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Item 4.7.1. of the provisional agenda

1958 Agreement:

Consideration of draft amendments

to existing UN Regulations submitted by GRPE

Proposal for Supplement 5 to the 03 series of amendments to UN Regulation No. 24 (Visible pollutants, measurement of power of C.I. engines (Diesel smoke))

Submitted by the Working Party on Pollution and Energy*

The text reproduced below was adopted by the Working Party on Pollution and Energy (GRPE) at its seventy-eighth session (ECE/TRANS/WP.29/GRPE/78, para. 37). It is based on ECE/TRANS/WP.29/GRPE/2019/6. It is submitted to the World Forum for Harmonization of Vehicle Regulations (WP.29) and to the Administrative Committee AC.1 for consideration at their June 2019 sessions.

* In accordance with the programme of work of the Inland Transport Committee for 2018–2019 (ECE/TRANS/274, para. 123 and ECE/TRANS/2018/21, Cluster 3.1), the World Forum will develop, harmonize and update UN Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

Supplement 5 to the 03 series of amendments to UN Regulation No. 24 (Visible pollutants, measurement of power of C.I. engines (Diesel smoke))

Paragraph 2.2., amend to read:

"2.2. "Net power" means the power of a C.I. engine as defined in annex 10 to this Regulation or in paragraph 2.3 of UN Regulation No. 85; "

Paragraph 2.7.1., amend to read:

"2.7.1. either the highest of the following three engine speeds:

- (a) 45 per cent of maximum net power speed,
- (b) 1000 rpm,
- (c) minimum speed permitted by the idling control,"

Paragraph 2.8.2., amend to read:

"2.8.2. "Hybrid electric vehicle (HEV)" means a vehicle that, for the purpose of mechanical propulsion, draws energy from both of the following on-vehicle sources of stored energy/power:

- (a) a consumable fuel
- (b) an electrical energy/power storage device (e.g.: battery, capacitor, flywheel/generator ...)"

Paragraph 4.1.5., amend to read:

"4.1.5. When determining the emission of visible pollutants the power and fuel consumption of the same engine submitted for approval shall be measured according to annex 10 to this Regulation or annex 5 to UN Regulation No. 85."

Paragraph 4.2.1.2., amend to read:

"4.2.1.2. An engine corresponding in all aspects to the description report in that annex 1 shall be submitted to the technical service for tests described in annex 10 to this Regulation or annex 5 to UN Regulation No. 85. Such tests shall only be carried out on the test bench,"

Paragraph 7.3., amend to read:

"7.3. Irrespective of these classifications in paragraph 7.2. a new approval, with tests, i.e. classification (1), will automatically be required unless the engine also respects the following conditions:

- (a) Maximum rated speed not greater than 100 per cent nor less than 75 per cent of that of the engine in the approval test,
- (b) Minimum rated speed not less than that of the engine in the approval test,
- (c) Torque rating not greater than 100 per cent, nor less than 70 per cent of that of the engine at that speed in the approval test,
- (d) Steady state absorption values are not greater than 1.1 times the values obtained in the approval test and do not exceed the prescribed limits in annex 7,

- (e) Exhaust back pressure not greater than that of the engine in the type approval test,
 - (f) Exhaust system volume does not differ by more than 40 per cent,
 - (g) Intake depression not greater than that of the engine in the type approval test,
 - (h) Moment of inertia of a new combined flywheel and transmission is within 15 per cent of the engine flywheel and transmission system approved.
- ..."

Paragraph 15.3.1., amend to read:

"15.3.1. The installation of the engine shall respect in particular the following limitations with respect to the type approval of the engine:

- (a) Intake depression shall not exceed that of the type approved engine
- (b) Exhaust back pressure shall not exceed that of the type approved engine
- (c) Exhaust system volume is within ± 40 per cent of the type approved engine
- (d) Moment of inertia of the combined flywheel and transmission is within ± 15 per cent of the type approved engine."

Annex 1, Paragraph 8.5.1., amend to read:

"8.5.1. Test on bench

Declared powers at the points of measurement referred to in Annex 4, paragraph 2.2. to this Regulation, shall be stated in Table 1.

Table 1

Declared speeds and powers of the engine/vehicle² submitted for approval (Speeds to be agreed with the test authority)

| <i>Measurement points</i> ⁵ | <i>Engine speed: n [rpm]</i> | <i>Power: P * [kW]</i> |
|--|------------------------------|------------------------|
| ... | ... | ... |
| ... | ... | ... |
| ... | ... | ... |
| ... | ... | ... |
| ... | ... | ... |

⁵ See Annex 5, paragraph 2.2.

