

Circular Stone Mastic Asphalt

why, how & what

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KWS Infra

Introduction

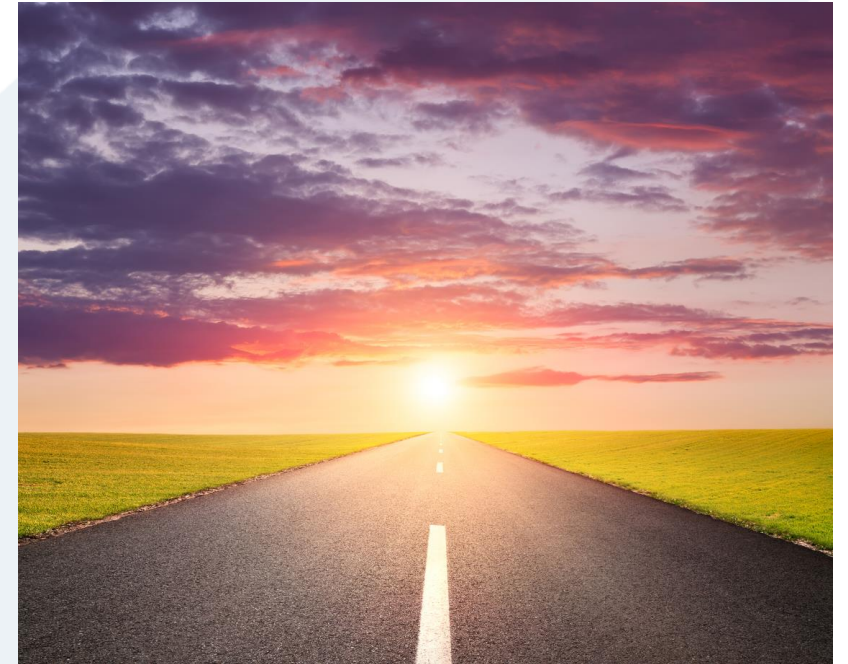
- 🏠 Transition to a circular road construction
- 🏠 SMA using up to 70% of recycled pavement (RAP)
- 🏠 Regulation
- 🏠 CROW Asfaltkwaliteitsloket



Concept

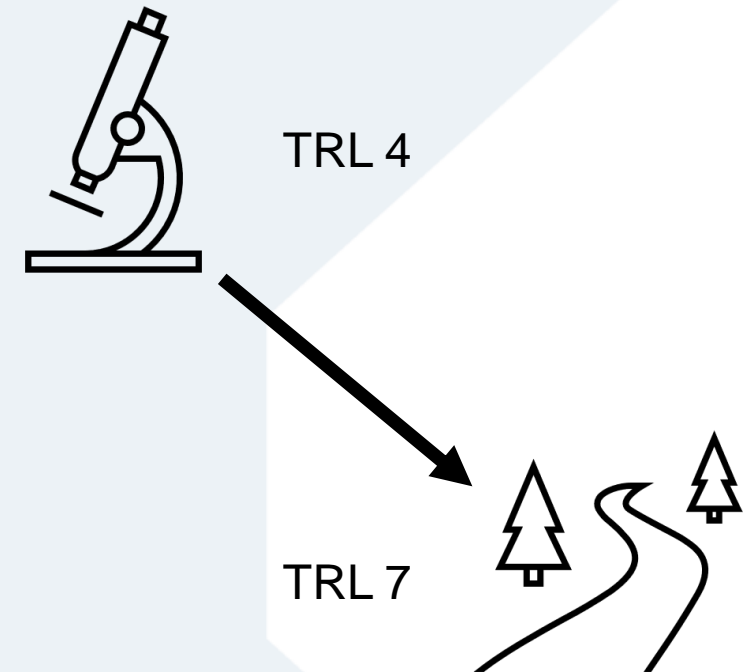
- 🏠 Same requirements as regular SMA
- 🏠 Only RAP from SMA pavements (*)
- 🏠 No additional crushing or screening
- 🏠 Biobased rejuvenator

