Hrvatsko asfaltersko društvo

Croatian asphalt association

Korištenje hidratiziranog vapna u asfaltnim mješavinama

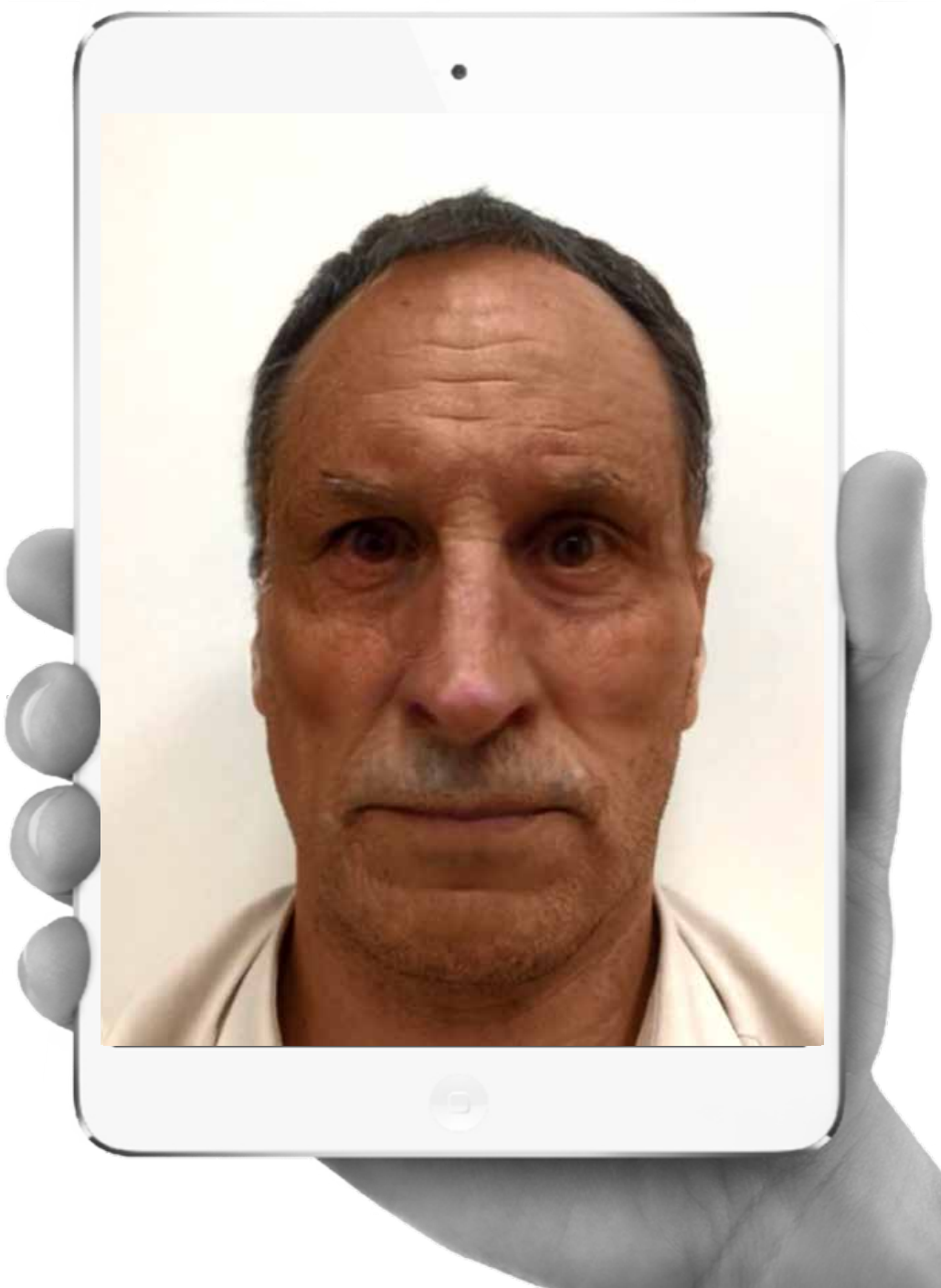
Use of hydrated lime in asphalt mixtures

Stefan Neumann, Baumit

Međunarodni seminar ASFALTNI KOLNICI 2019

International seminar ASPHALT PAVEMENTS 2019

Opatija, 04.–05. 04. 2019.



Thema: Anti-Aging for asphalt
Vortragender: Stefan Neumann

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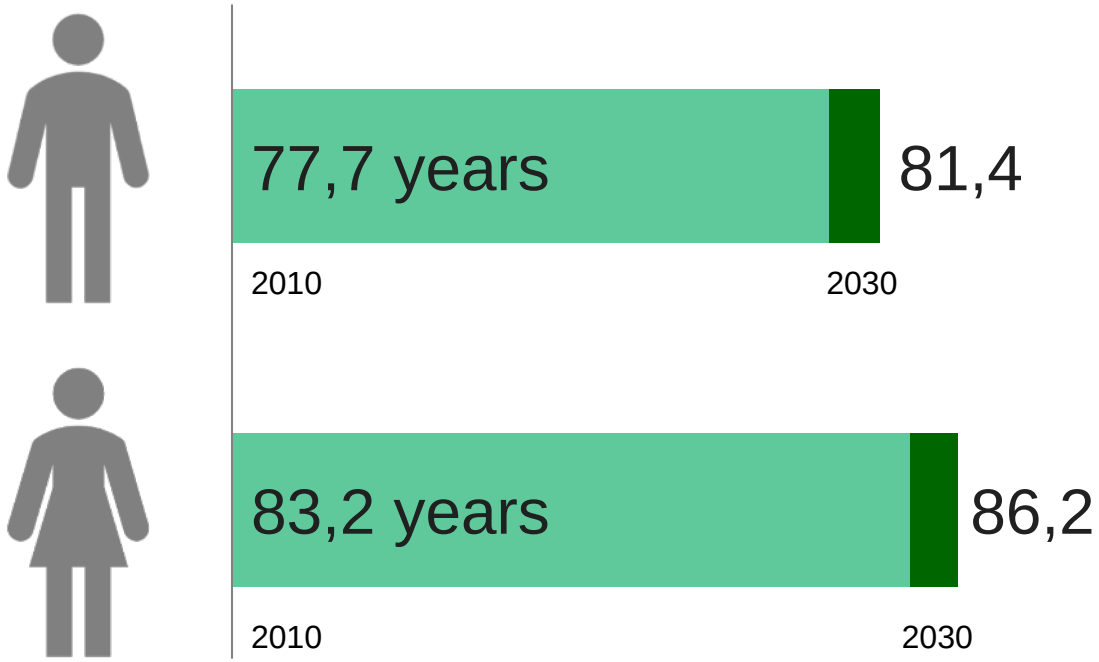
Life expectancy in Austria rises by 4.5% in 20 years



