

Mack T-11
D 7156 - EGR Engine Oil Test

Report Packet Version No.
T11 VERSION 20041119

Conducted For

TSTSPON1

TSTSPON2

| | |
|----------|---|
| LABVALID | 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. |

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

| | | | |
|---------------------------------|---------------------------|-------------------------------------|------------------------------|
| Stand: STAND | Stand Run: STRUN | Engine: ENGINE | Engine Hours: ENHOURS |
| End Of Test Date: DTCOMP | | End Of Test Time: EOTTIME | |
| Oil Code: OILCODE | | Formulation/Stand Code: FORM | |
| Altcode1: ALTCODE1 | Altcode2: ALTCODE2 | Altcode3: ALTCODE3 | |

| |
|--|
| <p>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.</p> |
|--|

Submitted By:

SUBLAB

Testing Laboratory

SUBSIGIM

Signature

SUBNAME

Typed Name

SUBTITLE

Title

Mack T-11
D 7156 - EGR Engine Oil Test
Form 2

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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 ₂ , % | 1.5 |
| Exhaust CO ₂ , % | 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

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

Test Results

| | | | |
|---|---------------------------|-----------------------------|----------|
| Date Test Started: | DTSTRT | Start Time: | STRTTIME |
| SAE Viscosity: | SAEVISC | Test Length: | TESTLEN |
| TMC Oil Code:^A | IND | Laboratory Oil Code: | LABOCODE |
| TGA Soot % at 96 h | TGA096 | | |
| TGA Soot % at 192 h | TGA192 | | |
| TGA Soot % at 228 h | TGA228 | | |
| TGA Soot % at 252 h | TGA252 | | |
| Centrifugal Oil Filter Mass Gain, g | MASSG | | |
| Oil Filter Delta P, kPa | XOILDP | | |
| EOT TBN | TBNEOT | | |
| Oil Consumption, g/hr | OILCON | | |
| Viscosity Increase at 6.0% Soot, cSt | VIS60 | | |
| MRV Yield Stress, cP | MRVYS | | |
| | Soot at 12 cSt (%) | MRV (cP) | |
| Original Result | SOOT | MRV180 | |
| Transformed Result | TRNSOOT | TRNMRV | |
| Correction Factor | SOOTCF | MRVCF | |
| Corrected Transformed Result | SOOTCOR | MRVCOR | |
| Severity Adjustment | SOOT_SA | MRV_SA | |
| Final Transformed Result | TSOOTFNL | TMRVFNL | |
| Final Original Unit Result | SOOTFNL | MRVFNL | |

Last Stand Reference Results

| | | | | |
|---|---------------------------|----------------------|----------|----------|
| Test Number: | RSTAND | RSTRUN | RENGINE | RENHOURS |
| Oil Code: | ROILCODE | | | |
| Test Length: | RTESTLEN | TMC Oil Code: | RIND | |
| EOT Date: | RDTCOMP | EOT Time: | REOTTIME | |
| Stand Calibration Expiration Date: | DTCALEXP | | | |
| TGA Soot % at 96 h | RTGA096 | | | |
| TGA Soot % at 192h | RTGA192 | | | |
| TGA Soot % at 228h | RTGA228 | | | |
| TGA Soot % at 252 h | RTGA252 | | | |
| Oil Consumption, g/hr | ROILCON | | | |
| Viscosity at 6.0% Soot, cSt | RVIS60 | | | |
| | Soot at 12 cSt (%) | MRV | | |
| Final Original Unit Result | RSOOTFNL | RMRVFNL | | |

^A Reference Tests only.

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

| | | | | | |
|--------------------------------|---------|-----------|---------|-----------|---------|
| Laboratory: | LAB | EOT Date: | DTCOMP | EOT Time: | EOTTIME |
| Test Number: | STAND | ENGINE | ENHOURS | | |
| Oil Code: | OILCODE | | | | |
| Formulation/Stand Code: | FORM | | | | |

