Presentation of the new CEDR report on noise reducing pavements

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About the report

- Main purpose to make knowledge on noise-reducing pavements available to all the CEDR member states
- Knowledge to be implemented in road planning and road maintenance
- Based on collection of results from research and development
- A handbook presenting European state of the art in the mid-2010s
- Target group:
    - road engineers
    - planners
    - decision makers

The CEDR noise history

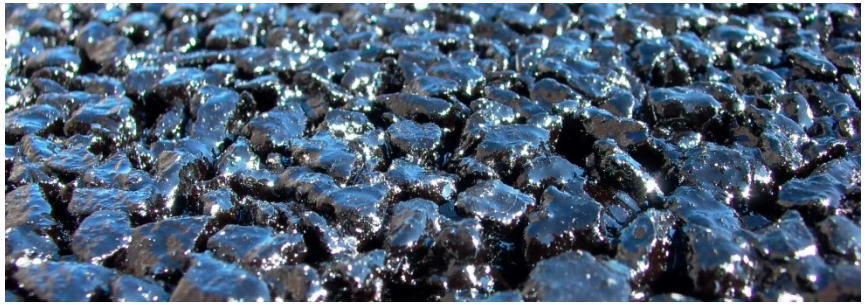
First task group road noise - 2010

- Consider use of noise-reducing pavements
- Noise as an active component in pavement management systems
- Development of noise labelling system can enhance the market
- Research in improved long-time durability and noise reduction

Second task group road noise - 2013

- Most cost-effective tool for noise abatement is reduction of the noise emissions from new vehicles and tyres – a task for EU

- Followed by the use of noise-reducing pavements – a task for Road Administrations



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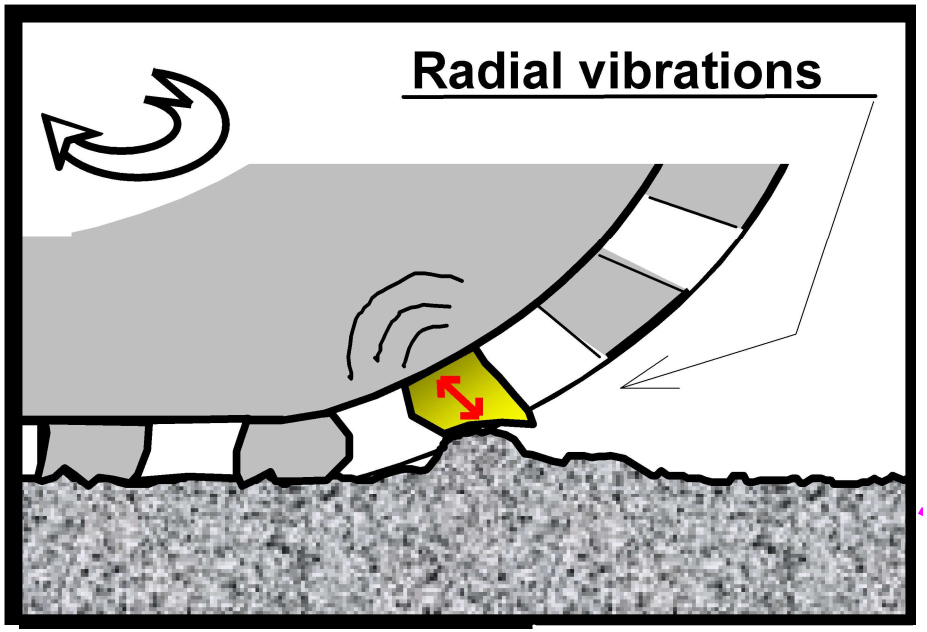
Vibration generated noise

