Porous Asphalt

Dutch experiences with Porous Asphalt pavements

Inge van Vilsteren
Rijkswaterstaat

Networks

Roads

Water management

Water

90 km², more than 85% Porous Asphalt
Effect of porous asphalt during rain
Noise reduction

In Netherlands Porous Asphalt (PA) used to:

Reduce Noise

(Dutch PA starting point = Single-layer PA16 is 4 dB(A)
Two-layer PA8 is 6 dB(A) relative to dense Asphalt Concrete)

Positive side effects
• No splash and spray (less traffic jams during rainfall)
• Negligible pollution of verge
• Comfort during rain
• No rutting
Standard Single-Layer Porous Asphalt

Mix composition of PA 16

Aggregate
On sieve  | desired | max. | min. |
--- | --- | --- | --- |
16.0 mm  |  | 0.0  | 7.0  |
11.2 mm  |  | 15.0 | 30.0 |
8.0 mm   |  | 50.0 | 65.0 |
5.6 mm   |  | 70.0 | 85.0 |
2.0 mm   |  | 85.0 |
0.063 mm |  | 95.5 |

Bitumen 70/100 | 5.2 % NO PMB USED

Remarks:
PA+ also contains a drainage inhibitor (fibers),
and a filler having 25% hydrated lime (Ca(OH)$_2$) → improves durability
Porous Asphalt (PA) layer

20% Air void. Stone skeleton 0/16 mixture
Two-layer Porous Asphalt

**Standard construction**
- 25 mm top layer 4/8
- 45 mm bottom layer 11/16

Application only if it is cost-effective noise reduction (i.e. saves costs of noise barriers)
Maintenance techniques for PA

PA (50 mm) replacement after 17 years on all lanes
Maintenance techniques for PA

Inlay PA (25 mm) after 11 years on slow lane

Raveling at the end of an inlay

Spay emulsion bitumen with rejuvenators
New PA mixtures (innovation)

Half-warm foamed PA16
Test sites laid in 2010, 2013, 2014 and more recent on RW31(2016) and A59 next weekend (2017)
• Production temperature 100 degree C
• 40% less energy is needed
• Saving of 25% CO2 during production
• Until now performance the same as hot PA

PA16 and TLPA with acrylic fibres
Serveral PA and TLPA test sites laid from 2003 to 2017
• Longer service life of PA is expected
• It is possible to lay TLPA with bitumen 70/100 without PMB’s
• Acrylic fibres reduces ageing and improves the resistance to erosion of the mortar bonding bridges.
Novel Maintenance techniques for PA
Rejuvenation after 7 years on most trafficked lanes
Costs (indication) per action
LCC comparison (fictive numbers)
Dutch experiences with Porous Asphalt pavements

• PA is our standard wearing course (reason: noise reduction)
• >85% of our motorways have silent pavements
• Initial noise reduction single-layer PA16 is 4 dB(A)/
  – two-layer PA8 is 6 dB(A)
• decrease of noise reduction of single layer PA is about 0.2 dB(A),
  – two-layer PA is about 0.33 dB(A) per year
• Ravelling is the most important cause of end of service life of PA16
• Average service life slow lane is 11 years/ fast lane is 17 years.
• Warranty period is 7 years for single-layer PA16(+) and 5 years for two-layer PA
• Promising innovations (Low temp. PA, Acrylic Fibres, Rejuvenation)