| Parameter | Units | QI Threshold | EOT QI ^A | Target | Average | Samples ^B | BQD ^C | Over/Under Range ^D |
|----------------------------------|-------|-----------------------------|---------------------|-------------|---------|----------------------|------------------|-------------------------------|
| Controlled Parameters | | | | | | | | |
| Speed | r/min | 0.000 | QRPM | 1800 | ARPM | NRPM | BRPM | ORPM |
| Fuel Flow | kg/h | 0.000 | QFFLO | 53.5 | AFFLO | NFFLO | BFFLO | OFFLO |
| Inlet Manifold Temp. | °C | 0.000 | QINMANT | 70 | AINMANT | NINMANT | BINMANT | OINMANT |
| Coolant Out Temp. | °C | 0.000 | QCOLOUT | 66 | ACOLOUT | NCOLOUT | BCOLOUT | OCOLOUT |
| Fuel In Temp. | °C | 0.000 | QFUEL | 40 | AFUEL | NFUEL | BFUEL | OFUEL |
| Oil Gallery Temp. | °C | 0.000 | QOILGT | 88 | AOILGT | 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 | | | 140 minimum | AINMANP | 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 ₂ | % | | | 1.5±.05 | AICO2 | | | |
| Non-controlled Parameters | | | | | | | | |
| Parameter | Units | Typical Values ^E | | Average | | | | |
| Power | kW | TBD | TBD | APWR | | | | |
| Torque | Nm | TBD | TBD | ALOAD | | | | |
| Exhaust CO ₂ | % | TBD | TBD | AECO2 | | | | |
| Pre-Turbine Temp. (F) | °C | TBD | TBD | APTURFT | | | | |
| Pre-Turbine Temp. (R) | °C | TBD | TBD | APTURRT | | | | |
| Tailpipe Temp. | °C | TBD | TBD | ATAILPT | | | | |
| Oil Sump Temp. | °C | TBD | TBD | AOILST | | | | |
| EGR Pre-Venturi Temp. | °C | TBD | TBD | AEGRPVT | | | | |
| Blowby | L/min | TBD | TBD | ABLOBY | | | | |
| Inlet Air Dew Point | °C | TBD | TBD | AINADP | | | | |
| Fuel Pressure | kPa | TBD | TBD | AFUEL | | | | |
| Main Gallery Oil Press. | kPa | TBD | TBD | AOILPRS | | | | |

^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 A3
^B Total number of data points taken. Minimum acceptable value is 2520
^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.
^E Typical values determined from reference oil test database

Mack T-11
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Form 6
Oil Analysis Summary

| | | | | | |
|--------------------------------|---------|------------------|--------|------------------|--------|
| Laboratory: | LAB | EOT Date: | DTCOMP | EOT Time: | EOTIME |
| Test Number: | STAND | STRUN | ENGINE | ENHOURS | |
| Oil Code: | OILCODE | | | | |
| Formulation/Stand Code: | FORM | | | | |

| Hours | Soot (Wt. %) D 5967 Annex 4 | Viscosity at 100°C (cSt) D 5967 Annex A3 | Viscosity Increase (cSt) | TBN D 4739 | TAN D 664 | Integrated IR Oxidation |
|----------|--------------------------------------|--|--------------------------------|---------------|--------------|-------------------------------|
| TST_H000 | TGA_H000 | V100H000 | | TBN_H000 | TAN_H000 | IRINH000 |
| TST_H012 | TGA_H012 | V100H012 | IVISH012 | TBN_H012 | TAN_H012 | IRINH012 |
| TST_H024 | TGA_H024 | V100H024 | IVISH024 | | | |
| TST_H036 | TGA_H036 | V100H036 | IVISH036 | TBN_H036 | TAN_H036 | IRINH036 |
| TST_H048 | TGA_H048 | V100H048 | IVISH048 | | | |
| TST_H060 | TGA_H060 | V100H060 | IVISH060 | TBN_H060 | TAN_H060 | IRINH060 |
| TST_H072 | TGA_H072 | V100H072 | IVISH072 | | | |
| TST_H084 | TGA_H084 | V100H084 | IVISH084 | TBN_H084 | TAN_H084 | IRINH084 |
| TST_H096 | TGA096 | V100H096 | IVISH096 | | | |
| TST_H108 | TGA_H108 | V100H108 | IVISH108 | TBN_H108 | TAN_H108 | IRINH108 |
| TST_H120 | TGA_H120 | V100H120 | IVISH120 | | | |
| TST_H132 | TGA_H132 | V100H132 | IVISH132 | TBN_H132 | TAN_H132 | IRINH132 |
| TST_H144 | TGA_H144 | V100H144 | IVISH144 | | | |
| TST_H156 | TGA_H156 | V100H156 | IVISH156 | TBN_H156 | TAN_H156 | IRINH156 |
| TST_H168 | TGA_H168 | V100H168 | IVISH168 | | | |
| TST_H180 | TGA_H180 | V100H180 | IVISH180 | TBN_H180 | TAN_H180 | IRINH180 |
| TST_H192 | TGA192 | V100H192 | IVISH192 | | | |
| TST_H204 | TGA_H204 | V100H204 | IVISH204 | TBN_H204 | TAN_H204 | IRINH204 |
| TST_H216 | TGA_H216 | V100H216 | IVISH216 | | | |
| TST_H228 | TGA228 | V100H228 | IVISH228 | TBN_H228 | TAN_H228 | IRINH228 |
| TST_H240 | TGA_H240 | V100H240 | IVISH240 | | | |
| TST_H252 | TGA252 | V100H252 | IVISH252 | TBNEOT | TAN_H252 | IRINH252 |

