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T-12 Information Letter 17-1
Sequence No. 20
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ASTM consensus has not been obtained on this information letter. An appropriate ASTM ballot will be issued in order to achieve such consensus.

TO: Mack Mailing List
SUBJECT: VXYPD Hardware Correction Factors Update

On February 24, 2017 via teleconference, the Mack Test Surveillance panel approved correction factors for Average Liner Wear (ALW), Average Top Ring Weight Loss (ATRWL), delta lead at end of test (PB) and delta lead from 250 to 300 hours (PB2) for the 'VXYPD' hardware combination. Accordingly, sections 11.6.2.1, 11.6.3.1, 11.6.4.3, 11.6.4.4, 11.6.5.1 and 11.6.6.1 have been revised and are attached.

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Attachment
c: ftp://ftp.astmtmc.cmu.edu/docs/diesel/mack/procedure_and_ils/T-12/il17-1.pdf

Distribution: Email

(Revises D7422-16a as amended by IL 16-2)

11.6.2.1 *Correction Factor for Average Top Ring Mass Loss*

- (1) For all tests using the STWN hardware combination that completed on or before May 18, 2011, multiply the average top ring mass loss from 11.6.2 by 0.95 to get the final average top ring mass loss result.
- (2) For all tests using the STWN hardware combination that completed on or after May 19, 2011 and started before June 5, 2012, multiply the average top ring mass loss from 11.6.2 by 0.92 to get the final average top ring mass loss result.
- (3) For all tests using the STWN hardware combination that started on or after June 5, 2012, multiply the average top ring mass loss from 11.6.2 by 0.705 to get the final average top ring mass loss result.
- (4) For all tests using the UUXO hardware combination multiply the average top ring mass loss from 11.6.2 by 0.849 to get the final average top ring mass loss result.
- (5) For all tests using the VUXO hardware combination that started on or after August 27th 2014, multiply the average top ring mass loss from 11.6.2 by 0.719 to get the final average top ring mass loss result.
- (6) For all tests using the VUXO hardware combination with batch A or B pistons (VUXOA or VUXOB) that started on or after August 4th 2015, multiply the average top ring mass loss from 11.6.2 by 0.912 to get the final average top ring mass loss result.
- (7) For all tests using the VUYP hardware combination with batch A, B or C pistons (VUYPA, VUYPB or VUYPC) multiply the average top ring mass loss from 11.6.2 by 0.912 to get the final average top ring mass loss result.
- (8) For all tests using the VXYPD hardware combination multiply the average top ring mass loss from 11.6.2 by 0.846 to get the final average top ring mass loss result.

Report the data on the appropriate form.

11.6.3.1 *Correction Factor for Average Cylinder Liner Wear*

- (1) For all tests using Batch R piston ring and cylinder liner hardware, multiply the average cylinder liner wear from 11.6.3 by 0.58 to get the final average cylinder liner wear result.
- (2) For all tests using the SWTN hardware combination that completed on or before May 18, 2011, multiply the average cylinder liner wear from 11.6.3 by 0.86 to get the final average cylinder liner wear result.
- (3) For all tests using the STWN hardware combination that completed on or after May 19, 2011 and started before June 5, 2012, multiply the average cylinder liner wear from 11.6.3 by 0.83 to get the final average cylinder liner wear result. For all tests using the STWN hardware combination that started on or after June 5, 2012, multiply the average cylinder liner wear from 11.6.3 by 0.946 to get the final average cylinder liner wear result.
- (4) For all tests using the UUXO hardware combination multiply the average cylinder liner wear from 11.6.3 by 0.566 to get the final average cylinder liner wear result.
- (5) For all tests using the VUXO hardware combination that started on or after August 27th 2014, multiply the average cylinder liner wear from 11.6.3 by 0.818 to get the final average cylinder liner wear result.

- (6) For all tests using the VUXO hardware combination with batch A or B pistons (VUXOA or VUXOB) that started on or after August 4th 2015, multiply the average cylinder liner wear from 11.6.3 by 0.953 to get the final average cylinder liner wear result.
- (7) For all tests using the VUYPD hardware combination with batch A, B or C pistons (VUYPA, VUYPB or VUYPC) multiply the average cylinder liner wear from 11.6.3 by 0.970 to get the final average cylinder liner wear result.
- (8) For all tests using the VXYPD hardware combination determine the final average liner wear result by applying the correction factor of 0.743 according to the following equation:

$$ALW_{Final} = \exp[(\ln(ALW) \times 0.743)] \quad (2)$$

Where:

ALW_{Final} = final Average Liner Wear

ALW = value calculated per 11.6.3

Report the data on the appropriate form.