- The texture of the surface makes tyre vibrate
- Low frequency

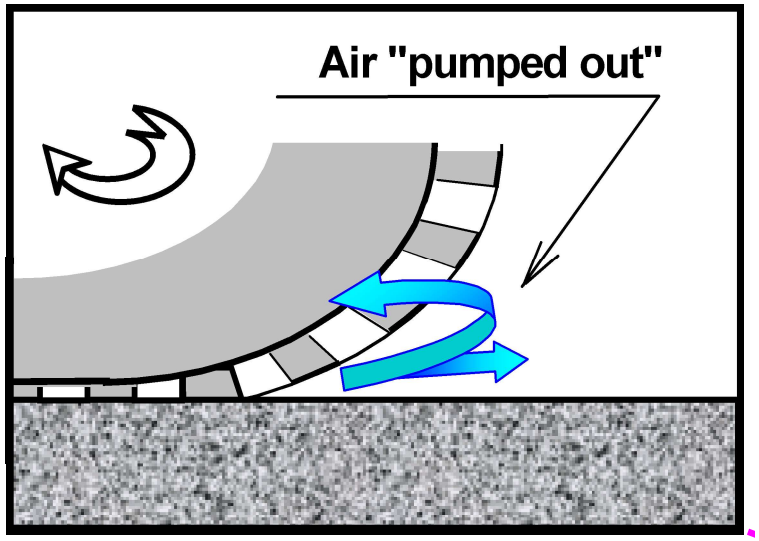
  under 1500 Hz

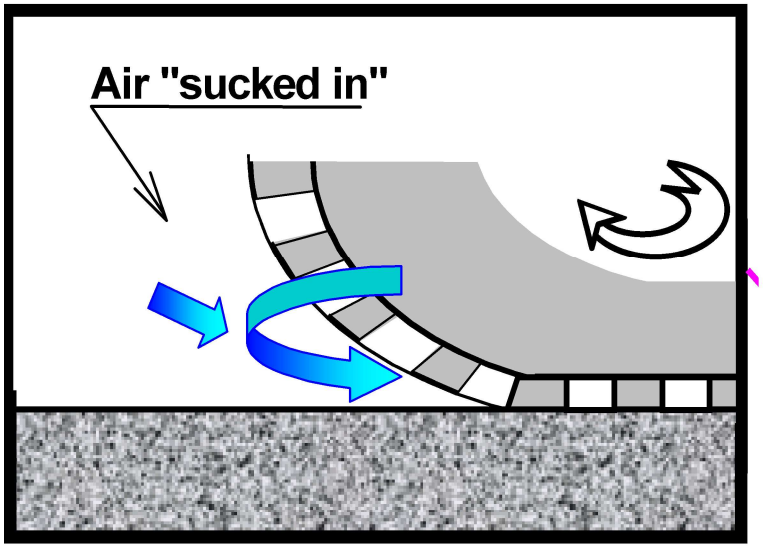


Air pumping noise

- Air is pressed out and in between the rubber blocks of the tyre
- High frequency

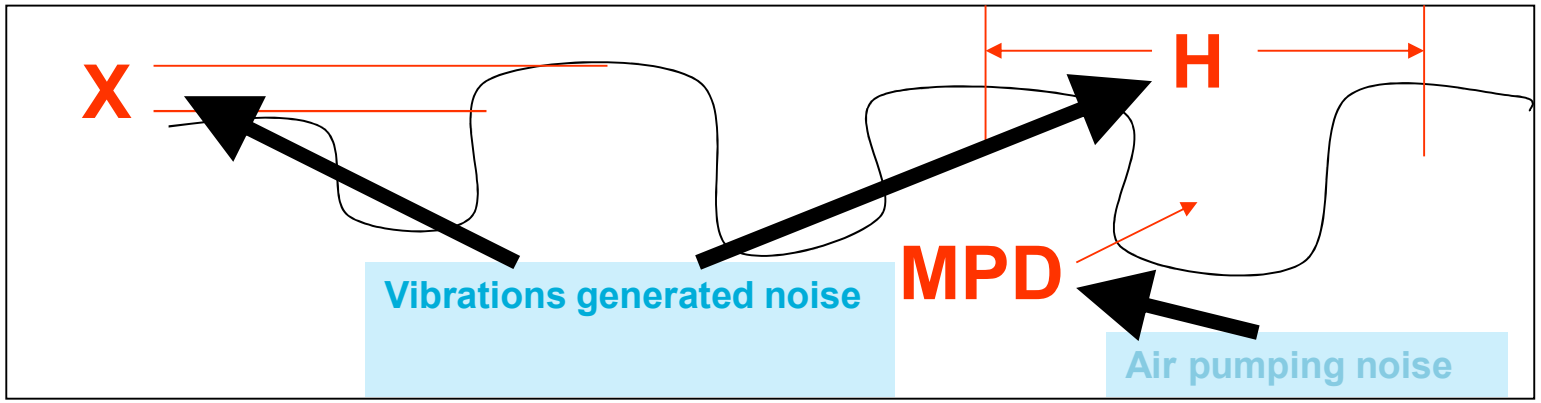
  over 1000 Hz





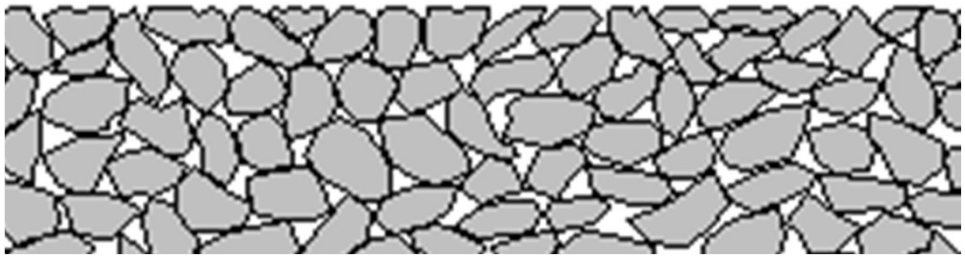
Optimization of noise reduction:

