b>	31V6A	31V6D	32V6A	32V6D	11V6A	11V6D	12V6A	12V6D												
<b>4 - 4.9</b>	31V5A	31V5D	32V5A	32V5D	11V5A	11V5D	12V5A	12V5D												
<b>3 - 3.9</b>	31V4A	31V4D	32V4A	32V4D	11V4A	11V4D	12V4A	12V4D												
<b>2 - 2.9</b>	31V3A	31V3D	32V3A	32V3D	11V3A	11V3D	12V3A	12V3D												
<b>1 - 1.9</b>	31V2A	31V2D	32V2A	32V2D	11V2A	11V2D	12V2A	12V2D												
<b>&gt;0 - 0.9</b>	31V1A	31V1D	32V1A	32V1D	11V1A	11V1D	12V1A	12V1D												
<b>Clean</b>	3VCLN	0	2VCLN	0	1VCLN	0	2VCLN	0	Clean	0	3VCLN	0	4VCLN	0	3VCLN	0	3VCLN	0	3VCLN	0
<b>Total</b>	1AVTO	1DVTO	2AVTO	2DVTO	1AVTO	1DVTO	2AVTO	2DVTO	3AVTO	3DVTO	3AVTO	3DVTO	4AVTO	4DVTO	3AVTO	3DVTO	3AVTO	3DVTO	3AVTO	3DVTO
<b>Rating Location Factor</b>	G1UWD1		G2UWD1		L1UWD1		L2UWD1		G3UWD1		L3UWD1		L4UWD1		OGUWD1		UCUWD1		UCUWD1	
<b>Ind Rating</b>	G1WD1	2	G2WD1	3	L1WD1	1	L2WD1	3	G3WD1	20	L3WD1	20	L4WD1	60	OGWD1	0.5	UCWD1	1	UCWD1	1
<b>WDP</b>	TGC		TGC		TLC		TLC		Unweighted Deposits		Unweighted Deposits		T.L. Flaked Carbon %		T.L. Flaked Carbon %		T.L. Flaked Carbon %		T.L. Flaked Carbon %	
<b>WDI</b>	TGC1		TGC1		TLC1		TLC1		WDI		WDI		TLFC1		TLFC1		TLFC1		TLFC1	





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

<b>Laboratory:</b>	LAB	<b>EOT Date:</b>	DTCOMP	<b>EOT Time:</b>	EOTTIME
<b>Test Number:</b>	STAND	<b>STRUN</b>	<b>ENGINE</b>	<b>ENHOURS</b>	
<b>Oil Code:</b>	OILCODE				
<b>Formulation/Stand Code:</b>	FORM				
<b>Date Rated:</b>	DTRATE	<b>Rater Initials:</b>	RINIT	<b>Verified By:</b>	VRINIT

Total Piston Ratings Summary													
Dep. Factor	Grooves						Dep. Factor	Lands					
	No. 1		No. 2		No. 1			No. 2		No. 3		No. 4	
	A, %	Dem.	A, %	Dem.	A, %	Dem.		A, %	Dem.	A, %	Dem.	A, %	Dem.
<b>HC -1.0</b>	G1HCA	G1HCD4	G2HCA4	G2HCD4	L1HCA4	L1HCD4	L2HCA4	L2HCD4					
<b>MC -0.5</b>	G1MCA	G1MCD4											
<b>LC - .25</b>	G1LCA	G1LCD4	G2LCA4	G2LCD4	L1LCA4	L1LCD4	L2LCA4	L2LCD4					
<b>Total</b>	1ACTO	1DCOT	2ACTOT	2DCTO	1ACTO	1DCTOT	2ACTOT	2DCTO					
<b>8 - 9</b>	G1V9A4	G1V9D4	G2V9A4	G2V9D4	L1V9A4	L1V9D4	L2V9A4	L2V9D4					
<b>7 - 7.9</b>	G1V8A4	G1V8D4	G2V8A4	G2V8D4	L1V8A4	L1V8D4	L2V8A4	L2V8D4					
<b>6 - 6.9</b>	G1V7A4	G1V7D4	G2V7A4	G2V7D4	L1V7A4	L1V7D4	L2V7A4	L2V7D4					
<b>5 - 5.9</b>	G1V6A4	G1V6D4	G2V6A4	G2V6D4	L1V6A4	L1V6D4	L2V6A4	L2V6D4					
<b>4 - 4.9</b>	G1V5A4	G1V5D4	G2V5A4	G2V5D4	L1V5A4	L1V5D4	L2V5A4	L2V5D4					
<b>3 - 3.9</b>	G1V4A4	G1V4D4	G2V4A4	G2V4D4	L1V4A4	L1V4D4	L2V4A4	L2V4D4					
<b>2 - 2.9</b>	G1V3A4	G1V3D4	G2V3A4	G2V3D4	L1V3A4	L1V3D4	L2V3A4	L2V3D4					
<b>1 - 1.9</b>	G1V2A4	G1V2D4	G2V2A4	G2V2D4	L1V2A4	L1V2D4	L2V2A4	L2V2D4					
<b>&gt;0 - 0.9</b>	G1V1A4	G1V1D4	G2V1A4	G2V1D4	L1V1A4	L1V1D4	L2V1A4	L2V1D4					
<b>Clean</b>	3VCLN	0	2VCLNA	0	1VCLNA	0	2VCLNA	0	Clean	3VCLN	0	2VCLN	0
<b>Total</b>	1AVTO	1DVTO	2AVTOT	2DVTO	1AVTO	1DVTOT	2AVTOT	2DVTO					
<b>Rating Location Factor</b>	G1UWD4		G2UWD4		L1UWD4		L2UWD4						
<b>Ind Rating</b>	G1WD4		G2WD4		L1WD4		L2WD4						
<b>WDP</b>	G1WD4		G2WD4		L1WD4		L2WD4		<b>TLC</b>		<b>TGC</b>		<b>TLC</b>
<b>WD4</b>	WD4		WD4		WD4		WD4		TLC4		TGC4		TLC4
<b>Unweighted Deposits</b>	G3WD4		L3WD4		L4WD4		L4WD4		<b>Unweighted Deposits</b>		<b>T.L. Flaked Carbon %</b>		TLFC4
	20		20		60		60		0.5		1		
	G3UWD4		L3UWD4		L4UWD4		L4UWD4		OGUWD4		UCUWD4		