Thema: Anti-Aging for asphalt
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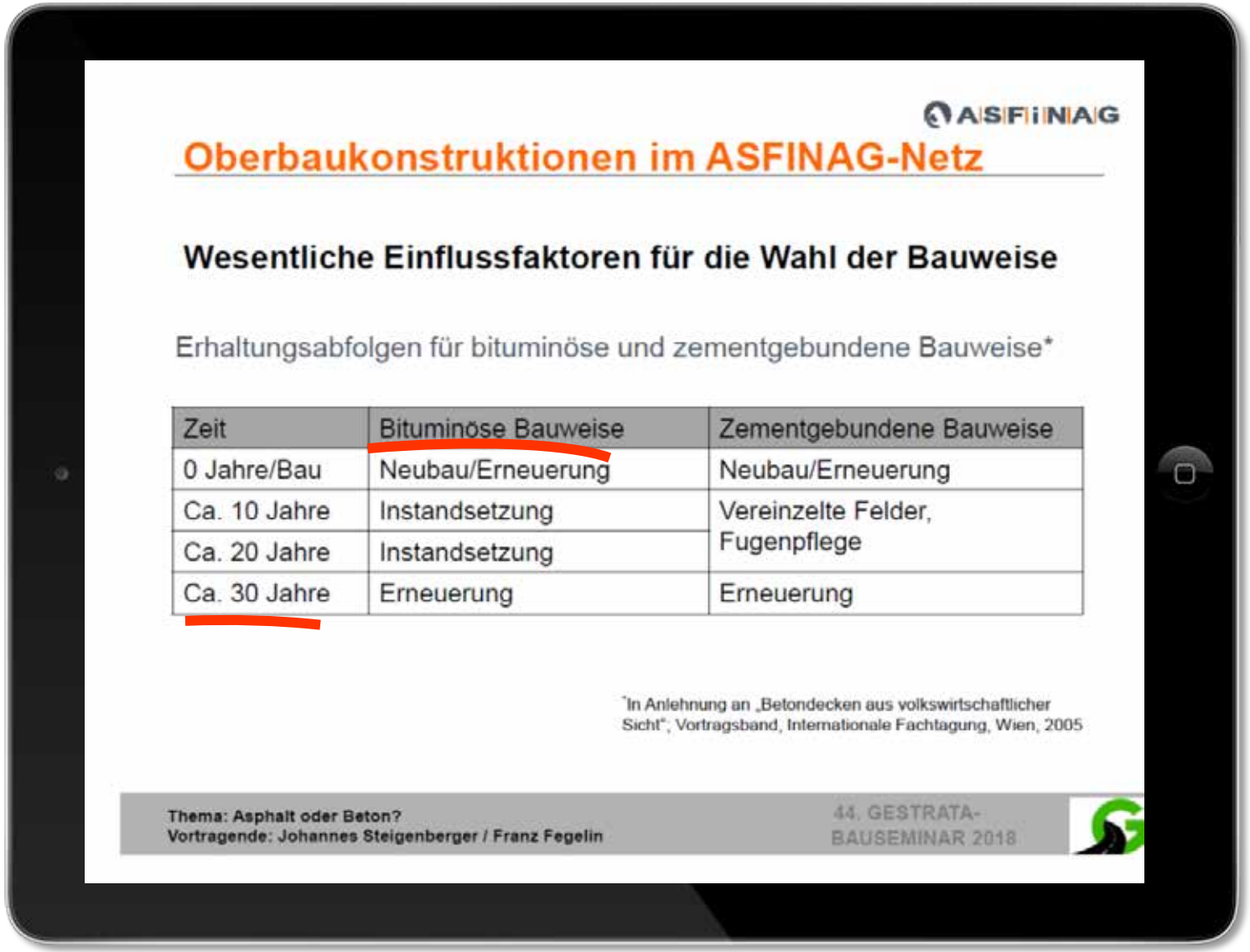
Life expectancy in Austria for asphalt …30 years



ASFINAG

Oberbaukonstruktionen im ASFINAG-Netz

Wesentliche Einflussfaktoren für die Wahl der Bauweise

Erhaltungsabfolgen für bituminöse und zementgebundene Bauweise*

Zeit	Bituminöse Bauweise	Zementgebundene Bauweise
0 Jahre/Bau	Neubau/Erneuerung	Neubau/Erneuerung
Ca. 10 Jahre	Instandsetzung	Vereinzelte Felder, Fugenpflege
Ca. 20 Jahre	Instandsetzung	
Ca. 30 Jahre	Erneuerung	Erneuerung

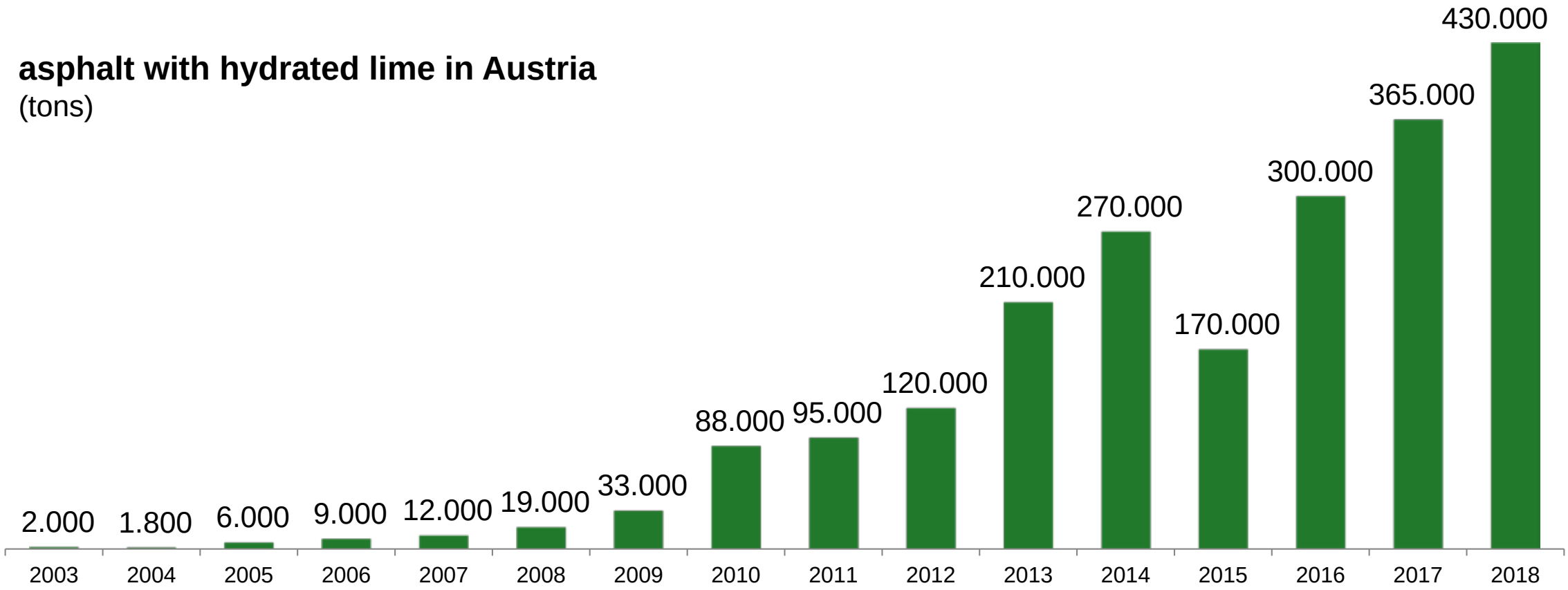
*In Anlehnung an „Betondecken aus volkswirtschaftlicher Sicht", Vortragsband, Internationale Fachtagung, Wien, 2005