11.6.4.3 Calculate Δ lead in accordance with the following:

$$\Delta\text{lead} = (\text{lead}_{300} - \text{lead}_{NEW}) \times (\text{OABWLU} / \text{ABWLU}) \quad (3)$$

where:

lead_{300} = lead content of the 300 h oil sample, mg/kg,

lead_{NEW} = lead content of the new oil sample, mg/kg,

ABWLU = as measured upper connecting rod bearing mass loss, mg, and

OABWLU = outlier screened upper connecting rod bearing mass loss, mg.

Report the calculated Δ lead at EOT value on the appropriate forms.

11.6.4.4 Correction Factor for Δ Lead at EOT

- (1) For all tests using the STWN hardware combination that completed on or before May 18, 2011, determine the final Δ Lead at EOT result by applying the correction factor of 0.95 according to the following equation:

$$\Delta\text{Lead}_{Final} = \exp[(\ln(\Delta\text{Lead}) \times 0.95)] \quad (4)$$

Where:

$\Delta\text{Lead}_{Final}$ = final Δ Lead at EOT

ΔLead = value calculated per Eq 3 (11.6.4.3).

- (2) For all tests using the STWN hardware combination that completed on or after May 19, 2011 and started before June 5, 2012, determine the final Δ Lead at EOT result by applying the correction factor of 0.92 according to the following equation:

$$\Delta\text{Lead}_{Final} = \exp[(\ln(\Delta\text{Lead}) \times 0.92)] \quad (5)$$

Where:

$\Delta\text{Lead}_{Final}$ = final Δ Lead at EOT

ΔLead = value calculated per Eq 3 (11.6.4.3).

- (3) For all tests using the STWN hardware combination that started on or after June 5, 2012, determine the final ΔLead at EOT result by applying the correction factor of 0.923 according to the following equation:

$$\Delta\text{Lead}_{\text{Final}} = \exp[(\ln(\Delta\text{Lead}) \times 0.923)] \quad (6)$$

Where:

$\Delta\text{Lead}_{\text{Final}}$ = final ΔLead at EOT

ΔLead = value calculated per Eq 3 (11.6.4.3).

- (4) For all tests using the UUXO hardware combination determine the final ΔLead at EOT result by applying the correction factor of 0.797 according to the following equation:

$$\Delta\text{Lead}_{\text{Final}} = \exp[(\ln(\Delta\text{Lead}) \times 0.797)] \quad (7)$$

Where:

$\Delta\text{Lead}_{\text{Final}}$ = final ΔLead at EOT

ΔLead = value calculated per Eq 3 (11.6.4.3).

- (5) For all tests using the VUXO hardware combination that started on or after August 27th 2014, determine the final ΔLead at EOT result by applying the correction factor of 0.813 according to the following equation:

$$\Delta\text{Lead}_{\text{Final}} = \exp[(\ln(\Delta\text{Lead}) \times 0.813)] \quad (8)$$

Where:

$\Delta\text{Lead}_{\text{Final}}$ = final ΔLead at EOT

ΔLead = value calculated per Eq 3 (11.6.4.3).

- (6) For all tests using the VUXO hardware combination with batch A or B pistons (VUXOA or VUXOB) that started on or after August 4th 2015, determine the final ΔLead at EOT result by applying the correction factor of 0.954 according to the following equation:

$$\Delta\text{Lead}_{\text{Final}} = \exp[(\ln(\Delta\text{Lead}) \times 0.954)] \quad (9)$$

Where:

$\Delta\text{Lead}_{\text{Final}}$ = final ΔLead at EOT

ΔLead = value calculated per Eq 3 (11.6.4.3).

- (7) For all tests starting on or after February 25th 2016 on hardware before batch VXYPD, determine the final ΔLead at EOT result by applying the correction factor calculated according to the following equations:

If $\text{OC}_{100-300} > 65.0$

$$\Delta\text{Lead}_{\text{Final}} = \exp[(\ln(\Delta\text{Lead}) + (65.0 - \text{OC}_{100-300}) \times 0.03088)] \quad (10)$$

If $\text{OC}_{100-300} \leq 65.0$

$$\Delta\text{Lead}_{\text{Final}} = \Delta\text{Lead} \quad (11)$$

Where:

$\Delta\text{Lead}_{\text{Final}}$ = final ΔLead at EOT

ΔLead = value calculated per Eq 3 (11.6.4.3).

