Holistic approach for rolling noise mitigation

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Road Pavement Potential

Tyre influence compared to road and speed

Different roads with the same tyres measured in 7.5 m:

- 8-10 dB(A)

Vehicle speed from 80 to 50 km/h:

- 5-9 dB(A)

Tyre of same size and category:

- 2-3 dB(A)

Road and speed can be controlled locally where annoyance is shown through noise mapping (EU Dir 2002/49 in EUROPE)
Tyre Basics – Contribution to vehicle properties

**Safety**
- Braking (dry & wet)
- Aquaplaning

**Handling**
- Tyre characteristics
- High Speed

**Comfort**
- Mechanical comfort
- Acoustical comfort

**Economy**
- Mileage Performance
- Fuel Consumption

**Environment**
- C02 emissions
- Rolling Noise nuisance

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The European Tyre and Rim Technical Organisation
What are the interactions between tyre and road to produce the road / tyre / vehicle performances?

To what extent can tyre manufacturers, road manufacturers, and road owners act independently, or should they join their efforts to make progress on:

- **Emissions**: ROLLING RESISTANCE
- **Safety**: WET GRIP
- **Pollution**: NOISE
Noise mechanisms for tyre/road noise

- horn effect
- rotation
- beat of tread blocks
- macro roughness
- airpumping
- Stick-slip
- road texture impact
- road pavement influenced
- surface vibrations
- snap out of tread blocks
- mega roughness
- groove resonance

The European Tyre and Rim Technical Organisation
Tyre excitation

Pressure in the footprint on different road surfaces

- Depending on the roughness and the waviness of the road surface the tread pattern of the tyre or the road surface texture is predominating. An effective decrease of rolling noise without measures on road making is not possible.

Source: Meßdaten: Pullwitt, BASf, BMBF-Projekt Leiser Verkehr, 2003
Close proximity measurements: CPX

The use of Standard Reference Test tyres allows to classify road pavement for rolling noise emissions on a normative basis.
Between the noisiest tyre on the noisiest road surface (Tyre 16 on SMA 0/16) and the quietest tyre on the quietest road surface (Tyre 12 on Rollpave PERS), there is a noise difference of approximately 17 dB at both 50 and 80 km/h. Even between tyre 16 on the SMA 0/16 and tyre 12 on a more commonly used surface as the double layer PAC (section 16), there is a difference of 14-15 dB.

Truls Berge, Noise measurements of passenger car tyres at the Kloosterzande test track, 2011
The approach for efficient societal benefit for rolling sound emissions has to be considered on a global basis where the main actors are the pavement, the tyre & the vehicle.

Traffic flow management & driver behaviour need to be included in this global approach.

Tyre/road noise in real life is generated on a wide range of different road surfaces.
View on further works to be performed

- Need for regulations, harmonized procedures or policies for low noise pavements and other noise reducing measures; in particular, harmonised procedures for classification, check of conformity of production of road surfaces.

- Many solutions for noise reduction have been developed. Further noise reducing measures are needed for:
  - improving the mix design of the pavement
  - promoting the next generation for low noise surfaces
  - promoting low noise dense surfaces for urban areas
  - optimization of low noise concrete pavements, both technical and subjective (acceptability by the population)
  - sharing knowledge and experience
Thank you