Thema: Asphalt oder Beton?
Vortragende: Johannes Steigenberger / Franz Fegelin

44. GESTRATA-BAUSEMINAR 2018

Thema: Anti-Aging for asphalt
Vortragender: Stefan Neumann

The use of hydrated lime has risen sharply in recent years



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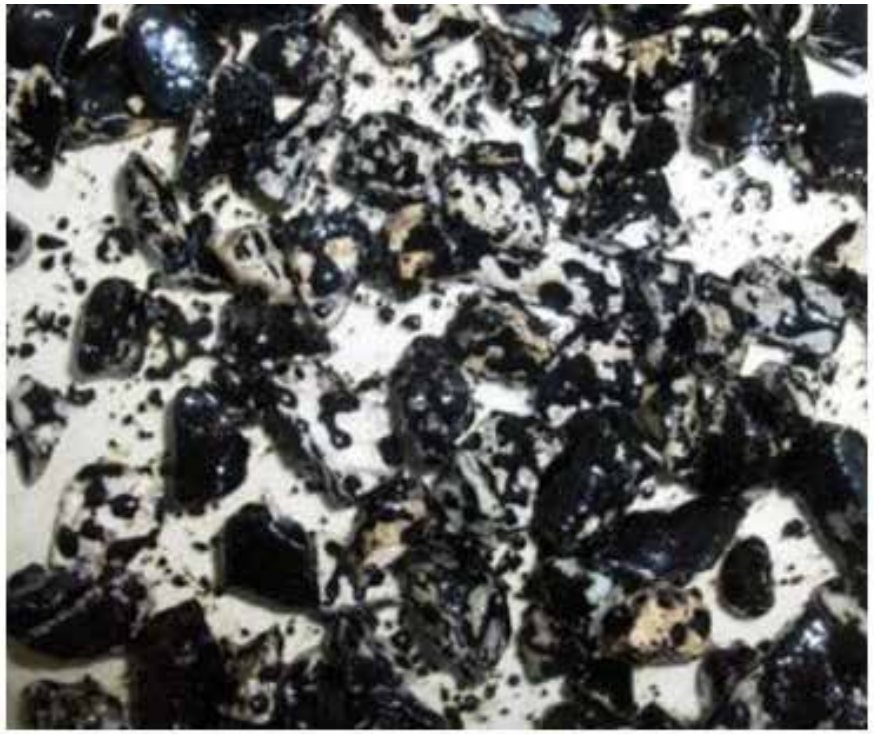
Improved adhesion