Mack T-11
D 7156 - EGR Engine Oil Test
Form 7
Oil Analysis Summary

| | | | | | |
|--------------------------------|---------|------------------|--------|------------------|--------|
| Laboratory: | LAB | EOT Date: | DTCOMP | EOT Time: | EOTIME |
| Test Number: | STAND | STRUN | ENGINE | ENHOURS | |
| Oil Code: | OILCODE | | | | |
| Formulation/Stand Code: | FORM | | | | |

| Hours | Shear Viscosity (cSt) D 6278 30 Pass | Shear Viscosity (cSt) 90 Pass | MRV Viscosity (cP) D 6896 | Rotational Viscosity at 100°C (mPa-s) | | Rotational Viscosity Rate Index | |
|---|--|----------------------------------|------------------------------|---------------------------------------|------------|---------------------------------|------------|
| | | | | Increasing | Decreasing | Increasing | Decreasing |
| TST_H000 | DINVIS30 | DINVIS90 | | RTVIH000 | RTVDH000 | RTRIH000 | RTRDH000 |
| TST_H012 | | | | | | | |
| TST_H024 | | | | RTVIH024 | RTVDH024 | RTRIH024 | RTRDH024 |
| TST_H036 | | | | | | | |
| TST_H048 | | | | RTVIH048 | RTVDH048 | RTRIH048 | RTRDH048 |
| TST_H060 | | | | | | | |
| TST_H072 | | | | RTVIH072 | RTVDH072 | RTRIH072 | RTRDH072 |
| TST_H084 | | | | | | | |
| TST_H096 | | | | RTVIH096 | RTVDH096 | RTRIH096 | RTRDH096 |
| TST_H108 | | | | | | | |
| TST_H120 | | | | RTVIH120 | RTVDH120 | RTRIH120 | RTRDH120 |
| TST_H132 | | | | RTVIH132 | RTVDH132 | RTRIH132 | RTRDH132 |
| TST_H144 | | | | RTVIH144 | RTVDH144 | RTRIH144 | RTRDH144 |
| TST_H156 | | | | RTVIH156 | RTVDH156 | RTRIH156 | RTRDH156 |
| TST_H168 | | | | RTVIH168 | RTVDH168 | RTRIH168 | RTRDH168 |
| TST_H180 | | | MRV180 | RTVIH180 | RTVDH180 | RTRIH180 | RTRDH180 |
| TST_H192 | | | | RTVIH192 | RTVDH192 | RTRIH192 | RTRDH192 |
| TST_H204 | | | | RTVIH204 | RTVDH204 | RTRIH204 | RTRDH204 |
| TST_H216 | | | | RTVIH216 | RTVDH216 | RTRIH216 | RTRDH216 |
| TST_H228 | | | | RTVIH228 | RTVDH228 | RTRIH228 | RTRDH228 |
| TST_H240 | | | | RTVIH240 | RTVDH240 | RTRIH240 | RTRDH240 |
| TST_H252 | | | | RTVIH252 | RTVDH252 | RTRIH252 | RTRDH252 |
| Rotational Viscosity of DIN 30 Pass Sample | | | | RTVID30 | RTVDD30 | RTRID30 | RTRDD30 |
| Rotational Viscosity of DIN 90 Pass Sample | | | | RTVID90 | RTVDD90 | RTRID90 | RTRDD90 |

