Category(ies) of vehicle : M & N

Database assessment
Simulation
Lit. Study

(OICA/ACEA/ATEEL) STUDY ON FUTURE SOUND LIMIT VALUES FOR TYPE APPROVAL FOR VEHICLES OF CATEGORY M & N

SOUND LIMITS
VEHICLE SOUND
TYRE ROAD NOISE
MARKET PENETRATION
ALTERNATIVE
ABATEMENT MEASURES

MAIN MESSAGES FROM THE PRESENTATION(S)

- The sound levels of new vehicles have decreased, but the effect on road traffic noise is delayed due to the market penetration of new vehicles.
- Reducing vehicle sound level limit values without significant improvements of tire/road noise would not provide the desired improvement in real driving conditions and thus introduction of limit values beyond phase 3 is regarded as technically unachievable given the current state of technology. The tyre is a key component for safety, energy consumption, noise and traction as well as handling performances.

SUMMARY

The study was conducted by ATEEL on request of OICA/ACEA.

- The study assesses the vehicle sound emission levels and evaluates the potential and feasibility of limit value reduction.
- It also translates the limit value reductions under type approval conditions to real road traffic conditions and estimates the efficiency of the defined reductions – scenarios – and compares the effect to alternative measures (**chapter 3**).

The minimum L_{urban} values of some vehicle categories – e.g. M1 and N1 – have not improved despite the introduction of alternative propulsion technologies, suggesting the feasibility limit has been reached. The introduction of alternative propulsion technologies to categories that are tested under the “truck principle”, whereas $L_{urban} = L_{wot}$, show a considerable benefit (**chapter 2**).

The dominant partial sound source varies over the complete vehicle speed range in all real-world traffic situations; the crossing point speed(s) varies over vehicle categories and propulsion types while tires dominate at higher speeds and propulsion at lower speeds (**chapter 4**). The sound emission levels of heavy commercial vehicles in low-speed traffic (and over short distances) benefit from the transition into electric propulsion.

The impact and efficiency of reduced type approval values as well as alternative measures were investigated by an in-house simulation tool. A potential increase of traffic volume over time, which may hamper the improvement of the road traffic noise, was not considered. It would only shift the absolute level of the calculated sound and would not change the message, because the delta (improvement) remains identical. Electric propulsion shows potential in lowering the sound emission of certain vehicle categories at low speeds, e.g. city buses. This could be beneficial for certain vehicle categories. However, AVAS (Acoustic Vehicle Alerting System) may deteriorate this benefit for some categories, e.g. M1. At high speeds, Electric Vehicles provide no benefit over ICE (Internal Combustion Engine) vehicles due to the dominance of tyre/road interaction. (**Chapter 5**) Other measures that influence the traffic flow have immediate effect on road traffic noise, e.g. lowering the speed limit.

The tire/road contribution will be the dominant sound source while entering phase 3 (**chapter 7**). The realistically available technologies for individual vehicle classes must be considered including the entire range of applications so that sensible concepts are not excluded from the market.

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The effect of phases 2 and 3 as well as new and future alternative propulsion technologies should be awaited and analyzed (chapter 7.3.3).

- "Recommendations:
    - Further reductions of limit values in Regulation No.51 only achievable assuming improvements on the quietest available tyres, without sacrificing safety performance attributes.
    - Before determining new limit values, the improvements achieved by limit phases 2 and 3 should be evaluated in real traffic after the compliance of a sufficiently large proportion of the fleet is reached
    - Numerous available alternative measures are proposed to significantly reduce the overall sound level (e.g. speed limits, silent road surface asphalt, geofencing, …) impacting all vehicles with immediate effect.
    - A widespread use of quieter tyres would be recommended as improvements in real traffic would be immediately effective under all boundary conditions and for all vehicles.
    - The application of AVAS should be monitored in order to restrict configurations being louder than necessary.
    - Niche and special purpose/emergency vehicles shall not be neglected in new draft legislations in order to ensure their continued existence."

- Further investigations possible such as
    - Impact of RD-ASEP on real traffic sound level
    - Influence of measurement uncertainty on vehicle development
    - Benefits of geofencing
    - Classification of road noise in the overall context

ADDITIONAL POINTS FROM DISCUSSIONS IN THE UN TF-VS

There is a potential difference between OEM tyres – used in Type approval testing – and after-market (replacement) tyres. This could lead to reduced benefits of new vehicles in real world driving than what to expect from the type approval testing. This should be considered.
The impact of the future RD-ASEP (Real Driving-Additional Sound Emission Provisions) has not been assessed whereas relevant data was not available.

REFERENCES

- TFVS-04-10 (OICA/ACEA/ATEEL): Intermediate presentation
- TFVS-07-03 (OICA/ACEA/ATEEL): Final report
- TFVS-07-04 (OICA/ACEA/ATEEL): Final presentation