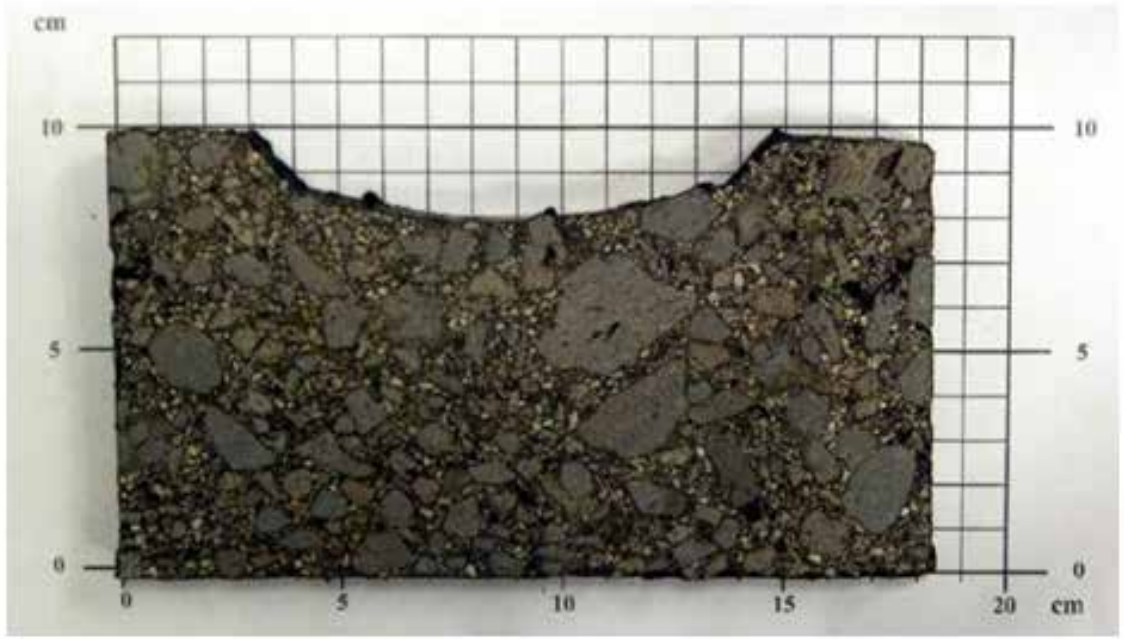


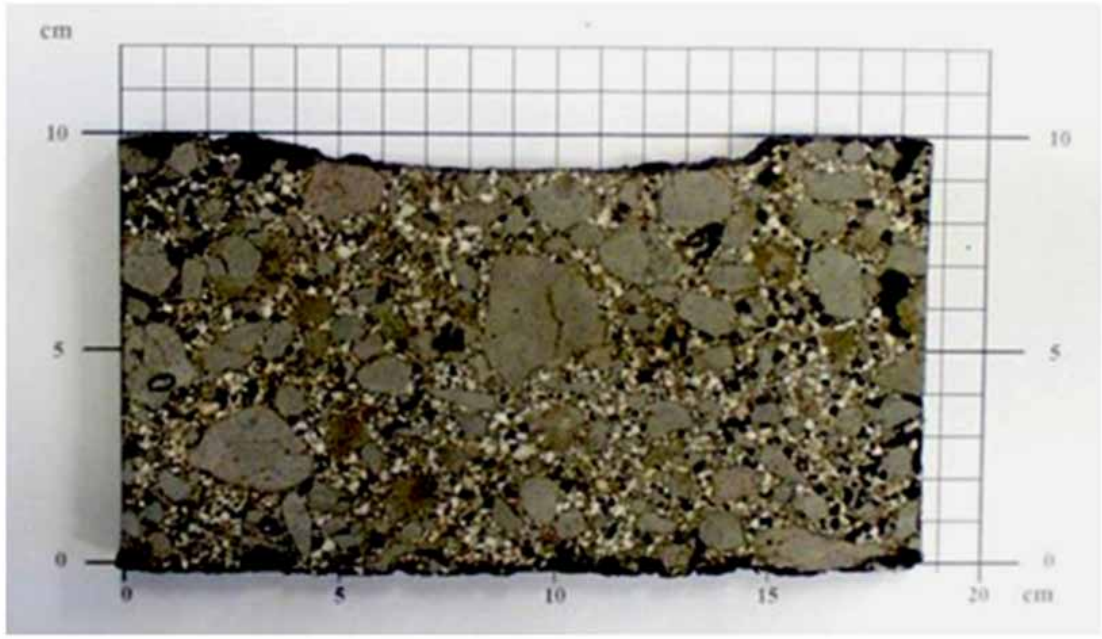
dolomite filler

hydrated lime

Aggregate with 3% bitumen and 3% filler (hydrated lime) after water storage test

Improvement of deformation resistance





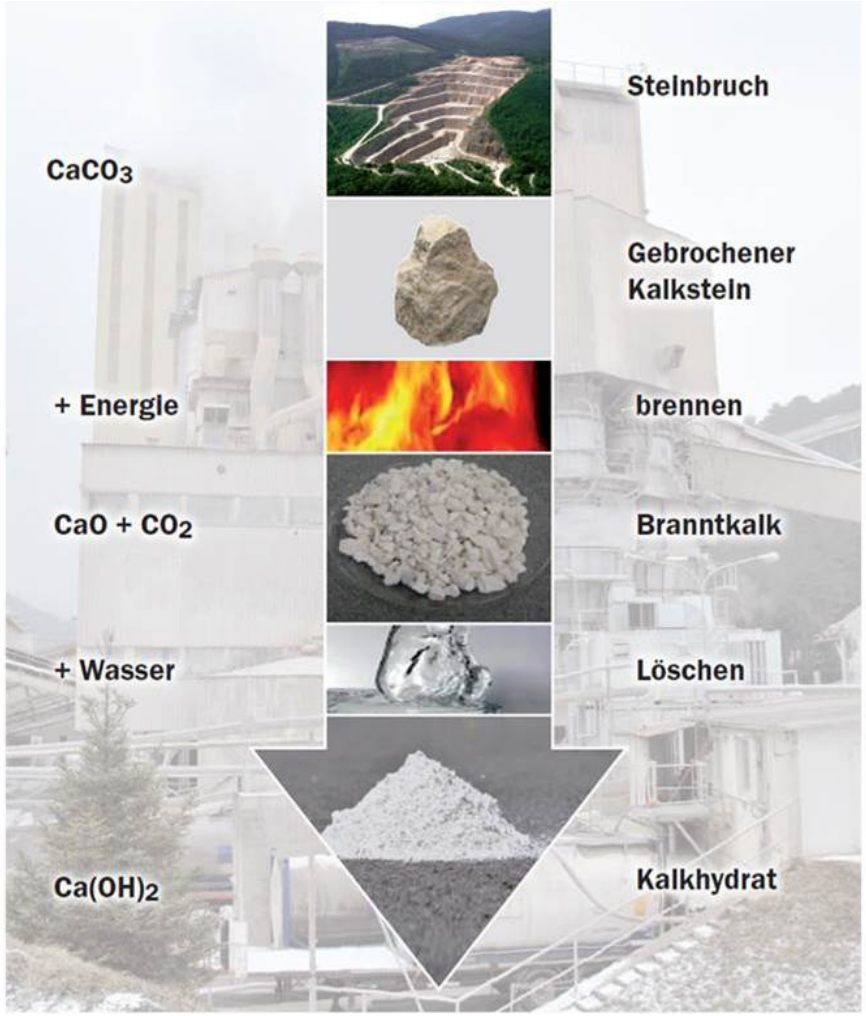
dolomite filler

hydrated lime

AC 32 trag 70/100, permanent deformation after the tracking test (RVS 11.06.64)

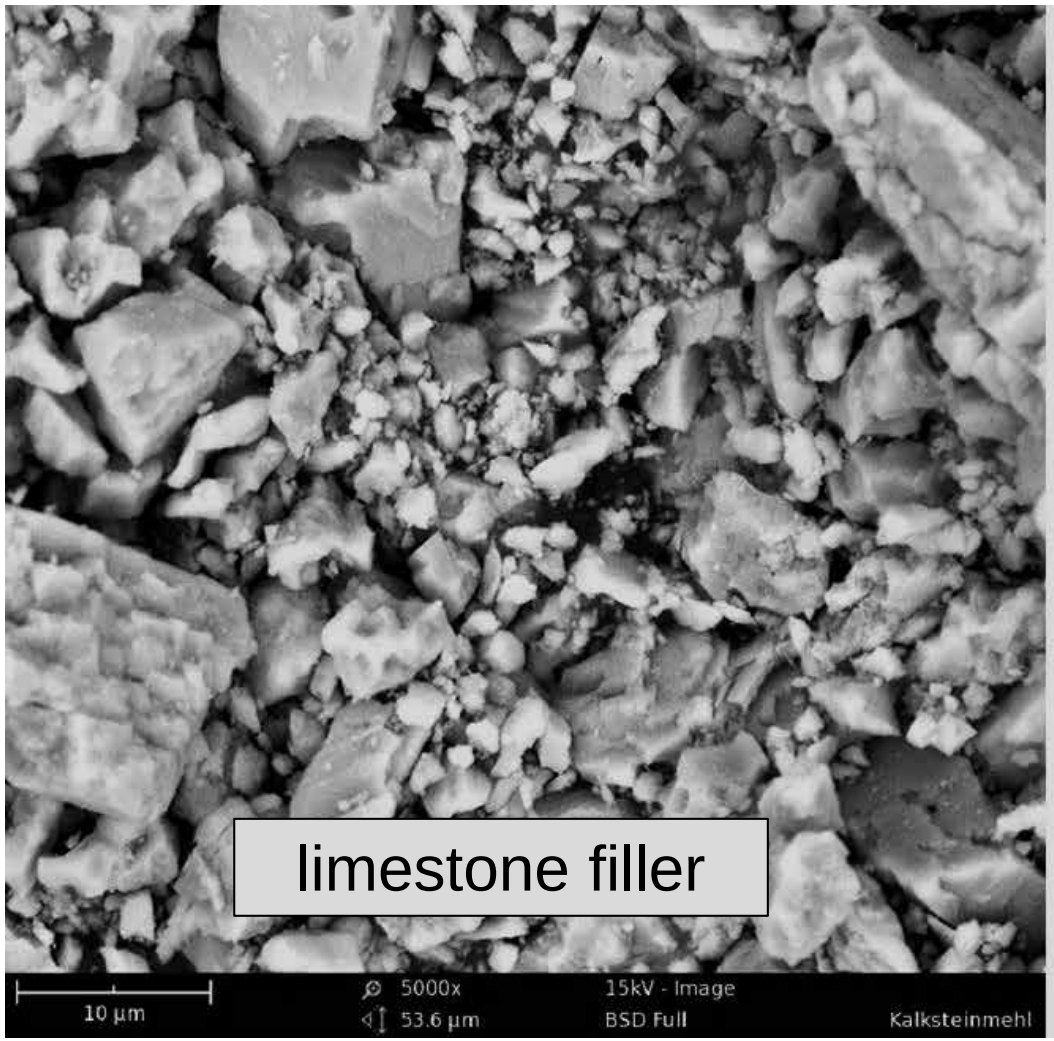
But what is the hydrated lime?