$\text{OC}_{100-300}$ = average oil consumption calculated in 11.6.6

- (8) For all tests run on VXYPD hardware, determine the final ΔLead at EOT result by applying the correction factor calculated according to the following equations:

If $\text{OC}_{100-300} > 65.0$

$$\Delta\text{Lead}_{\text{Final}} = \exp[(\ln(\Delta\text{Lead}) + (65.0 - \text{OC}_{100-300}) \times 0.03234)] \quad (12)$$

If $\text{OC}_{100-300} \leq 65.0$

$$\Delta\text{Lead}_{\text{Final}} = \Delta\text{Lead} \quad (13)$$

Where:

$\Delta\text{Lead}_{\text{Final}}$ = final ΔLead at EOT

ΔLead = value calculated per Eq 3 (11.6.4.3).

$\text{OC}_{100-300}$ = average oil consumption calculated in 11.6.6

Report the data on the appropriate form.

11.6.5.1 Correction Factor for ΔLead (250 to 300) h

- (1) For all tests using the STWN hardware combination that completed on or before May 18, 2011, determine the final ΔLead (250 to 300) h result by applying the correction factor of 1.03 according to the following equation:

$$\Delta\text{Lead (250-300)}_{\text{Final}} = \exp[(\ln(\Delta\text{Lead 250-300}) \times 1.03)] \quad (14)$$

Where:

$\Delta\text{Lead (250-300)}_{\text{Final}}$ = final ΔLead (250 to 300) h

$\Delta\text{Lead (250-300)}$ = value calculated per 11.6.5

- (2) For all tests using the STWN hardware combination that completed on or after May 19, 2011 and started before June 5, 2012, determine the final ΔLead (250 to 300) h result by applying the correction factor of 0.93 according to the following equation:

$$\Delta\text{Lead (250-300)}_{\text{Final}} = \exp[(\ln(\Delta\text{Lead 250-300}) \times 0.93)] \quad (15)$$

Where:

$\Delta\text{Lead (250-300)}_{\text{Final}}$ = final ΔLead (250 to 300) h

$\Delta\text{Lead (250-300)}$ = value calculated per 11.6.5

- (3) For all tests using the STWN hardware combination that started on or after June 5, 2012, determine the final ΔLead (250 to 300) h result by applying the correction factor of 0.956 according to the following equation:

$$\Delta\text{Lead (250-300)}_{\text{Final}} = \exp[(\ln(\Delta\text{Lead 250-300}) \times 0.956)] \quad (16)$$

Where:

$\Delta\text{Lead (250-300)}_{\text{Final}}$ = final ΔLead (250 to 300) h

$\Delta\text{Lead (250-300)}$ = value calculated per 11.6.5

- (4) For all tests using the UUXO hardware combination determine the final ΔLead (250 to 300) h result by applying the correction factor of 0.700 according to the following equation:

$$\Delta\text{Lead (250-300)}_{\text{Final}} = \exp[(\ln(\Delta\text{Lead 250-300}) \times 0.700)] \quad (17)$$

Where:

$\Delta\text{Lead (250-300)}_{\text{Final}} = \text{final } \Delta\text{Lead (250 to 300) h}$
 $\Delta\text{Lead (250-300)} = \text{value calculated per 11.6.5}$

- (5) For all tests using the VUXO hardware combination that started on or after August 27th 2014, determine the final $\Delta\text{Lead (250 to 300) h}$ result by applying the correction factor of 0.710 according to the following equation:

$$\Delta\text{Lead (250-300)}_{\text{Final}} = \exp[(\ln(\Delta\text{Lead 250-300}) \times 0.710)] \quad (18)$$

Where:

$\Delta\text{Lead (250-300)}_{\text{Final}} = \text{final } \Delta\text{Lead (250 to 300) h}$
 $\Delta\text{Lead (250-300)} = \text{value calculated per 11.6.5}$

- (6) For all tests using the VUXO hardware combination with batch A or B pistons (VUXOA or VUXOB) that started on or after August 4th 2015, determine the final $\Delta\text{Lead (250 to 300) h}$ result by applying the correction factor of 0.895 according to the following equation:

$$\Delta\text{Lead (250-300)}_{\text{Final}} = \exp[(\ln(\Delta\text{Lead 250-300}) \times 0.895)] \quad (19)$$

Where:

$\Delta\text{Lead (250-300)}_{\text{Final}} = \text{final } \Delta\text{Lead (250 to 300) h}$
 $\Delta\text{Lead (250-300)} = \text{value calculated per 11.6.5}$

- (7) For all tests that started on or after February 25th 2016 on hardware before batch VXYPD, determine the final $\Delta\text{Lead (250 to 300) h}$ by applying the correction factor calculated according to the following equations:

If $\text{OC}_{100-300} > 65.0$

$$\Delta\text{Lead(250-300)}_{\text{Final}} = \exp[(\ln(\Delta\text{Lead(250-300)}) + (65.0 - \text{OC}_{100-300}) \times 0.04021)] \quad (20)$$