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

<b>Laboratory:</b>	LAB	<b>EOT Date:</b>	DTCOMP	<b>EOT Time:</b>	EOTTIME
<b>Test Number:</b>	STAND		STRUN	ENGINE	ENHOURS
<b>Oil Code:</b>	OILCODE				
<b>Formulation/Stand Code:</b>	FORM				
<b>Date Rated:</b>	DTRATE	<b>Rater Initials:</b>	RINIT	<b>Verified By:</b>	VRINIT

Total Piston Ratings Summary															
Dep. Factor	Grooves			Lands			Dep. Factor	Groove			Lands			Oil Cooling	Under Crown
	No. 1	No. 2	No. 1	No. 2	No. 1	No. 2		No. 3	No. 3	No. 4	No. 3	No. 4	No. 3		
	A,%	Dem.	A,%	Dem.	A,%	Dem.		A,%	Dem.	A,%	Dem.	A,%	Dem.	A,%	Dem.
<b>HC -1.0</b>	G1HCA	G1HCD5	G2HCA5	G2HCD5	L1HCA5	L1HCD5	L2HCA5	L2HCD5	G3HCA	G3HCD5	L3HCA5	L3HCD5	L4HCA5	L4HCD5	
<b>MC -0.5</b>	G1MCA	G1MCD5							G3MCA	G3MCD5					
<b>LC - .25</b>	G1LCA	G1LCD5	G2LCA5	G2LCD5	L1LCA5	L1LCD5	L2LCA5	L2LCD5	G3LCA	G3LCD5	L3LCA5	L3LCD5	L4LCA5	L4LCD5	
<b>Total</b>	1ACTO	1DCTO	2ACTO	2DCTO	1ACTO	1DCTO	2ACTO	2DCTO	3ACTO	3DCTO	4ACTO	4DCTO	3ACTO	3DCTO	4ACTO
<b>8 - 9</b>	G1V9A	G1V9D5	G2V9A5	G2V9D5	L1V9A5	L1V9D5	L2V9A5	L2V9D5							
<b>7 - 7.9</b>	G1V8A	G1V8D5	G2V8A5	G2V8D5	L1V8A5	L1V8D5	L2V8A5	L2V8D5							
<b>6 - 6.9</b>	G1V7A	G1V7D5	G2V7A5	G2V7D5	L1V7A5	L1V7D5	L2V7A5	L2V7D5							
<b>5 - 5.9</b>	G1V6A	G1V6D5	G2V6A5	G2V6D5	L1V6A5	L1V6D5	L2V6A5	L2V6D5							
<b>4 - 4.9</b>	G1V5A	G1V5D5	G2V5A5	G2V5D5	L1V5A5	L1V5D5	L2V5A5	L2V5D5							
<b>3 - 3.9</b>	G1V4A	G1V4D5	G2V4A5	G2V4D5	L1V4A5	L1V4D5	L2V4A5	L2V4D5							
<b>2 - 2.9</b>	G1V3A	G1V3D5	G2V3A5	G2V3D5	L1V3A5	L1V3D5	L2V3A5	L2V3D5							
<b>1 - 1.9</b>	G1V2A	G1V2D5	G2V2A5	G2V2D5	L1V2A5	L1V2D5	L2V2A5	L2V2D5							
<b>&gt;0 - 0.9</b>	G1V1A	G1V1D5	G2V1A5	G2V1D5	L1V1A5	L1V1D5	L2V1A5	L2V1D5							
<b>Clean</b>	1VCLN	0	2VCLNA	0	1VCLNA	0	2VCLNA	0	3VCLN	0	4VCLNA	0	3VCLN	0	4VCLN
<b>Total</b>	1AVTO	1DVTO	2AVTO	2DVTO	1AVTO	1DVTO	2AVTO	2DVTO	3AVTO	3DVTO	4AVTO	4DVTO	3AVTO	3DVTO	4AVTO
<b>Rating Location Factor</b>	G1UWD5	G2UWD5	G2UWD5	G2UWD5	L1UWD5	L1UWD5	L2UWD5	L2UWD5	G3UWD5	L3UWD5	L3UWD5	L4UWD5	L4UWD5	OGUWD5	UCUWD5
<b>Ind Rating</b>	G1WD5	G2WD5	G2WD5	G2WD5	L1WD5	L1WD5	L2WD5	L2WD5	G3WD5	L3WD5	L3WD5	L4WD5	L4WD5	OGWD5	UCWD5
<b>WDP</b>	TGC			TLC			TLC			Unweighted Deposits			T.L. Flaked Carbon %		
WD5	TGC5			TLC5			TLC5			UWD5			TLFC5		