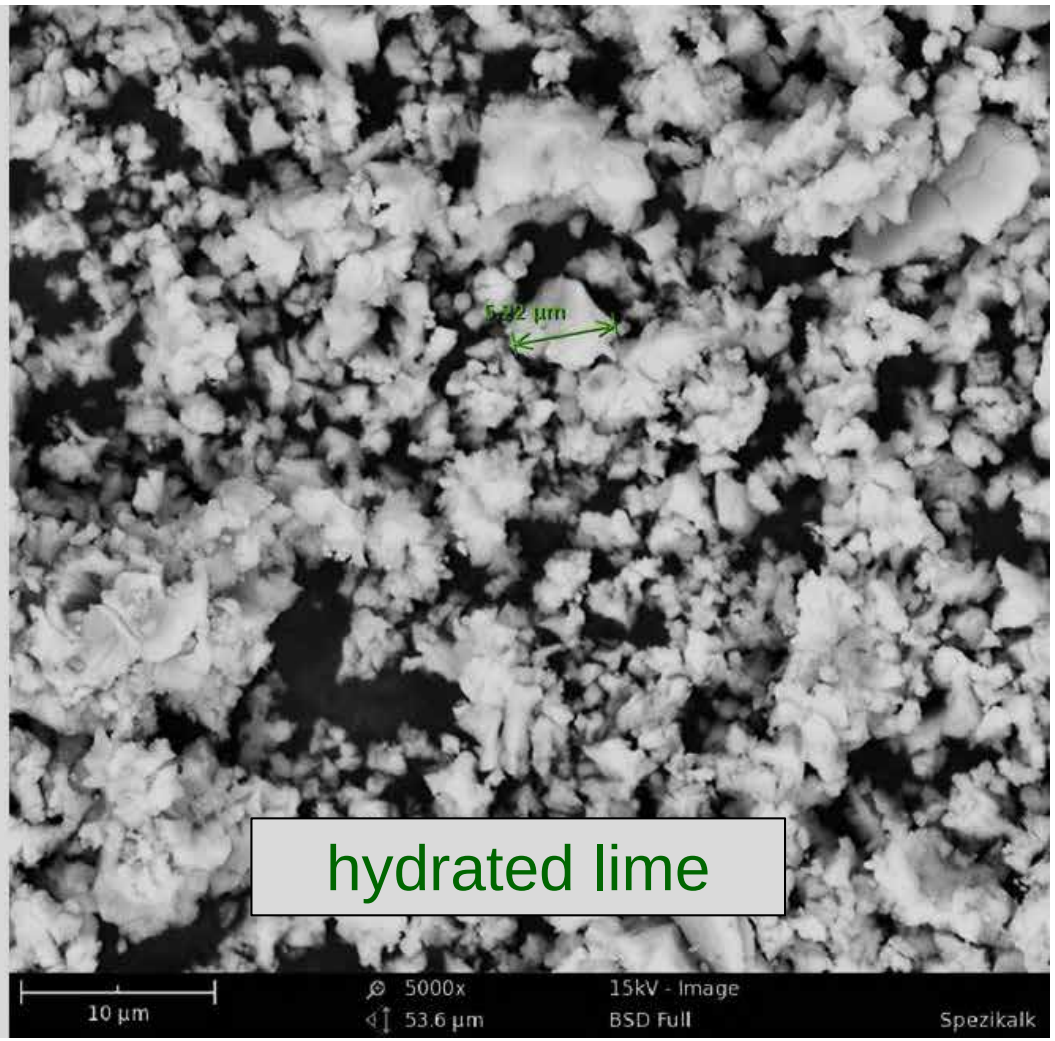
Production and properties



- Active ingredient: Ca (OH) 2
- Screening: <0.063 mm
- Special surface: approx. 18 m² / g
- Bulk density: approx. 350 kg / m³
- Humidity: <0.3%
- Delivery in silo truck
- Storage in foreign filler silo
- Dosing via filler scale

difference between limestone and hydrated lime





Can hydrated lime prolong the life of asphalt?

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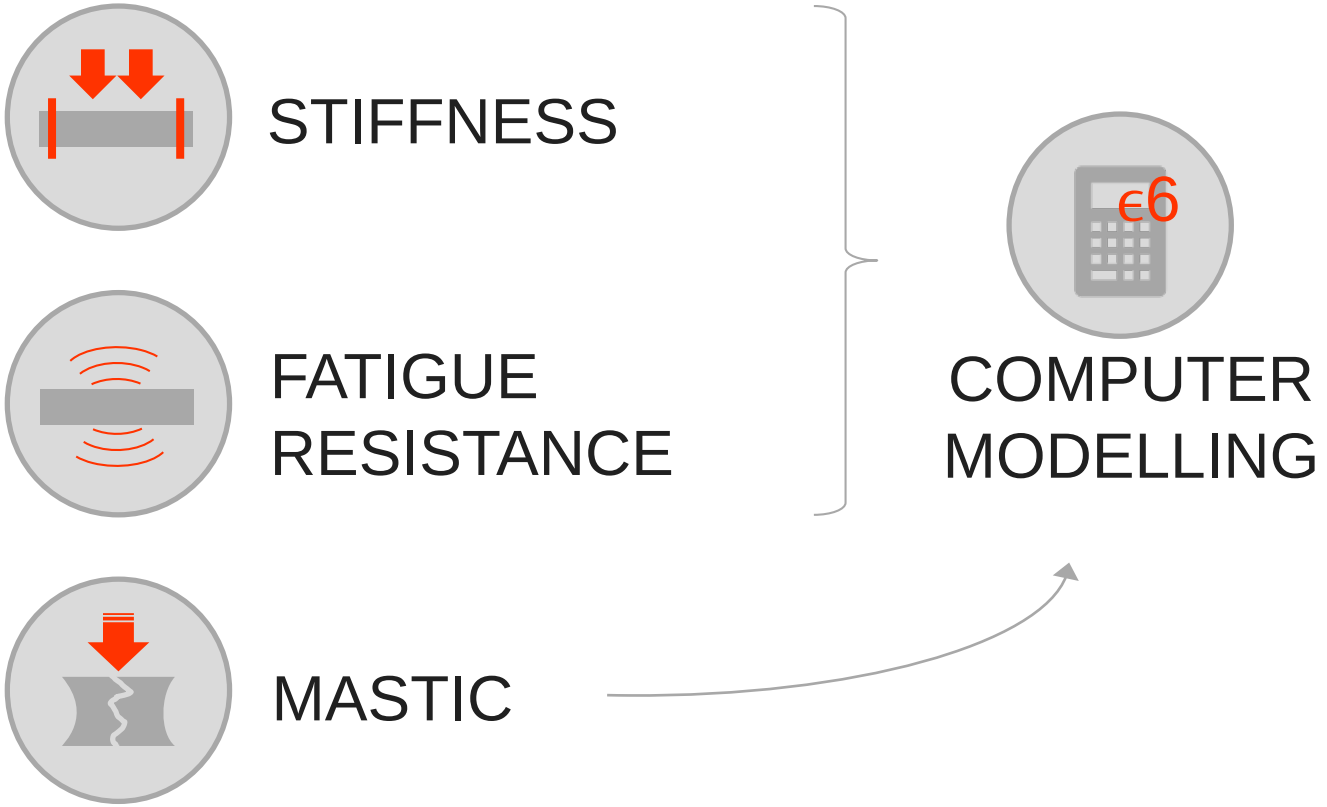
Simulation of aging:
Tests on asphalt with and without hydrated lime

SMA 11 deck PmB 45/80-65, S3, GS

SMA 16 deck PmB 45/80-65, S3, GS

AC 22 binder PmB 45/80-65, H1, G4

AC 32 trag 70/100, T1, G4



Comparability of the specimens

WITHOUT HYDRATED LIME:

High quality recipe to minimize the negative influence of filler!

3 % limestone filler,
3.5% dolomite filler (comes from sand 0/2mm)