(*) Separate milling as foundation for the recycling strategy



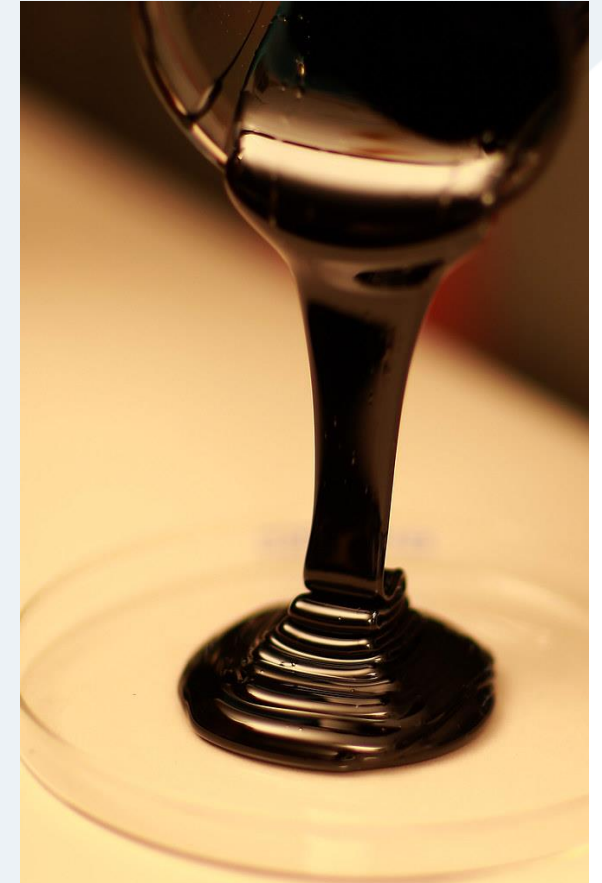
Acceptance is essential

- 🏠 Independent validation of Claims & Quality
- 🏠 Validation TRL 4 and TRL 7
- 🏠 TRL 4: SMA 11B 70% RAP
- 🏠 TRL 7: SMA 11B and SMA 8G+
- 🏠 Biobased rejuvenator



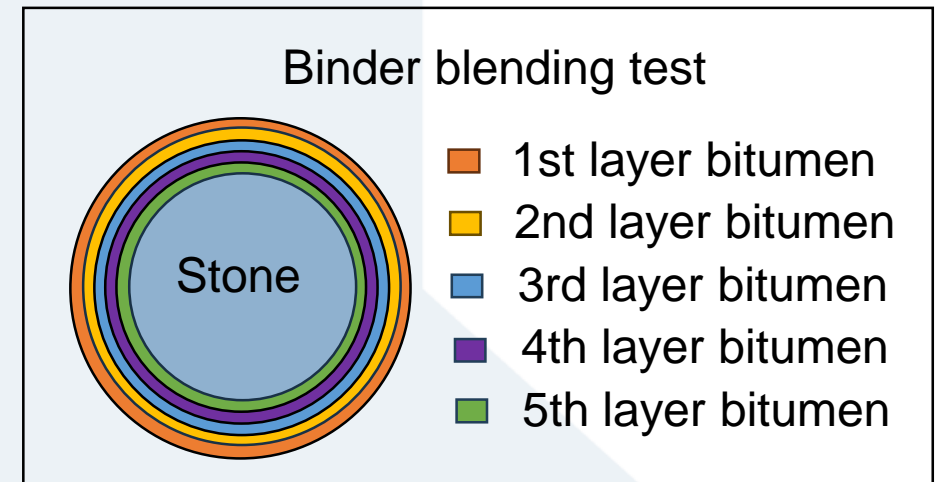
Materials and Methods

- 🏠 Development based on risk analysis & evaluation
- 🏠 Focused on functional behaviour and binder properties
- 🏠 Ravelling (RSAT)
- 🏠 Deformation
- 🏠 Skid resistance (PSV, FAP)



Materials and Methods

- 🏠 Basic testing: grading, binder content and porosity
- 🏠 Binder testing: Fraass, IR and rheological characterization
- 🏠 Functional testing: RSAT, ITS(R) and Cyclic ITT
- 🏠 Binder blending: extraction in five phases
- 🏠 Skid resistance: FAP
- 🏠 Test sections!



