Transmitted by the experts from IMMA

Informal document GRBP-71-19-Rev.1
(71st GRBP, 28-31 January 2020, agenda item 2)

R41 ASEP Revision
### History:

<table>
<thead>
<tr>
<th>Starting point for the R51 revision:</th>
<th>Starting point for the R41 revision:</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRB-64-16 (FR) with the result of a questionnaire to CP’s, NGO’s and manufacturers about ASEP in R51 &amp; R41.</td>
<td>GRB-67-03 (DE) “Problems with noise emissions from L-cat”</td>
</tr>
<tr>
<td>Conclusion (slide 15):</td>
<td>Identified areas of concern:</td>
</tr>
<tr>
<td>- Lot of comments on ASEP for ECE51.03. Further work is needed.</td>
<td>- NORESS</td>
</tr>
<tr>
<td>- Only few comments and questions on ASEP for ECE41.04. It seems that no need for further work</td>
<td>- “Grey Areas” (=flaps) in UNECE</td>
</tr>
</tbody>
</table>

IWG ASEP established for R51 revision

IMMA started working on a revised R41 ASEP test procedure, independently from IWG ASEP
Revision Focus: Real Driving

- Test range expanded
- Grey areas covered = aggressive exhaust flap controls avoided
- Covers any acceleration, in any mode
- Mandatory for Type Approval
Expanded ASEP test range:

New ASEP engine map coverage

ASEP’s enlarged rpm & speed range increases the engine map coverage

ASEP test range covers ~69% of real world conditions. Remaining conditions are in non-critical areas: low rpm, highway speeds

With the expanded test range, ASEP now has have major coverage of conditions possible in real driving
## ASEP comparison:

<table>
<thead>
<tr>
<th></th>
<th>R41/04</th>
<th>R41 new ASEP proposal</th>
<th>R51 new ASEP proposal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Speed range</strong></td>
<td>20 – 80 km/h</td>
<td>10 – 100 km/h (for PMR ≥ 150)</td>
<td>0 – 100 km/h</td>
</tr>
<tr>
<td><strong>Max rpm</strong></td>
<td>3.4 * PMR⁻⁰·³³ * (S – n_idle) + n_idle</td>
<td>0,8 x S (= increased)</td>
<td>0,8 x S (= increased)</td>
</tr>
<tr>
<td><strong>Gears tested</strong></td>
<td>Fixed gear (not including 1st)</td>
<td>Any gear (including 1st)</td>
<td>Any gear (including 1st)</td>
</tr>
<tr>
<td><strong>Throttle operation</strong></td>
<td>WOT only</td>
<td>Any constant throttle</td>
<td>Any constant throttle</td>
</tr>
<tr>
<td><strong>Approach (pre AA’)</strong></td>
<td>Constant speed</td>
<td>Any approach (constant speed, acceleration, deceleration)</td>
<td>Constant speed</td>
</tr>
<tr>
<td><strong>Applicability</strong></td>
<td>All (PMR&gt;50)</td>
<td>All (PMR&gt;50)</td>
<td>Vehicles with flap systems or sound generators</td>
</tr>
<tr>
<td><strong>ASEP limits</strong></td>
<td>Established for R41/04 based on fleet data</td>
<td>Established for R41/04 based on fleet data</td>
<td>ASEP sound expectation model</td>
</tr>
</tbody>
</table>

**IMMA’s approach for ASEP revision**: Expand current test range = straightforward & ready for implementation
Current R41 ASEP WOT Test:

“constant speed“ approach

measurement area

approach AA’ at constant speed

V_{test} +/− 1 kph

v_{max} @ BB’

L_{max}

WOT Only

throttle operation

speed / rpm

[%, [km/h]]
Proposal for a Revised R41 ASEP (example 1):

Any constant throttle

approach AA’ at variable speed

$v_{\text{test}} \pm [5] \text{ km/h}$

$\%$, [km/h]

pre-measurement area  measurement area

„real driving“
Proposal for a Revised R41 ASEP (example 2):

Any constant throttle operation (could also be WOT)

approach AA’ at variable speed

v_{test} +/- 5 km/h

v_{max} @ BB’

pre-measurement area

measurement area

„real driving“
IWG ASEP different approach for R51:

IMMA is aware that the R51 proposal is introducing a new approach based on a sound expectation model.

IMMA’s preliminary investigation of this (car-based) model reveals that substantial modifications are necessary for the model to be suitable for motorcycles.

To cover for the motor-cycle specific characteristics (less tyre noise but more mechanical noise due to exposed engine, shorter and exposed exhaust, chain drive, different transmission & clutch, ...), at least following items need adjusting:

- Tyre noise calculation,
- Mechanical no load,
- Partial load transient functions (e.g. form factor $\alpha$)
- Dynamic load slopes,
- Performance factor $v \times a$,
- Motorcycle (R41) specific formulas needed for $A_wotref$, $A_{urban}$, $N_{max}$, ...

- The R51 model approach in its current from is not suitable for motorcycles.
- IMMA requests adequate time to investigate the necessary adjustments for potential future application on motorcycles.
- Until that time, implementing IMMA’s ASEP proposal as a 1st step will already solve the existing ‘grey zones’ in current R41 ASEP test procedure.
Thank you.