bitumen content: 4.5%

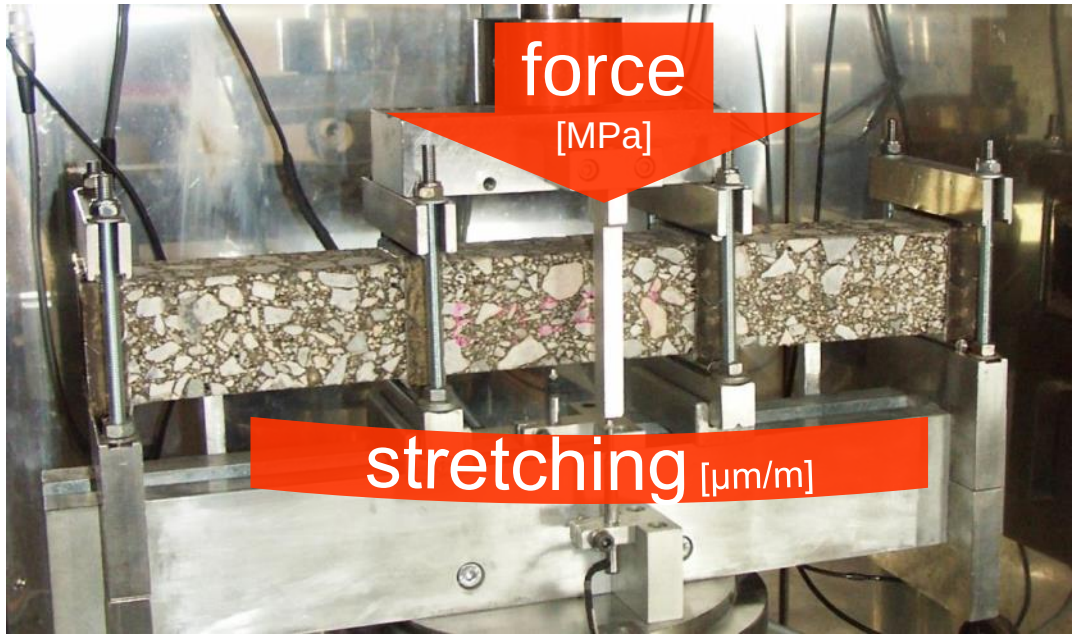
WITH HYDRATED LIME:

2% hydrated lime à ca. 30% of filler content

Hydrated lime replaces part of the limestone powder
bitumen content: 4.6% due to higher surface area

	SMA 11/16		AC 22 binder		AC 32 trag	
bitumen	PmB 45/80-65		PmB 45/80-65		B 70/100	
aggregate	porphyrit/kersantit		dolomite		dolomite	
filler	limestone		limestone/dolomite		limestone/dolomite	
hydrated lime	no	2%	no	2%	no	2%

Stiffness test according to EN 12697-26 with 4-point bending beam



measured force at a given deflection

+20 ° Celsius | 0,1 - 30 Hz

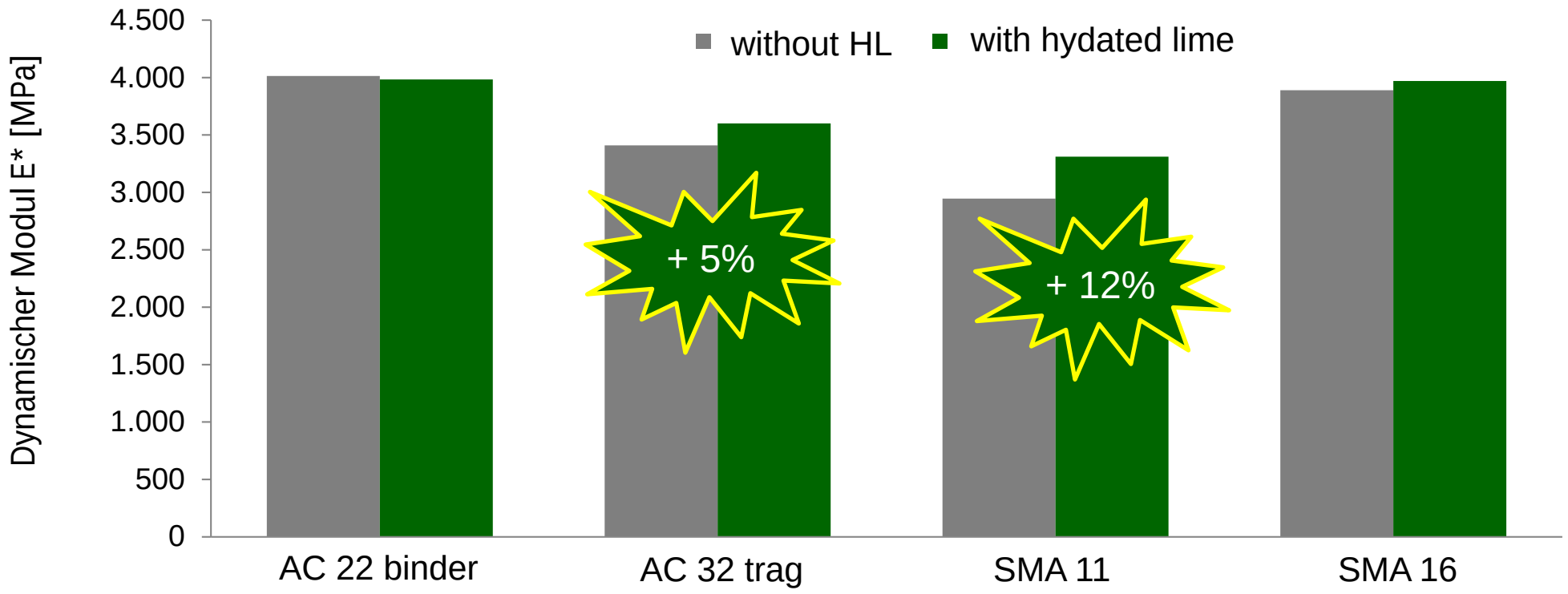
stretching at the bottom is limited to 35 µm/m.
No damage to the specimen!

! As higher the temperature, as higher the stiffening effect of hydrated lime

Up to 12% higher stiffness when using hydrated lime

Stiffness test

95% exceedance probability, at 8 Hz, 20 C °



Fatigue test according to EN 12697-24 with 4-point bending beam

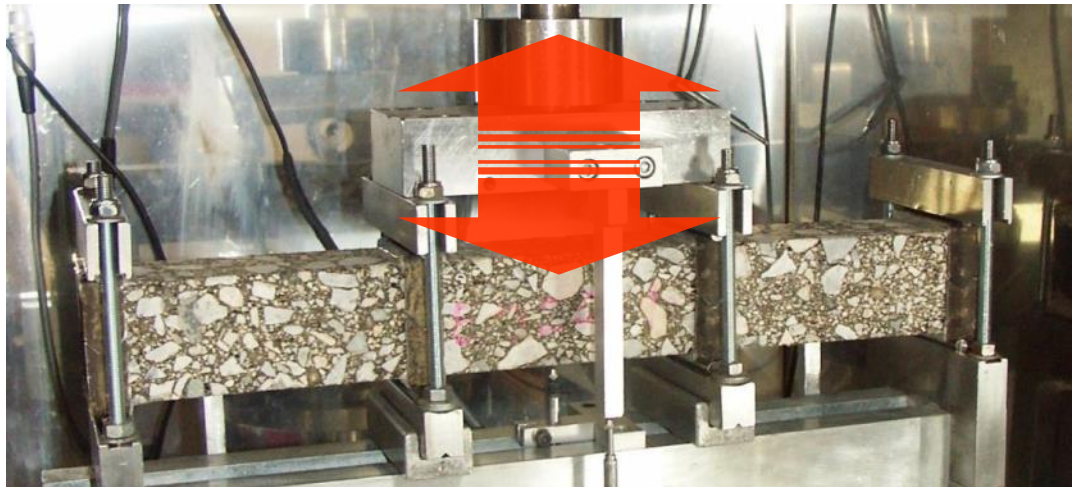


Tabelle 1: Dehnungsstufen für die Ermüdungsprüfung

Mischgut	Dehnungsstufe [µm/m]		
AC 22 binder PmB 45/80-65, H1, G4	260	320	380
AC 22 binder PmB 45/80-65, H1, G4, KA	260	320	380
AC 32 trag 70/100, T1, G4	110	200	260
AC 32 trag 70/100, T1, G4, KA	110	200	260

fatigue = Number of load changes until specimen has reached 50% of the starting value of the complex stiffness modulus
+20 ° C | 30 Hz