* Net power according to Annex 10 to this UN Regulation or Annex 5 to UN Regulation No. 85."

Annex 2, Paragraph 11.1.1., amend to read:

"11.1.1. Tests at steady speeds: Vehicle on roller dynamometer/engine on test bench ²

| <i>Measurement points</i> | <i>Engine speed n [rpm]</i> | <i>Power P [kW]</i> | <i>Nominal flow G [litres/sec]</i> | <i>Measured absorption values [m⁻¹]</i> |
|---------------------------|-------------------------------------|-----------------------------|--|--|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |
| 6 | | | | |

"

Paragraph 11.1.2.1., amend to read:

"11.1.2.1. Engine test in accordance with Annex 5 ³

| <i>Percentage of Maximum [rpm] ⁴</i> | <i>Percentage of maximum torque at rpm stated [m⁻¹]</i> | <i>Measured absorption value [m⁻¹]</i> | <i>Corrected absorption value [m⁻¹]</i> |
|---|--|---|--|
| 100 | 100 | | |
| 90 | 100 | | |
| 100 | 90 | | |
| 90 | 90 | | |
| 100 | 80 | | |
| 90 | 80 | | |

⁴ The lower limit may be that stated by the manufacturer in accordance with this Regulation, part I, paragraph 6.3.4."

Annex 4, add new paragraph 3.1.6., to read:

"3.1.6. Alternatively and regardless of the requirements set out in paragraphs 3.1.4. and 3.1.5., at the request of manufacturer, the power of the engine can be measured in accordance with annex 5 to UN Regulation No. 85."

Renumber paragraphs 3.1.6., to 3.1.7. and 3.1.7. to 3.1.8.

Add new paragraph 3.3.3., to read:

"3.3.3. Alternatively and regardless of the requirements set out in paragraphs 3.3.1. and 3.3.2., at the request of manufacturer, the provisions of annex 5 to UN Regulation No. 85 can be used."

Amend paragraph 4.1., to read:

"4.1. For each of the engine speeds at which the absorption coefficient is measured pursuant to paragraph 2.2. above, the nominal gas flow shall be calculated by means of the following formulae:

(a) for two-stroke engines $G = V.n/60$

(b) for four-stroke engines $G = V.n/120$

in which:

G = nominal gas flow, in litres per second (l/s)

V = cylinder capacity of the engine, in litres (l)

n = engine speed, in revolutions per minute (min^{-1})"

Annex 7, amend to read:

"Annex 7

Limit values applicable for the test at steady speeds

| <i>Nominal flow G</i> <i>[litres/second]</i> | <i>Absorption coefficient k</i> <i>[m^{-1}]</i> |
|--|---|
| 42 | 2.26 |
| 45 | 2.19 |
| 50 | 2.08 |
| 55 | 1.985 |
| 60 | 1.90 |
| 65 | 1.84 |
| 70 | 1.775 |

| <i>Nominal flow G</i> <i>[litres/second]</i> | <i>Absorption coefficient k</i> <i>[m⁻¹]</i> |
|---|--|
| 75 | 1.72 |
| 80 | 1.665 |
| 85 | 1.62 |
| 90 | 1.575 |
| 95 | 1.535 |
| 100 | 1.495 |
| 105 | 1.465 |
| 110 | 1.425 |
| 115 | 1.395 |
| 120 | 1.37 |
| 125 | 1.345 |
| 130 | 1.32 |
| 135 | 1.30 |
| 140 | 1.27 |
| 145 | 1.25 |
| 150 | 1.225 |
| 155 | 1.205 |
| 160 | 1.19 |
| 165 | 1.17 |
| 170 | 1.155 |
| 175 | 1.14 |
| 180 | 1.125 |
| 185 | 1.11 |

| <i>Nominal flow G</i> <i>[litres/second]</i> | <i>Absorption coefficient k</i> <i>[m⁻¹]</i> |
|---|--|
| 190 | 1.095 |
| 195 | 1.08 |
| 200 | 1.065 |

Note: Although the above values are rounded to the nearest 0.01 or 0.005, this does not mean that the measurements need to be made to this degree of accuracy.

Annex 10, paragraph 5.1.2., amend the text to read (the table remains unamended):

"5.1.2. Auxiliaries to be removed

Certain vehicle accessories necessary only for the operation of the vehicle and which may be mounted on the engine shall be removed for the test. The following non-exhaustive list is given as a sample.

- (a) Air compressor for brakes;
- (b) Power steering compressor;
- (c) Suspension compressor;
- (d) Air-conditioning system.

Where accessories cannot be removed, the power they absorb in the unloaded condition may be determined and added to the measured engine power.

..."