Mack T-11
D 7156 - EGR Engine Oil Test
Form 8
Oil Analysis Summary

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

| Hours | Fuel Dilution D 3524 | Metal Elements (ppm) D 5185 | | | | | | | |
|----------|-------------------------|--------------------------------|----------|----------|----------|----------|----------|----------|----------|
| | | Fe | Pb | Cu | Cr | Al | Si | Sn | Na |
| TST_H000 | | FEWMH000 | PBWMH000 | CUWMH000 | CRWMH000 | ALWMH000 | SIWMH000 | SNWMH000 | NAWMH000 |
| TST_H012 | | | | | | | | | |
| TST_H024 | | FEWMH024 | PBWMH024 | CUWMH024 | CRWMH024 | ALWMH024 | SIWMH024 | SNWMH024 | NAWMH024 |
| TST_H036 | | | | | | | | | |
| TST_H048 | | FEWMH048 | PBWMH048 | CUWMH048 | CRWMH048 | ALWMH048 | SIWMH048 | SNWMH048 | NAWMH048 |
| TST_H060 | | | | | | | | | |
| TST_H072 | | FEWMH072 | PBWMH072 | CUWMH072 | CRWMH072 | ALWMH072 | SIWMH072 | SNWMH072 | NAWMH072 |
| TST_H084 | | | | | | | | | |
| TST_H096 | FDILH096 | FEWMH096 | PBWMH096 | CUWMH096 | CRWMH096 | ALWMH096 | SIWMH096 | SNWMH096 | NAWMH096 |
| TST_H108 | | | | | | | | | |
| TST_H120 | | FEWMH120 | PBWMH120 | CUWMH120 | CRWMH120 | ALWMH120 | SIWMH120 | SNWMH120 | NAWMH120 |
| TST_H132 | | | | | | | | | |
| TST_H144 | | FEWMH144 | PBWMH144 | CUWMH144 | CRWMH144 | ALWMH144 | SIWMH144 | SNWMH144 | NAWMH144 |
| TST_H156 | | | | | | | | | |
| TST_H168 | | FEWMH168 | PBWMH168 | CUWMH168 | CRWMH168 | ALWMH168 | SIWMH168 | SNWMH168 | NAWMH168 |
| TST_H180 | | | | | | | | | |
| TST_H192 | FDILH192 | FEWMH192 | PBWMH192 | CUWMH192 | CRWMH192 | ALWMH192 | SIWMH192 | SNWMH192 | NAWMH192 |
| TST_H204 | | | | | | | | | |
| TST_H216 | | FEWMH216 | PBWMH216 | CUWMH216 | CRWMH216 | ALWMH216 | SIWMH216 | SNWMH216 | NAWMH216 |
| TST_H228 | | | | | | | | | |
| TST_H240 | | FEWMH240 | PBWMH240 | CUWMH240 | CRWMH240 | ALWMH240 | SIWMH240 | SNWMH240 | NAWMH240 |
| TST_H252 | FDILH252 | FEWMH252 | PBWMH252 | CUWMH252 | CRWMH252 | ALWMH252 | SIWMH252 | SNWMH252 | NAWMH252 |

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

| | | |
|--------------------------------|------------------------------------|--------------------------|
| Laboratory: LAB | EOT Date: DTCOMP | EOT Time: EOTTIME |
| Test Number: STAND | STRUN | ENGINE ENHOURS |
| Oil Code: | | OILCODE |
| Formulation/Stand Code: | | FORM |
| Supplier: FUELSUP | Batch Identifiers: 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 |
| Hydrocarbon Composition | | | | |
| 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 | FUELUCU | | D 130 |
| Flash Point, °C | 54 Minimum | FLASHPT | | D 93 |
| Pour Point, °C | -18 Maximum | FUELPOUR | | D 97 |
| Carbon Residue on 10% Residuam, % | 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 | FUELTAN | | D 664 |
| Strong Acid Number | 0.00 Maximum | FUELSAN | | D 664 |
| Accelerated Stability | tbd | FUELACS | | D 2274 |
| Distillation, °C | | | | |
| 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-11
D 7156 - EGR Engine Oil Test
Form 10**