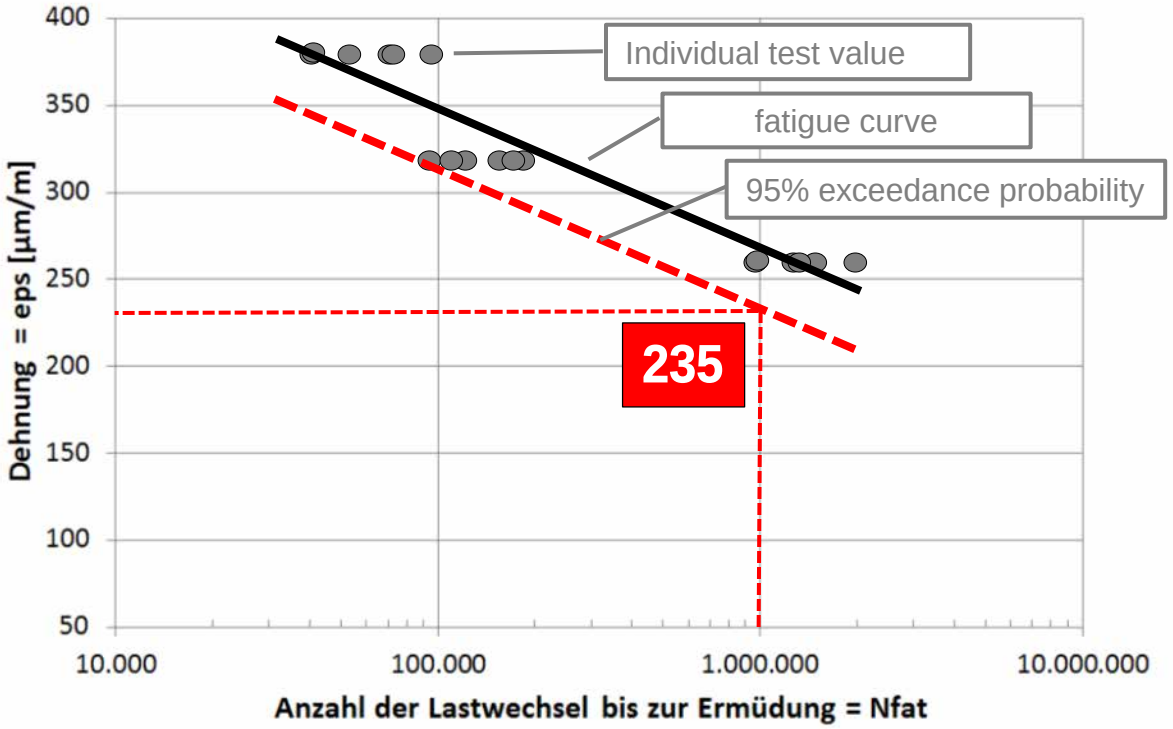
18 Individual tests per mixture, (3 Strain levels with 6 specimens)

The strain levels were chosen, that fatigue occurs after 10,000 to 1,000,000 load cycles

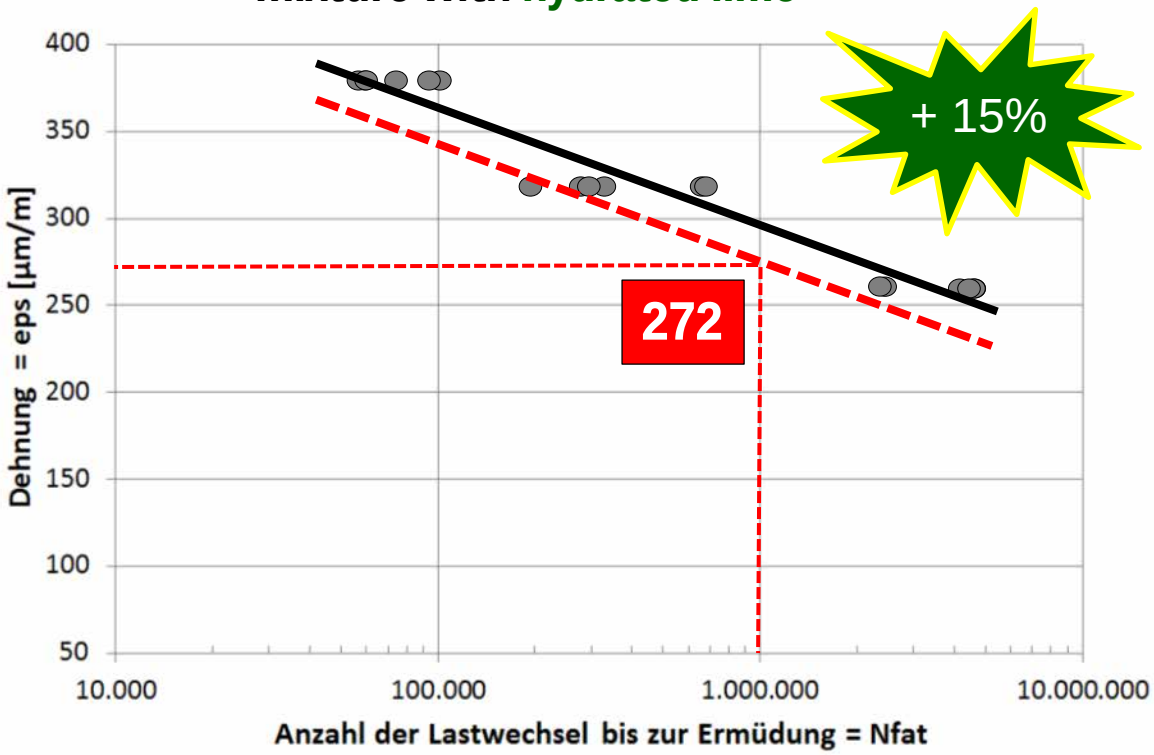
AC 22 binder: 15% higher stain values for mixtures with hydrated lime at 1.000.000 load changes