- The highest points of the surface same height. Reduce X
- Cubic aggregate and good compaction
- Distance between high points short. Reduce H
- Small aggregate size
- Holes in the surface as big as possible. Increase MPD
- Large built in air void



Porous asphalt

Open in the whole layer thickness



Thin layers

Only open in the top surface

Measurement of tyre road noise
CPX - Close ProXimity method

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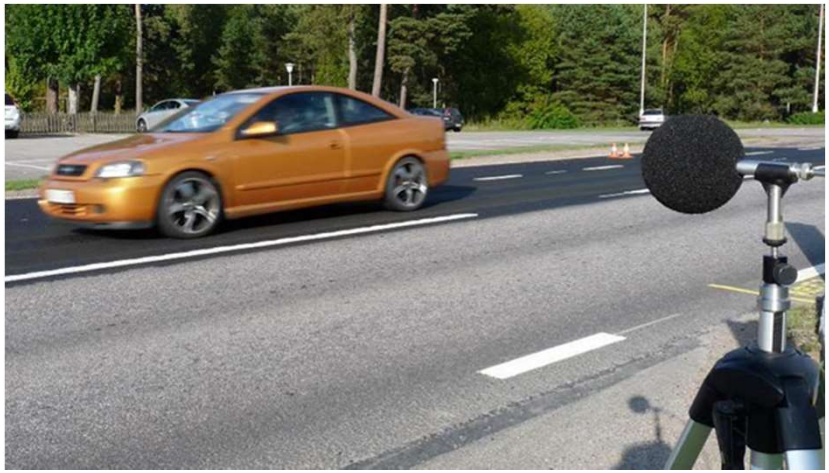
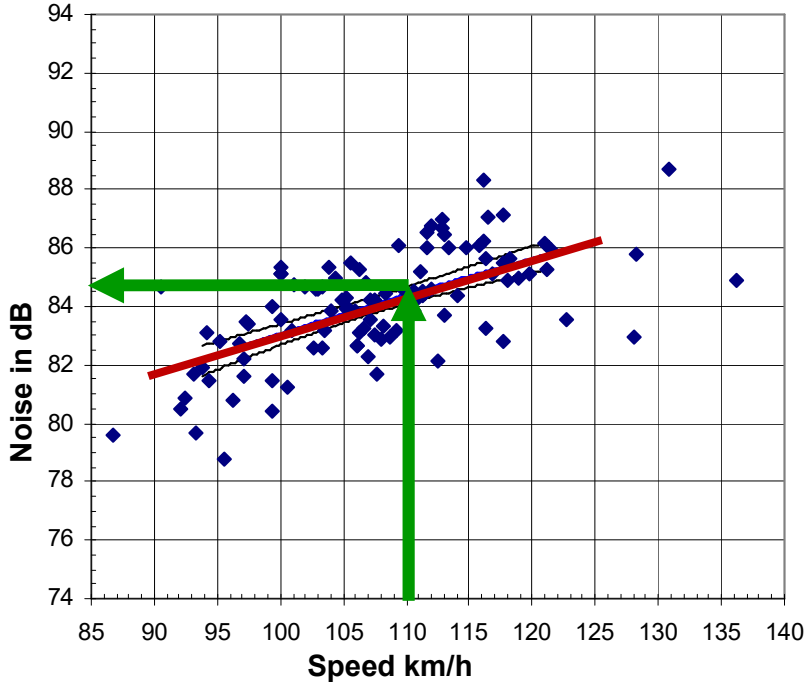
Measurement of tyre road noise
SPB - Statistical Pass By method





