



Rijkswaterstaat
*Ministry of Infrastructure and the
Environment*

Rejuvenators in NL

1st EAPA workshop
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Dutch political goals

Rijkswaterstaat strategy on asphalt construction and maintenance based on:

Until recently

- Noise - Porous Asphalt on complete network
- Costs
- Availability (traffic Jams)

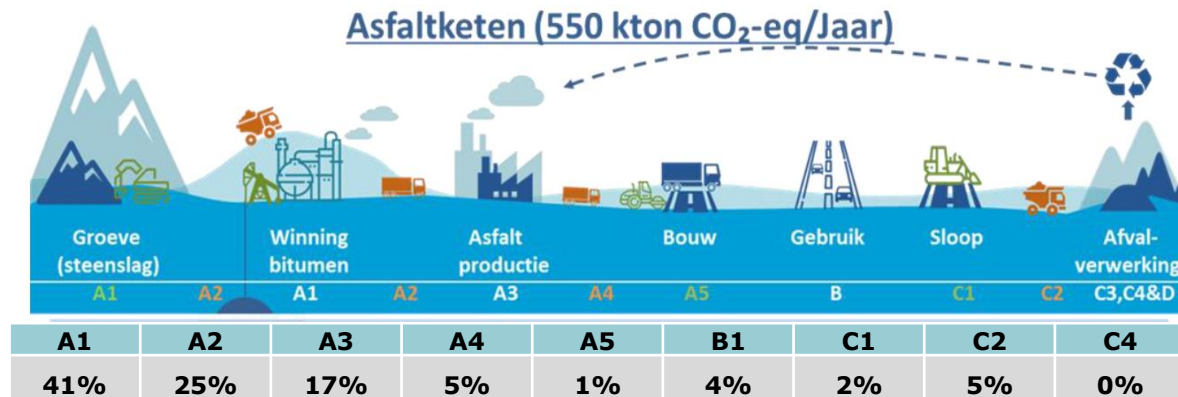
New political goals

- CO₂ reduction (50% in 2030)
- Reduction of Primair Materials (50% in 2030)



Rijkswaterstaat vision on Sustainable asphalt (CO₂&CE)

Cradle to gate approach



Main focus points:

- Recycling in top layer
- Production at low temperature
- Longer lifetime
- Alternative fuel in production
- Rolling resistance



Recycling PA in PA (and PA in AC)

- Rijkswaterstaat validation scheme for test sections with PA/AC $\leq 50\%$ RAP, and **no additives**:
 - Skid resistance
 - Mixing of old and virgin binder (afpelproof)
 - Penetration index
 - DSR
- Now validation requests for $> 50\%$ RAP with use of **additives**
 - Additional tests for additives, not yet decided



Additives

1. Several bitumen modifier companies in NL

- Cargill
- Latexfalt
- ESHA
- Kraton
- ...

2. Focus on Bio-based products

3. Test Sections

- Provincial roads
- 2019-2020 on Rijkswaterstaat roads



Benchmarking

Several studies mainly on AC-binder but also on PA

e.g. van der Wall e.a. Infradagen 2018 paper on AC

- Comprehensive comparison
- 70% PR AC binder
- Several bio-based binders ($> 0,1\%$ $< 0,2\%$)
- Measurements at binder and mixture level
- Virgin and aged (RTFOT +PAV)
- Functional analysis
- Compositional analysis



Benchmarking

Composition (Mixture)