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

<b>Laboratory:</b>	LAB	<b>EOT Date:</b>	DTCOMP	<b>EOT Time:</b>	EOTTIME
<b>Test Number:</b>	STAND		STRUN	ENHOURS	
<b>Oil Code:</b>	OILCODE				
<b>Formulation/Stand Code:</b>	FORM				
<b>Date Rated:</b>	DTRATE	<b>Rater Initials:</b>	RINIT	<b>Verified By:</b>	VRINIT

Total Piston Ratings Summary														
Dep. Factor	Grooves						Dep. Factor	Lands						
	No. 1		No. 2		No. 3			No. 4		No. 3		No. 4		
	A, %	Dem.	A, %	Dem.	A, %	Dem.		A, %	Dem.	A, %	Dem.	A, %	Dem.	
<b>HC -1.0</b>	G1HCA	G1HCD6	G2HCA	G2HCD6	L1HCA	L1HCD6	L2HCA	L2HCD6	L3HCA	L3HCD6	L4HCA	L4HCD6		
<b>MC -0.5</b>	G1MCA	G1MCD6												
<b>LC - .25</b>	G1LCA	G1LCD6	G2LCA	G2LCD6	L1LCA	L1LCD6	L2LCA	L2LCD6	L3LCA	L3LCD6	L4LCA	L4LCD6		
<b>Total</b>	1ACTO	1DCTO	2ACTO	2DCTO	1ACTO	1DCTO	2ACTO	2DCTO	1ACTO	1DCTO	4ACTO	4DCTO	3ACTO	3DCTO
<b>8 - 9</b>	G1V9A	G1V9D6	G2V9A	G2V9D6	L1V9A	L1V9D6	L2V9A	L2V9D6						
<b>7 - 7.9</b>	G1V8A	G1V8D6	G2V8A	G2V8D6	L1V8A	L1V8D6	L2V8A	L2V8D6						
<b>6 - 6.9</b>	G1V7A	G1V7D6	G2V7A	G2V7D6	L1V7A	L1V7D6	L2V7A	L2V7D6						
<b>5 - 5.9</b>	G1V6A	G1V6D6	G2V6A	G2V6D6	L1V6A	L1V6D6	L2V6A	L2V6D6						
<b>4 - 4.9</b>	G1V5A	G1V5D6	G2V5A	G2V5D6	L1V5A	L1V5D6	L2V5A	L2V5D6						
<b>3 - 3.9</b>	G1V4A	G1V4D6	G2V4A	G2V4D6	L1V4A	L1V4D6	L2V4A	L2V4D6						
<b>2 - 2.9</b>	G1V3A	G1V3D6	G2V3A	G2V3D6	L1V3A	L1V3D6	L2V3A	L2V3D6						
<b>1 - 1.9</b>	G1V2A	G1V2D6	G2V2A	G2V2D6	L1V2A	L1V2D6	L2V2A	L2V2D6						
<b>&gt;0 - 0.9</b>	G1V1A	G1V1D6	G2V1A	G2V1D6	L1V1A	L1V1D6	L2V1A	L2V1D6						
<b>Clean</b>	1VCLN	0	2VCLN	0	1VCLN	0	2VCLN	0	3VCLN	0	4VCLN	0	3VCLN	0
<b>Total</b>	1AVTO	1DVTOT	2AVTO	2DVTOT	1AVTO	1DVTOT	2AVTO	2DVTOT	1AVTO	1DVTOT	4AVTO	4DVTOT	3AVTO	3DVTOT
<b>Rating Location Factor</b>	G1UWD6		G2UWD6		L1UWD6		L2UWD6		L3UWD6		L4UWD6		OGUWD6	UCUWD6
<b>Ind Rating</b>	G1WD6		G2WD6		L1WD6		L2WD6		L3WD6		L4WD6		OGWD6	UCWD6
<b>WDP</b>	TGC		TGC		TLC		TLC		Unweighted Deposits		T.L. Flaked Carbon %		TLFC6	
WD6	TGC6		TGC6		TLC6		TLC6		UWD6		TLFC6			