84.4 dB at 110 km/h at 20° C

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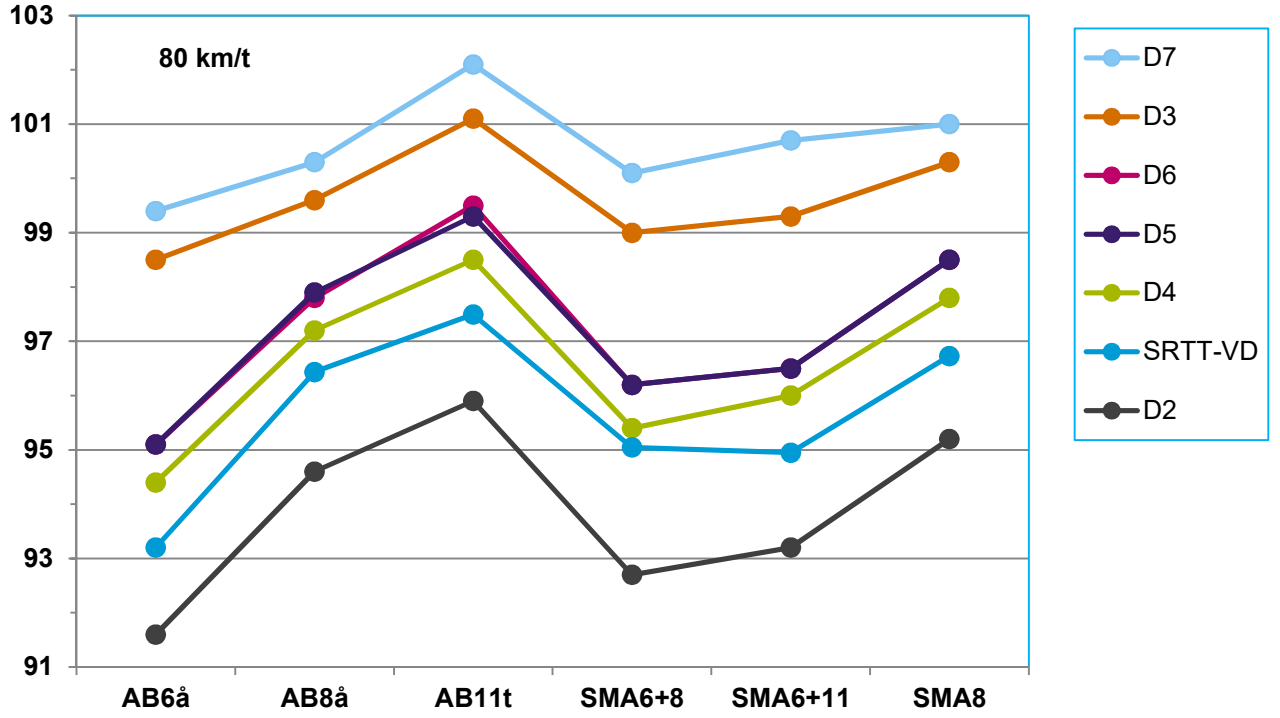
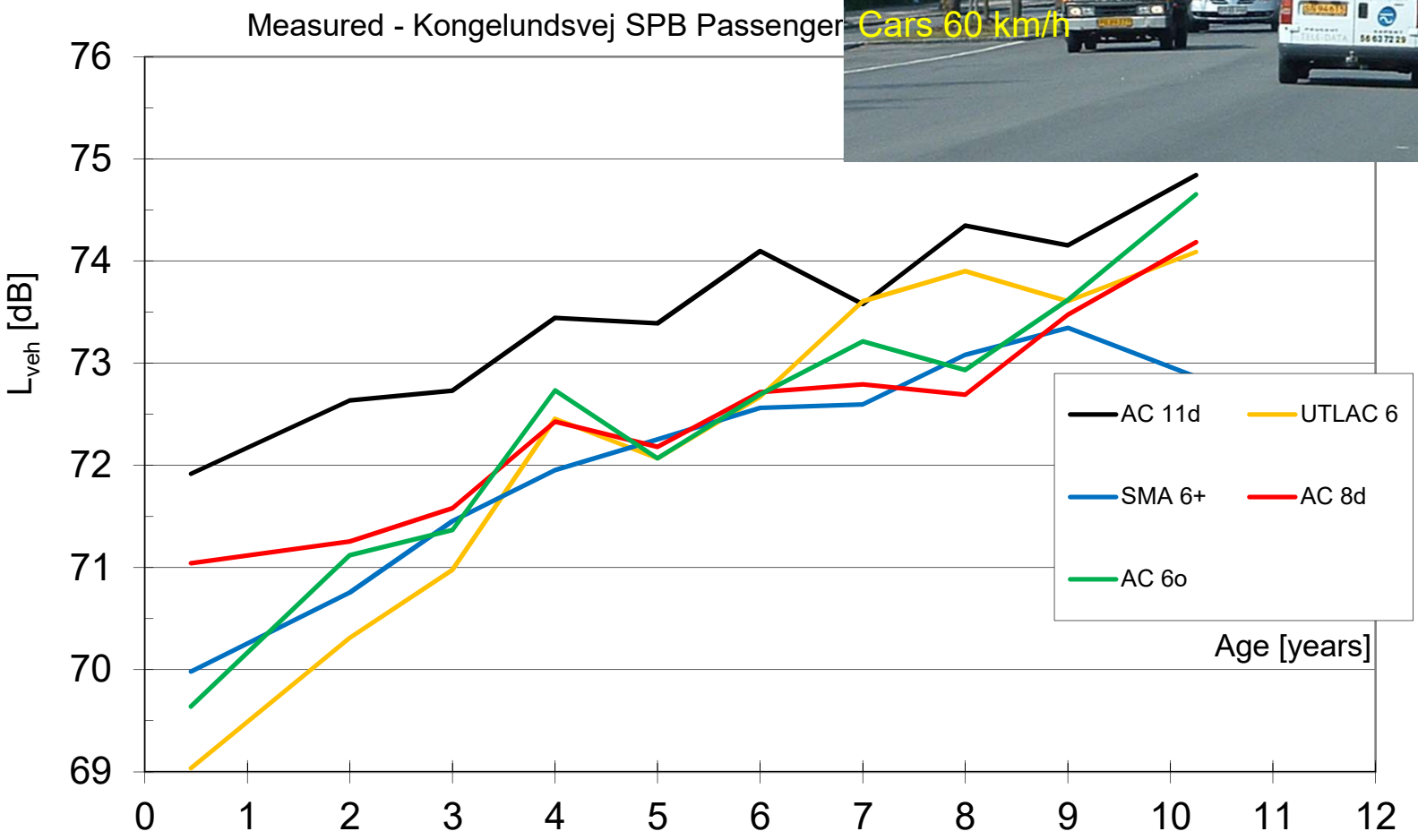
Tyres and noise



