Report
GRB ad hoc Working Group
ASEP

issued by the Chairman of the ASEP WG
GRB 50; September 2009
Reminder: why ASEP

- Annex 3 covers the part of the engine map with lower revs

- Decision made to have Additional Sound Emission Provisions to cover a wider part of the engine map (higher revs).
3. The informal group shall develop a complementary test method and evaluation criteria for insertion into Annex 10. The complementary test method shall cover the noise emission under higher engine speeds and loads than the proposed procedure in TRANS/WP.29/GRB/2005/5, as amended.
Meetings: (20)

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Why did it take so long?

- Period of denial by Industry
- Seeking and shaping, three different methods
- Stringency discussion
- Struggle for every dB(A)
Why did it take so long? (2)

Please mind:

Annex 3 was a discussion for 6 years, limits still to be discussed

Annex 3 only one point in the engine map

ASEP is covering a wide area of the map

*If someone says: annex 10 is ……*
Reminder from last report to GRB

Remaining work to be done:
1. Fine tuning method (CVT’s, Hybrids)
2. Finalize Wording
3. Stringency and Limitation
Results, Deliverables (1)

Acceptance of ASEP
Database and analyses
Stringency Analysis
An unanimous proposal to improve Annex 3 (by skipping border 2 m/ss – Formal NL)

A lot of other issues (like CVT’s, Hybrids, COP, Vmax, Higher gears)
Skipping border 2 m/ss

Major improvement quality ASEP

Anchor point towards the middle of the engine map

Improved capability to prescribe the sound behavior
Skip border 2m/s²
Formal NL Annex 3:

Supported by the group
No relevant changes for Limits Annex 3 (kp factor)

Effect: major improvement quality ASEP
ASEP in lower gears/higher revs
Anchor point towards the middle of the engine map
Deliverables

It should be a method
OUTCOME: NEGATIVE

NO FINAL PROPOSAL ASEP METHOD
Deliverables (3):
Results of stringency discussion in the group

A method as developed/proposed by OICA, supported by several members of the working group, without limitation.

A proposal by The Netherlands, with a limitation
Method ADBO

ADBO=As Developed By OICA

Lwot Annex 3 is basis
Add margin and bonus → anchor point

Slope fixed: x dB * 1000 revs
Method NL

Same anchor point (marginal difference)
Also margin and bonus

Difference:
Slope to Not To Exceed level (NTE)
Main Difference: Level Stringency

ADBO:
Slope border line: x dB times 1000 revs

NL
Slope border line:
Line to ‘Not to Exceed Level’
Next Deliverable: Stringency issue

Raised by several members
Analyses done by small group

Key issues
1. Comparison with old limit
2. Maximum allowed noise level
“After studying the proposal TNO concluded that the present proposal will result in a very undesirable situation: compared to the R51.02 regulation that is currently in use and also is based on an acceleration test, the OICA proposal will result in an extra driveline noise allowance for most vehicles, which can reach up to 10 dB with an average of about 3 dB.”
Issue raised: Germany

- Document GRBIG 13.008 (Germany)
  - “The OICA method allows vehicles to become more noisy in the future compared to the current method”
Stringency:

Two aspects
  – limit
  – area of control (boundary conditions)

Two regulations
Annex 3
Annex 10
Factors influencing stringency

A table has been made summing up the most important factors. In rank order:

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Follow Up Stringency

Annex 3: proposal by the whole group

Annex 10:
no support in ASEP group to work on it

→

NL felt obliged to have their own proposal, to provide GRB with an alternative
Positions of IG ASEP delegates

Limitation ADBO Method

• Preliminary guesses for ASEP coefficients have been given
  – SLOPE: 5 to 7
  – MARGIN: 2 - 3
  – EDGING: 1 – 1,5

• The group agreed that additional analysis is necessary to judge the stringency
EDGING

• ADBO method: new element
• No decision by the group
• Edging = extra slope
• Slope 7, Edging 1,5
  → real slope = 8,5 dB/1000 revs (OICA pref.)

Please note:
Edging intended to improve limitation curve
Means lower slope and lower margin
Without those: it’s only a weakening
Limits ASEP <-> Limits Annex 3

- A table has been made summing up the most important factors. In rank order:

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ASEP <-> Future Limits Annex 3 (2)

Strong connection

Limits annex 3 in evaluation

**Option:**
Decision together
Fine tuning ASEP on limits Annex 3
Follow Up

My understanding:

Methods ready
Mr Theis: limitation up to GRB

So group is finished (?)
THANK YOU
Follow Up?

• The group agreed that additional analysis is necessary to judge the stringency
Control range

- Vehicle speed $v < 80 \text{ km/h}$
- Acceleration $a < 4 \text{ m/s}^2$
- Engine speed $n < 2,0 \cdot \text{pmr}^{-0.222} \cdot \text{s}$
System: how it works
step 1: anchor point

Anchor point in gear i comes from Annex 3 \( (L_{\text{wot,i}}, n_{\text{BB,i}}) \)
System: how it works
step 2: ASEP measurements

4 additional measurements in gear i within boundaries
System: how it works
step 3: construction of slope

Calculate slope through measurements
Slope is maximized to $X$ dB/1000 rpm; $X$ determines stringency (to be agreed on)
System: how it works
step 4: add bonus to anchor point

Bonus = \text{Limit}_{A3} - \text{L}_{urban,A3} \quad \text{(bigger for silent vehicles)}
a little clarification on the bonus

• The agreed starting point for the ASEP limit curve (= anchor point + bonus) is actually equal to the limit of Annex 3 (with a small correction of 2 a 3 dB(A) for the gear and the throttle position as used in ASEP compared to Annex 3)

• Anchor point = \( L_{wot,i} \) (at \( n_{BB,i} \))
• Bonus = \( \text{Limit}_{A3} - L_{\text{urban},A3} \)

• Anchor point + Bonus = \( L_{wot,i} + \text{Limit}_{A3} - L_{\text{urban},A3} \)
• Anchor point + Bonus = \( \text{Limit}_{A3} + L_{wot,i} - L_{\text{urban},A3} \)
• Anchor point + Bonus = \( \text{Limit}_{A3} + (L_{wot,i} - L_{\text{urban},A3}) \)
• Anchor point + Bonus = \( \text{Limit}_{A3} + \) correction for gear and throttle
System: how it works
step 5: limit line

Limit = anchor point + bonus + margin Z + slope X + Edging Y

Parameters X, Y and Z determine stringency (to be agreed on)
System: how it works
step 6: compare measurements to limit

Every measurement from step 2 is checked against limit...
System: how it works
step 7: repeat in other gears

• In principle all gears and modes have to fulfill ASEP, however
  – Gears higher than i+1 are exempted
  – Gear 1 likely to be skipped due to engine speed overrun within test track
  – In practice mostly only gear 2 and 3
  – Gear i and i+1 have different limits
  – Limit gear i applies also for gear i-1 i-2 etc