If $\text{OC}_{100-300} \leq 65.0$

$$\Delta\text{Lead(250-300)}_{\text{Final}} = \Delta\text{Lead(250-300)} \quad (21)$$

Where:

$\Delta\text{Lead (250-300)}_{\text{Final}} = \text{final } \Delta\text{Lead (250 to 300) h}$
 $\Delta\text{Lead (250-300)} = \text{value calculated per 11.6.5}$
 $\text{OC}_{100-300} = \text{average oil consumption calculated from 11.6.6}$

- (8) For all tests run on VXYPD hardware, determine the final $\Delta\text{Lead (250 to 300) h}$ result by applying the correction factor calculated according to the following equations:

If $\text{OC}_{100-300} > 65.0$

$$\Delta\text{Lead(250-300)}_{\text{Final}} = \exp[(\ln(\Delta\text{Lead(250-300)}) + (65.0 - \text{OC}_{100-300}) \times 0.04089)] \quad (22)$$

If $\text{OC}_{100-300} \leq 65.0$

$$\Delta\text{Lead(250-300)}_{\text{Final}} = \Delta\text{Lead(250-300)} \quad (23)$$

Where:

$\Delta\text{Lead (250-300)}_{\text{Final}} = \text{final } \Delta\text{Lead (250 to 300) h}$
 $\Delta\text{Lead (250-300)} = \text{value calculated per 11.6.5}$
 $\text{OC}_{100-300} = \text{average oil consumption calculated from 11.6.6}$

Report the data on the appropriate form.

11.6.6.1 Correction Factor for Oil Consumption

- (1) For all tests using the STWN hardware combination that completed on or before May 18, 2011, determine the final oil consumption result by applying the correction factor of 0.96 according to the following equation:

$$OC = \exp[(\ln(OC_{100-300}) \times 0.96)] \quad (24)$$

Where:

OC = final oil consumption

OC₁₀₀₋₃₀₀ = average oil consumption from 11.6.6

- (2) For all tests using the STWN hardware combination that completed on or after May 19, 2011 and started before June 5, 2012, determine the final oil consumption result by applying the correction factor of 0.95 according to the following equation:

$$OC = \exp[(\ln(OC_{100-300}) \times 0.95)] \quad (25)$$

Where:

OC = final oil consumption

OC₁₀₀₋₃₀₀ = average oil consumption from 11.6.6

- (3) For all tests using the STWN hardware combination that started on or after June 5, 2012, determine the final oil consumption result by applying the correction factor of 0.961 according to the following equation:

$$OC = \exp[(\ln(OC_{100-300}) \times 0.961)] \quad (26)$$

Where:

OC = final oil consumption

OC₁₀₀₋₃₀₀ = average oil consumption from 11.6.6

- (4) For all tests using the UUXO hardware combination determine the final oil consumption result by applying the correction factor of 0.916 according to the following equation:

$$OC = \exp[(\ln(OC_{100-300}) \times 0.916)] \quad (27)$$

Where:

OC = final oil consumption

OC₁₀₀₋₃₀₀ = average oil consumption from 11.6.6

- (5) For all tests using the VUXO hardware combination that started on or after August 27th 2014, determine the final oil consumption result by applying the correction factor of 0.913 according to the following equation:

$$OC = \exp[(\ln(OC_{100-300}) \times 0.913)] \quad (28)$$

Where:

OC = final oil consumption

OC₁₀₀₋₃₀₀ = average oil consumption from 11.6.6

- (6) For all tests using the VUXO hardware combination with batch A or B pistons (VUXOA or VUXOB) that started on or after August 4th 2015, determine the final oil consumption result by applying the correction factor of 0.942 according to the following equation:

$$OC = \exp[(\ln(OC_{100-300}) \times 0.942)] \quad (29)$$

Where:

OC = final oil consumption

OC₁₀₀₋₃₀₀ = average oil consumption from 11.6.6

- (7) For all tests using the VUYP hardware combination with batch A, B or C pistons (VUYPA, VUYPB or VUYPC) determine the final oil consumption result by applying the correction factor of 0.940 according to the following equation:

$$OC = \exp[(\ln(OC_{100-300}) \times 0.940)] \quad (30)$$

Where:

OC = final oil consumption

OC₁₀₀₋₃₀₀ = average oil consumption from 11.6.6

- (8) For all tests using the VXYPD hardware combination determine the final oil consumption result by applying the correction factor of 0.926 according to the following equation:

$$OC = \exp[(\ln(OC_{100-300}) \times 0.926)] \quad (31)$$

Where:

OC = final oil consumption

OC₁₀₀₋₃₀₀ = average oil consumption from 11.6.6

Report the data on the appropriate form.