The aging of pavements and their noise emission



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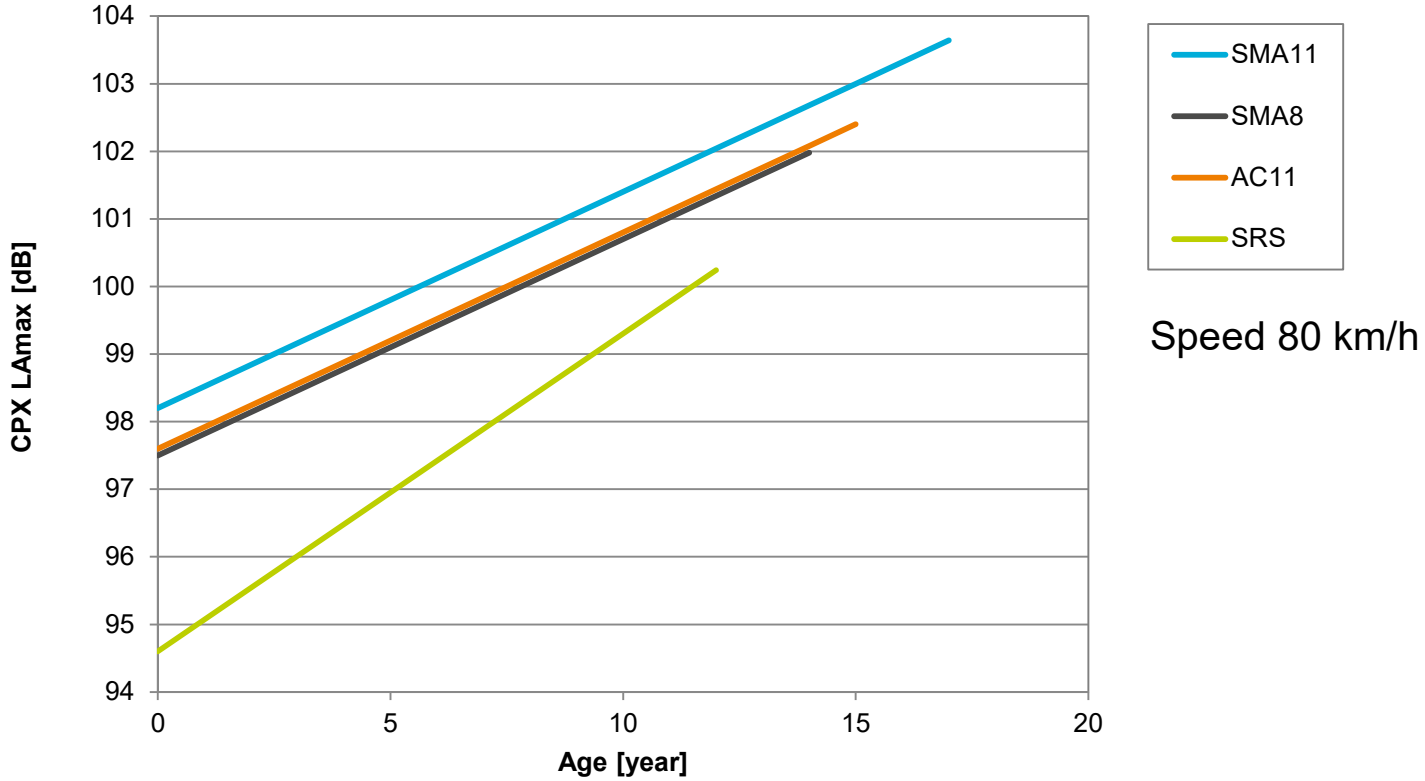
Aging of typical Danish pavements