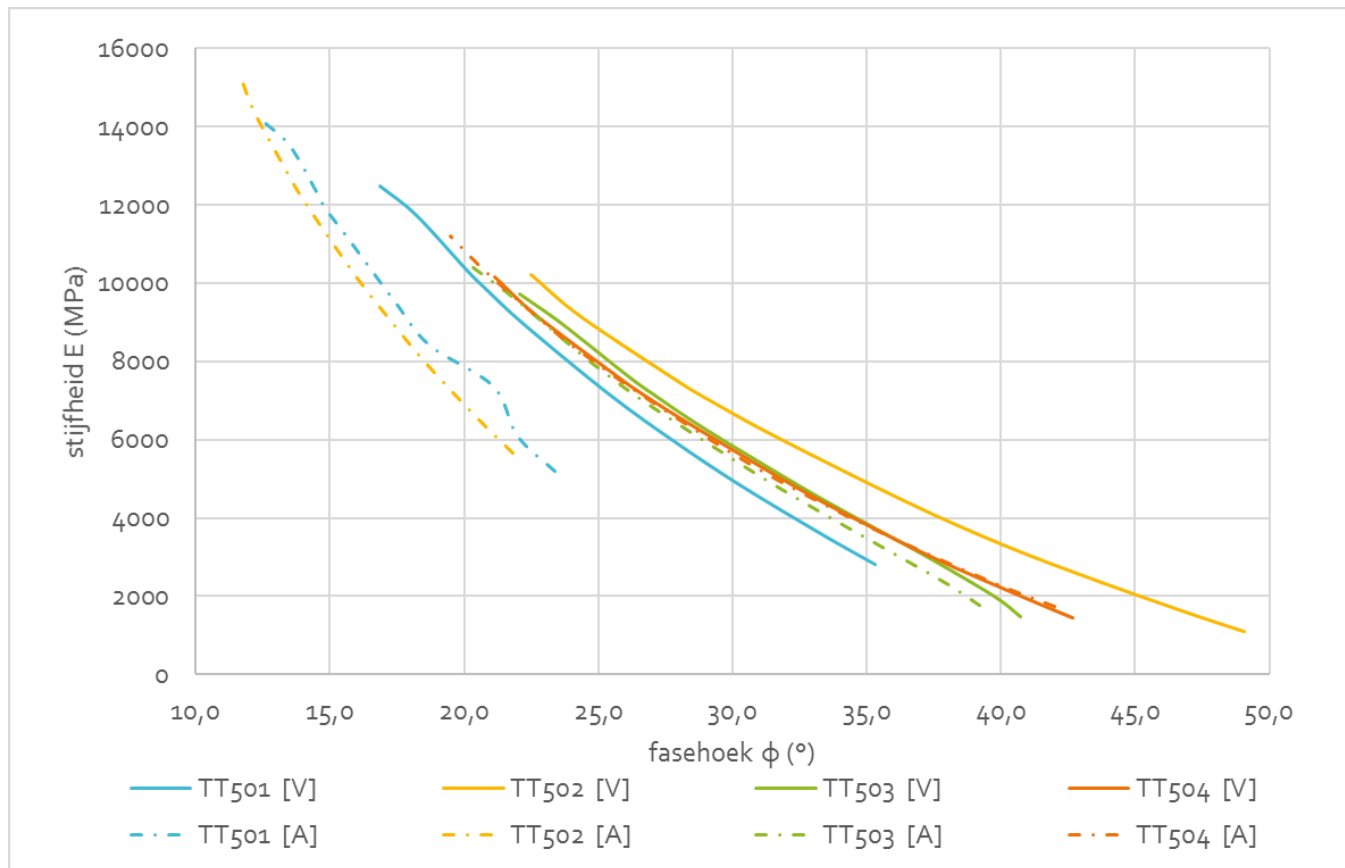
- FTIR (also aged)
- GPIC
- SARA analysis
- Peel test ("slicing of bitumen layer")

Functional

- Stifness
- Fatigue
- ITSR
- Relaxation rate (Fc-value)



Example fatigue mixture virgin (V) and Aged (A)





Explorative research

Artificial Aging lab test TNO

- Using TNO aging protocol - 1000 h 60°C
- Several commercial biobased additives 100% PR PA in PA
- DSR analysis
- Results are comparable to “virgin” PA

Environmental impact analysis (LCA – EN15804)

- Biobased additives have Environmental Impact > bitumen
- A positive effect, e.g. longer life time or less primary materials, is needed.
- *“In some cases a life time of 2 years is necessary”*



Possible positive effects

Biobased additives can have following effects:

- Higher compatability aged and virgin bitumen
- Improved low T performance (Fraass)
- Improved high T performance (rutting)
- Improved diffusion → improved blending
- Improved adhesion
- ...

Not all rejuvenators have the same effect and optimisation is needed for

- Different additives
- Different mixtures



What do we need

- **Design rules:** NL- healing factor
- **Specification rules:** do we need to divided them in different types
- **Environmental impact rules:** some might have huge negative effect, others only minor.
- **(International) standardization:** test methods
- **International standardization:** mixture specifcation