Characteristics of the Data Acquisition System

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

| Parameter (1) | Sensing Device (2) | Calibration Frequency (3) | Record Device (4) | Observation Frequency (5) | Record Frequency (6) | Log Frequency (7) | System Response (8) |
|------------------------|--------------------------|---------------------------------|-------------------------|---------------------------------|----------------------------|-------------------------|---------------------------|
| Temperatures | | | | | | | |
| Oil @ Filt. | OTEMSENS | OTEMCALF | OTEMRECD | OTEMOBSF | OTEMRECF | OTEMLOGF | OTEMSYSR |
| Fuel In. | FTEMSSENS | FTEMCALF | FTEMRECD | FTEMOBSF | FTEMRECF | FTEMLOGF | FTEMSYSR |
| Intake Air | AITSENS | AITCALF | AITRECD | AITOBSF | AITRECF | AITLOGF | AITSYSR |
| Intake Man. | IMANSENS | IMANCALF | IMANRECD | IMANOBSF | IMANRECF | IMANLOGF | IMANSYSR |
| Pre-Turb. | PTURSENS | PTURCALF | PTURRECD | PTUROBSF | PTURRECF | PTURLOGF | PTURSYSR |
| Cool. Out | COTSENS | COTCALF | COTRECD | COTOBSF | COTRECF | COTLOGF | COTSYSR |
| Other | | | | | | | |
| Fuel Flow | FFLOSENS | FFLOCALF | FFLORECD | FFLOBSF | FFLORECF | FFLOLOGF | FFLOSYSR |
| Engine RPM | RPMSSENS | RPMCALF | RPMRECD | RPMOBSF | RPMRECF | RPMLOGF | RPMSYSR |
| Load | LOADSENS | LOADCALF | LOADRECD | LOADOBSF | LOADRECF | LOADLOGF | LOADSYSR |
| Inlet Restr. | INRESENS | INRECALF | INRERECD | INREOBSF | INRERECF | INRELOGF | INRESYSR |
| Exh. Press. | EXPRSENS | EXPRCALF | EXPRECD | EXPROBSF | EXPRECF | EXPRLOGF | EXPRSYSR |
| Oil Gal. Press. | 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-11
D 7156 - EGR Engine Oil Test
Form 11
Build-up and Hardware Information

| | | | | | |
|--------------------------------|---------|------------------|--------|------------------|---------|
| Laboratory: | LAB | EOT Date: | DTCOMP | EOT Time: | EOTTIME |
| Test Number: | STAND | STRUN | ENGINE | ENHOURS | |
| Oil Code: | OILCODE | | | | |
| Formulation/Stand Code: | 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 |
| SITHR009 | SIT R009 |
| SITHR010 | SIT R010 |
| SITHR011 | SIT R011 |
| SITHR012 | SIT R012 |
| SITHR013 | SIT R013 |
| SITHR014 | SIT R014 |
| SITHR015 | SIT R015 |
| TOTSIT | Total Timing Changes |

Hardware

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

| Cylinder Kit Location | CPD ID Number |
|-----------------------|---------------|
| Cylinder 1 | CPDIDC1 |
| Cylinder 2 | CPDIDC2 |
| Cylinder 3 | CPDIDC3 |
| Cylinder 4 | CPDIDC4 |
| Cylinder 5 | CPDIDC5 |
| Cylinder 6 | CPDIDC6 |

Mack T-11
D 7156 - EGR Engine Oil Test
Form 12
Unscheduled Downtime and Maintenance Summary

| | | |
|--------------------------------|-------------------------|--------------------------|
| Laboratory: LAB | EOT Date: DTCOMP | EOT Time: EOTTIME |
| Test Number: STAND | STRUN | ENGINE ENHOURS |
| Oil Code: | | OILCODE |
| Formulation/Stand Code: | | 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 | | | Total Downtime |

Other Comments

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

Mack T-11
D 7156 - EGR Engine Oil Test
Form 12A
Unscheduled Downtime and Maintenance Summary

| | | |
|--------------------------------|-------------------------|--------------------------|
| Laboratory: LAB | EOT Date: DTCOMP | EOT Time: EOTTIME |
| Test Number: STAND | STRUN | ENGINE ENHOURS |
| Oil Code: | | OILCODE |
| Formulation/Stand Code: | | 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 | | | Total Downtime |

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

Mack T-11
D 7156 - EGR Engine Oil Test
Form 12B
Unscheduled Downtime and Maintenance Summary

| | | |
|--------------------------------|-------------------------|--------------------------|
| Laboratory: LAB | EOT Date: DTCOMP | EOT Time: EOTTIME |
| Test Number: STAND | STRUN | ENGINE ENHOURS |
| Oil Code: | | OILCODE |
| Formulation/Stand Code: | | 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 |
| DOWNR040 | DDATR040 | DTIMR040 | DREAR040 |
| DOWNR041 | DDATR041 | DTIMR041 | DREAR041 |
| DOWNR042 | DDATR042 | DTIMR042 | DREAR042 |
| DOWNR043 | DDATR043 | DTIMR043 | DREAR043 |
| DOWNR044 | DDATR044 | DTIMR044 | DREAR044 |
| DOWNR045 | DDATR045 | DTIMR045 | DREAR045 |
| TOTLDOWN | | | Total Downtime |

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