Speed 80 km/h

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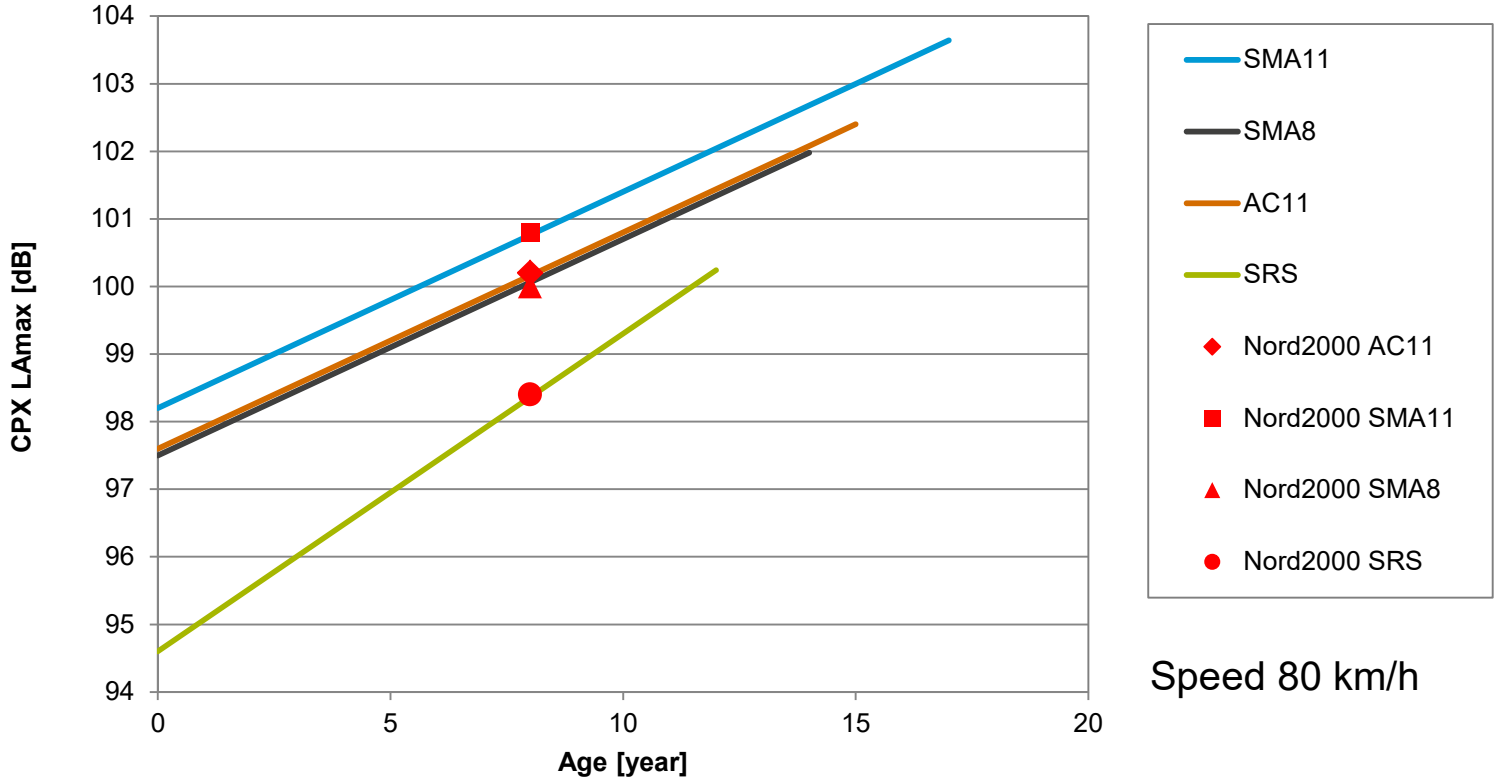
Noise emission Danish version Nord2000 prediction Method



