Content

• Experiences with porous asphalt types

• First generation of thin-layer noise-reducing wearing courses

• Danish involvement in the EU SILVIA project

• National “Noise Reduction Group”

• Noise classification system and specification for noise reducing wearing courses
Conclusion on porous asphalt

- Noise reduction of 3-4 dB(A) compared to DAC
- Structural lifetime app. 7 years. Optimisation needed
- Small aggregate size is better
- Average speed < 50 km/h no “self cleaning effect”
- Special winter maintenance
Conclusion on double layer porous asphalt

- Noise reductions up to 6.5 dB(A).
- Both engine and tyre/road noise are reduced
- Optimal solution PA8 on top PA16 or PA22 as the bottom layer
- Sensitive towards side way forces
- Needs cleaning, high-pressure water jetting
- Relatively expensive and requires a lot of planning and maintenance.
Historical development of noise-reducing wearing courses in Denmark

Thin-layer noise reducing wearing, optimisation of

- Ultra Thin Layer Asphalt Concrete
- Open graded asphalt concrete
- Stone mastic asphalt

Mainly focused on:

- Open surface texture
- Small amount of connecting voids
SILVIA

To avoid noise from air pumping:
- Open surface texture

To avoid noise from tyre vibrations:
- Very even surface
- As small max. aggregate size as possible
- As cubic aggregate as possible
- If possible an elastic pavement
SILVIA

- SMA 6+ seems to be a promising compromise
- Good skid resistance with small max. aggregate sizes
Needs

• Comparison of different pavements

• Reference, noise measurement, speeds etc.

Decision

• Standardisation by “National noise reduction working group”

• Participants from asphalt contractors, road authorities and consultants.
Results of the WG covered:

- Consistent measurement method, CPX_{DK}

- National reference values

\[
\begin{align*}
\text{CPX}_{DK} \text{ reference at } 50 \text{ km/h: } & 94.0 \text{ dB(A)} \\
\text{CPX}_{DK} \text{ reference at } 80 \text{ km/h: } & 102.0 \text{ dB(A)}
\end{align*}
\]

These values are established to represent an 8 years old dense graded 0/11 asphalt concrete or SMA
Historical development of noise-reducing wearing courses in Denmark

Classification and declaration of noise-reducing pavements

Noise reduction in dB(A)

Class A: Very good noise reduction \( x > 7.0 \)

Class B: Good noise reduction \( 5.0 < x < 7.0 \)

Class C: Noise reduction \( 3.0 < x < 5.0 \)
Historical development of noise-reducing wearing courses in Denmark

**SRS NOISE-DECLARATION**

<table>
<thead>
<tr>
<th>NOISE MEASUREMENT:</th>
<th>CPX - measurement at 50 km/h</th>
<th>CPX - measurement at 80 km/h</th>
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<tbody>
<tr>
<td>Declaration section</td>
<td>N/A</td>
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<td>Job Mix Formula</td>
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<td>CPC test results</td>
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<td>Production &amp; analysis</td>
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**JOB MIX FORMULA DETAILS:**

- Bitumen type: □ 40/50 – 60/80 □ 60/90 – 90/120 □ 260-330 – 330/430 □ Other (please specify)
- Aggregate source: □ Crushed gravel □ Other (please specify)
- Marshall stability: □ 0.1 mm □ 0.2 mm □ 0.3 mm □ 0.4 mm
- Gradation, % passing: 0.093 mm: 8 mm: 5.0 mm: 11 mm:

**Remarks:**

- Complies with SRS requirements for declaration of noise reducing surfacings in Denmark

This declaration is valid for 5 years
National Noise Classification has been published for different thin layer noise-reducing wearing courses such as UTLAC, SMA 8, SMA 6+ and OAC.
Status

- All Danish asphalt contractors have products in class C and B, some even in class A
- Noise classification system is accepted and used by clients and contractors
- Noise-reducing pavements is widely used on roads near residential areas
Perspective

- Model for development of traffic noise with time and traffic
- No further noise-reduction by means of traditional asphalt technology
- Optimization for ensuring longer duration of noise-reduction, longer structural durability as well as cost reductions
- Revise the noise classification system
Thank you for your attention

Obrigado pela vossa atenção