Results TRL 4

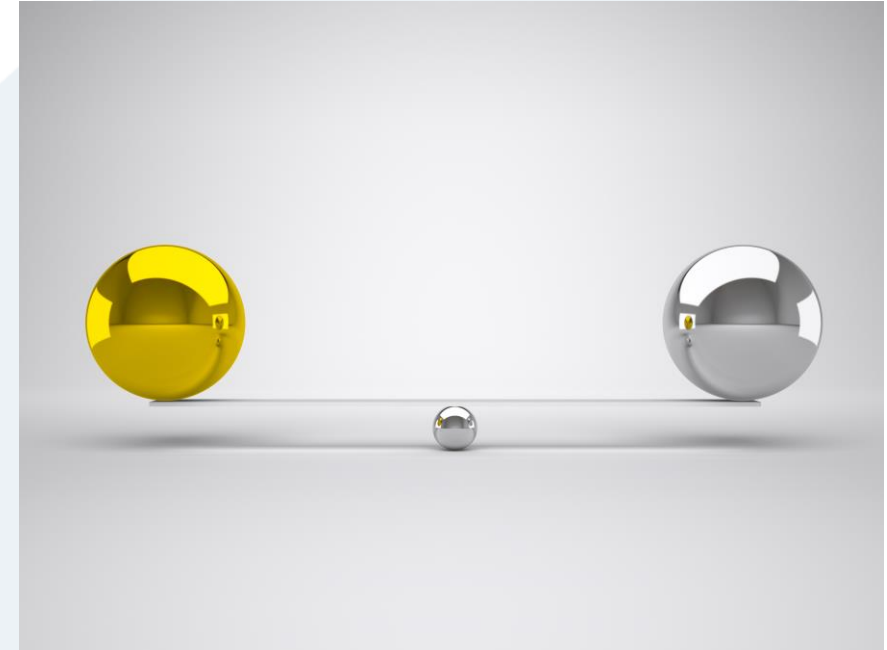
Parameter	Result	Requirement	Source Requirement	Sample source
Bmin [%]	6,6	≥ 6,6	[1]	Lab
Vmin [%]	5,5	≥ 5,0	[1]	Lab
Calculated Penetration	81	70/100	[1]	Lab
Penetration after extraction	45	42	[1]	Lab
Breekpunt Fraass [°C]	-14	< -10	RWS (for PA)	Lab
Binder stiffness	As reference	As reference	RWS (for PA)	Lab
ITSR	100	> 80	[1]	Lab
Grading	Compliant	Tabel 81.2.9	[1]	Lab
Blending	100%	total	RWS (for PA)	Asphalt plant
ITS 1°C [MPa]	2,98	≥ 1,8	RWS (for PA)	Lab
RSAT [gram]	2,3	NA	-	Lab
PSV RAP	58	≥ 58	[1]	RAP
PSV new aggregate	60	≥ 58	[1]	Aggregate
FAP ₉₀	0,42	NA	RWS (for PA)	Lab
FAP ₂₇₀	0,42	-NA	-	Lab

Results TRL 7

Parameter	Result	Requirement	Source Requirement	Sample source
Bitumen [%]	6,7	≥ 6,6	[1]	Core
Porosity [%]	4,3	6,0 +/- 3,0	[1]	Core
Grading	Compliant	Tabel 81.2.7	[1]	Core
Penetration after extraction	55	≥ 48	[1]	Asphalt plant
Stiffness bitumen	As reference	As reference	RWS (for PA)	Asphalt plant
Ring & Ball	52,2	Equal (52,8)	[1]	Asphalt plant
ITSR	90	> 80	[1]	Asphalt plant
ITS 15°C [MPa]	1,39	NA	RWS (for PA)	Asphalt plant
Skid resistance	0,55	≥ 0,44	[1]	Test section
Workability	As reference	NA	-	Test section

Conclusions validation

- 🏠 Performance at the same level
- 🏠 ECI reduction with 50%
- 🏠 Optimum RAP content is 50%
- 🏠 Milling more expensive,
- 🏠 Sustainability and economical advantage
- 🏠 Requires change Financial model of project



SMA 11 70% RAP

March 2021



March 2022



April 2023



April 2024



To make the sustainability transition

- 🏠 Focus on what really has impact
- 🏠 Do the effort (research)
- 🏠 Achieve trust (independent validation of claims)
- 🏠 Open Cooperation and transparency key