Speed 80 km/h

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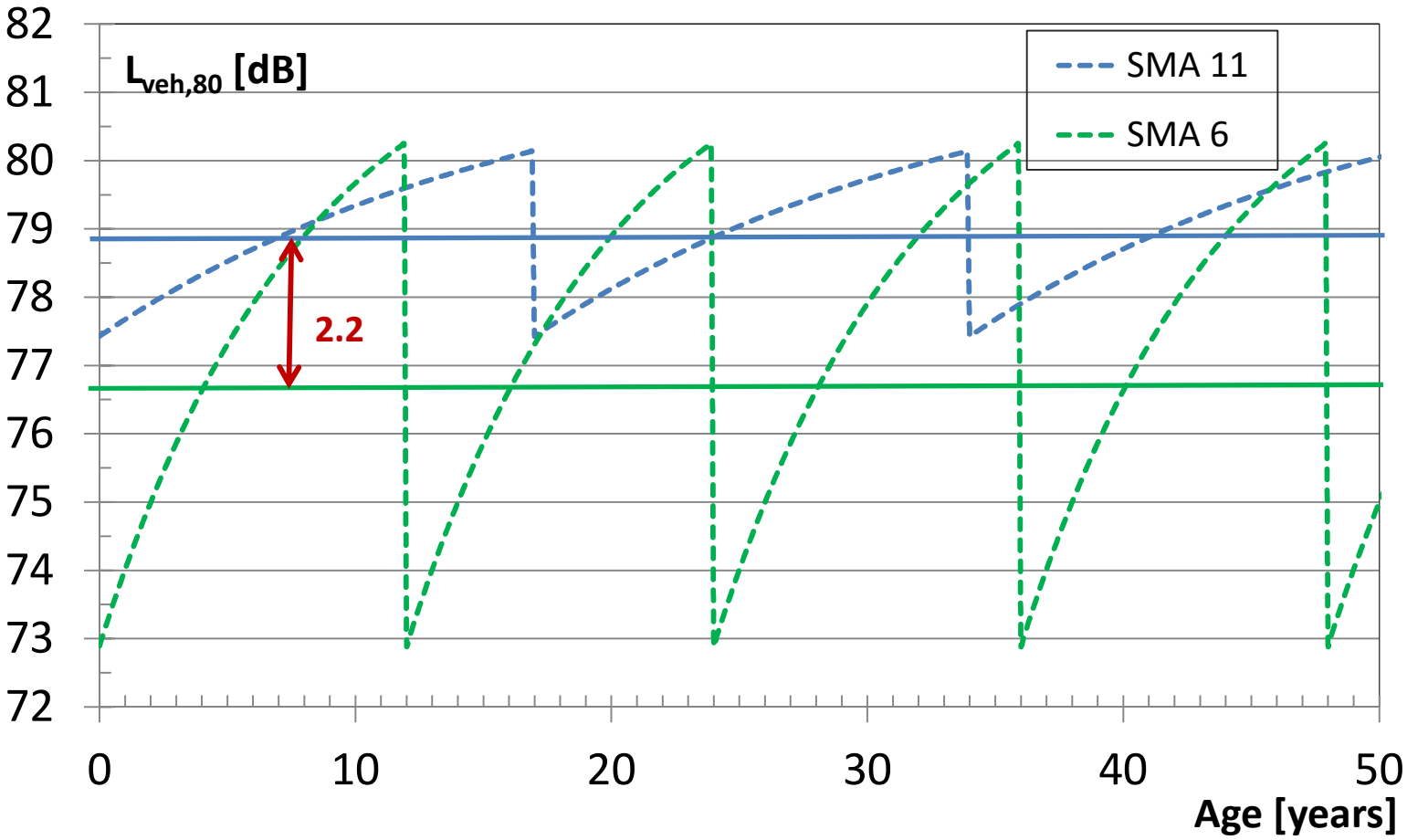
Constructed example

Development of noise over time for SMA 11 pavement and noise-reducing thin layer SMA 6 over a period of 50 years



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Relevant functionalities and factors:

1. noise reduction, and lifetime of noise reduction
2. rolling resistance (influence on energy consumption and CO_2 emissions)
3. friction (important for traffic safety)
4. drivers comfort (splash and spray), more silent inside vehicle
5. traffic safety (aqua planning, wet grip, splash and spray and visibility of road markings)
6. cost of pavement
7. lifetime of pavement
8. maintenance operations if needed
9. winter maintenance
10. restrictions on practical application on roads

Noise-reducing thin layer pavements

Functionalities and factors	Comments
Estimated lifetime average noise reduction for passenger cars	1 – 3 dB relative to AC 11 2.5 – 4.5 dB relative to SMA 16
Friction	Using smaller aggregates improves friction
Cost of pavement	Basic cost same as a standard pavement. If the sub layer in poor condition – new sub layer
Lifetime of pavement	A few years shorter than standard pavements
Restrictions on practical application on roads	Not suitable for road sections and intersections with turning forces caused by tyres

Porous asphalt

Functionalities and factors	Comments
Estimated lifetime average noise reduction for passenger cars	One layer porous asphalt: 2 – 4 dB relative to AC 11 3.5 – 5.5 dB relative to SMA 16 Two layer 1 to 2 dB extra
Traffic safety	Slight improvement caused friction and reduced splash and spray. Slight reduction caused by worsened conditions in winter time
Cost of pavement	Higher than standard pavements
Lifetime of pavement	A few years shorter than standard pavements
Winter maintenance	Complicated and challenging

Optimized cement concrete pavement

Functionalities and factors	Comments
Estimated lifetime average noise reduction for passenger cars	0 – 1.5 dB relative to AC 11 1.5 – 3.0 dB relative to SMA 16
Cost of pavement	Construction costs higher than with asphalt construction, through the long lifetime lower lifecycle costs

Poroelastic pavements

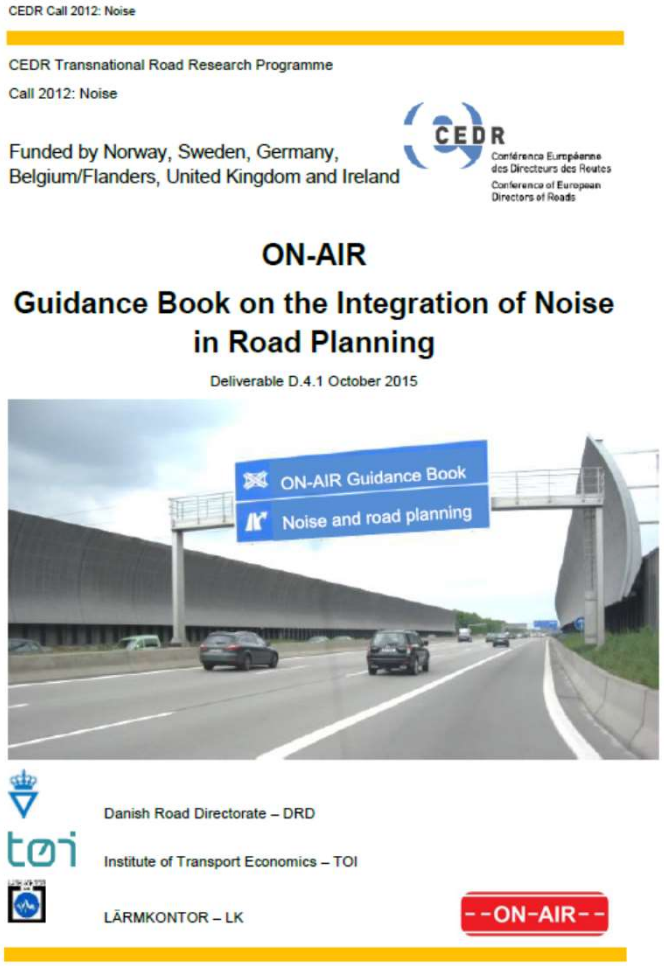
Functionalities and factors	Comments
Estimated lifetime average noise reduction for passenger cars	In the first year: 8 – 10 dB relative to AC 11 10 - 12 dB relative to SMA 16 no long-time measurement series
Friction	Friction over guidelines
Cost of pavement	Significantly higher than cost for porous pavements
Lifetime of pavement	Shorter than ordinary porous pavements

ON-AIR Guidance Book from CEDR

Tools and guidelines which can facilitate the integration of noise abatement in:

- Planning of new roads and motorways
- Planning of reconstruction and enlargement of existing roads and motorways
- Maintenance and management of existing roads and motorways

Includes noise reducing pavements at all stages



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Noise integration in the tendering process

1. Specify a pavement type such as a thin layer or a porous pavement, without control measurement of noise after application
2. National system of noise labelling of pavements produced by different contractors, without control measurement of noise after application
3. Noise reduction criteria in tendering for the initial noise, but no requirements for specific pavement types, with control measurement of noise after application
4. Noise reduction criteria in tendering for the initial noise, as well as the development of noise over time but no requirements for specific pavement types, with control measurement of noise every year