fatigue curve AC 22 binder

mixture without hydrated lime



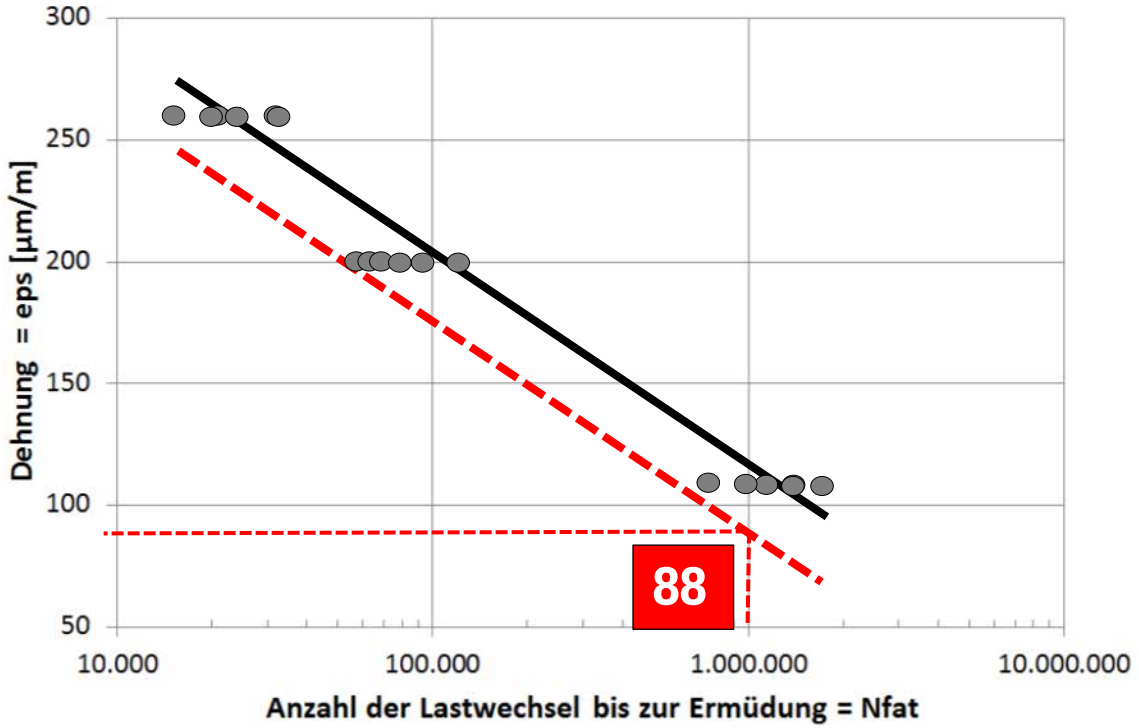
mixture with hydrated lime



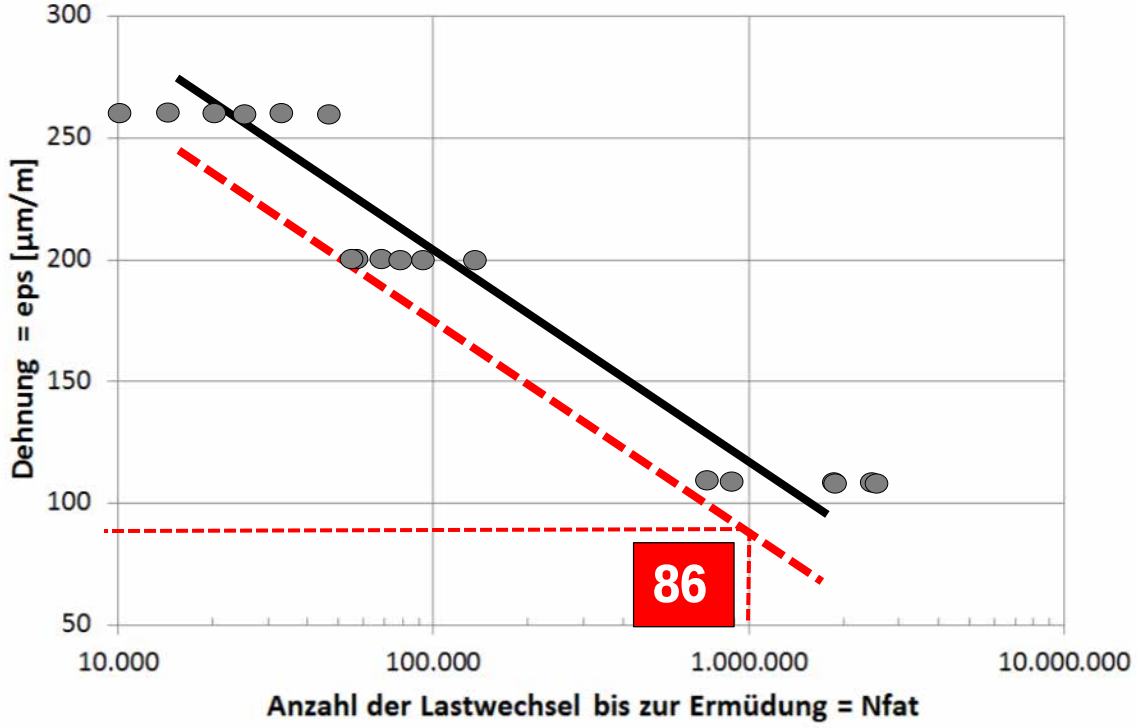
AC 32 trag: 2% less stain values for mixtures with hydrated lime at 1.000.000 load changes

fatigue curve AC 32 trag

mixture without hydrated lime



mixture with hydrated lime



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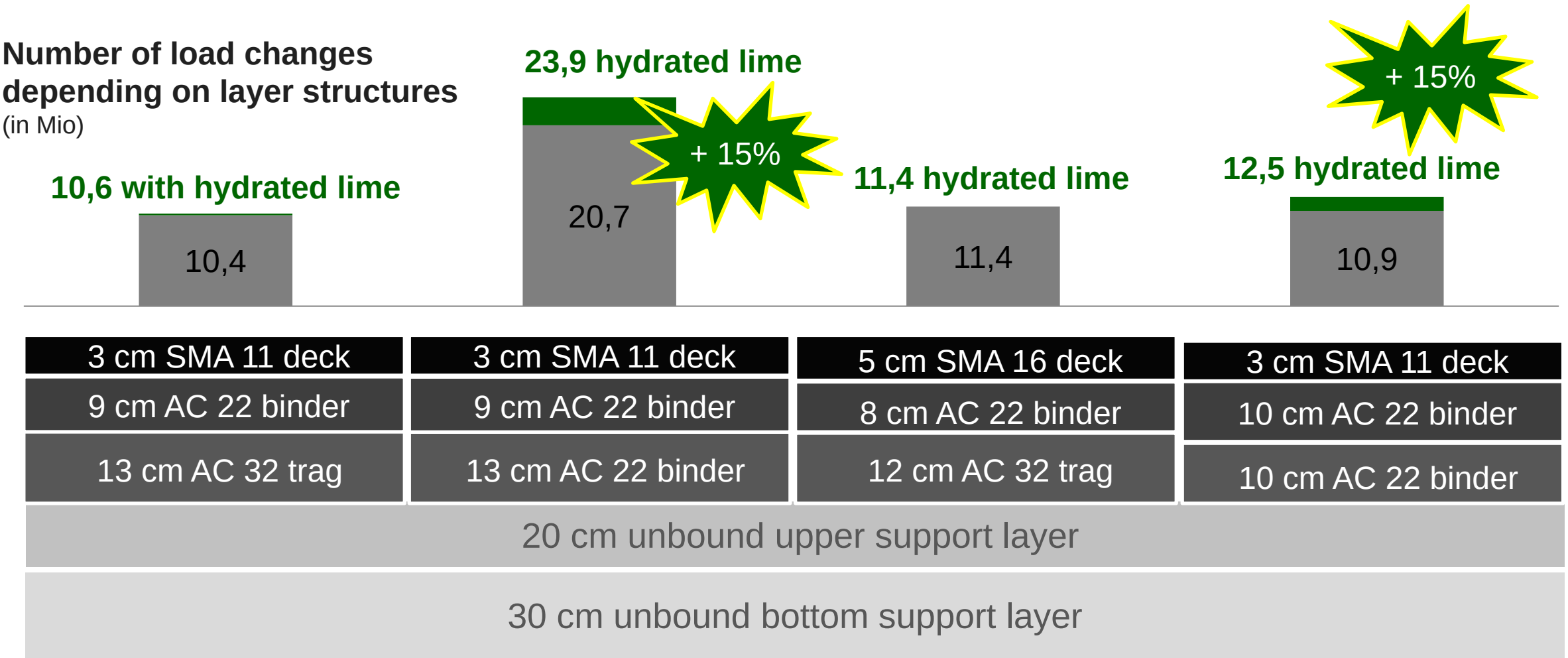
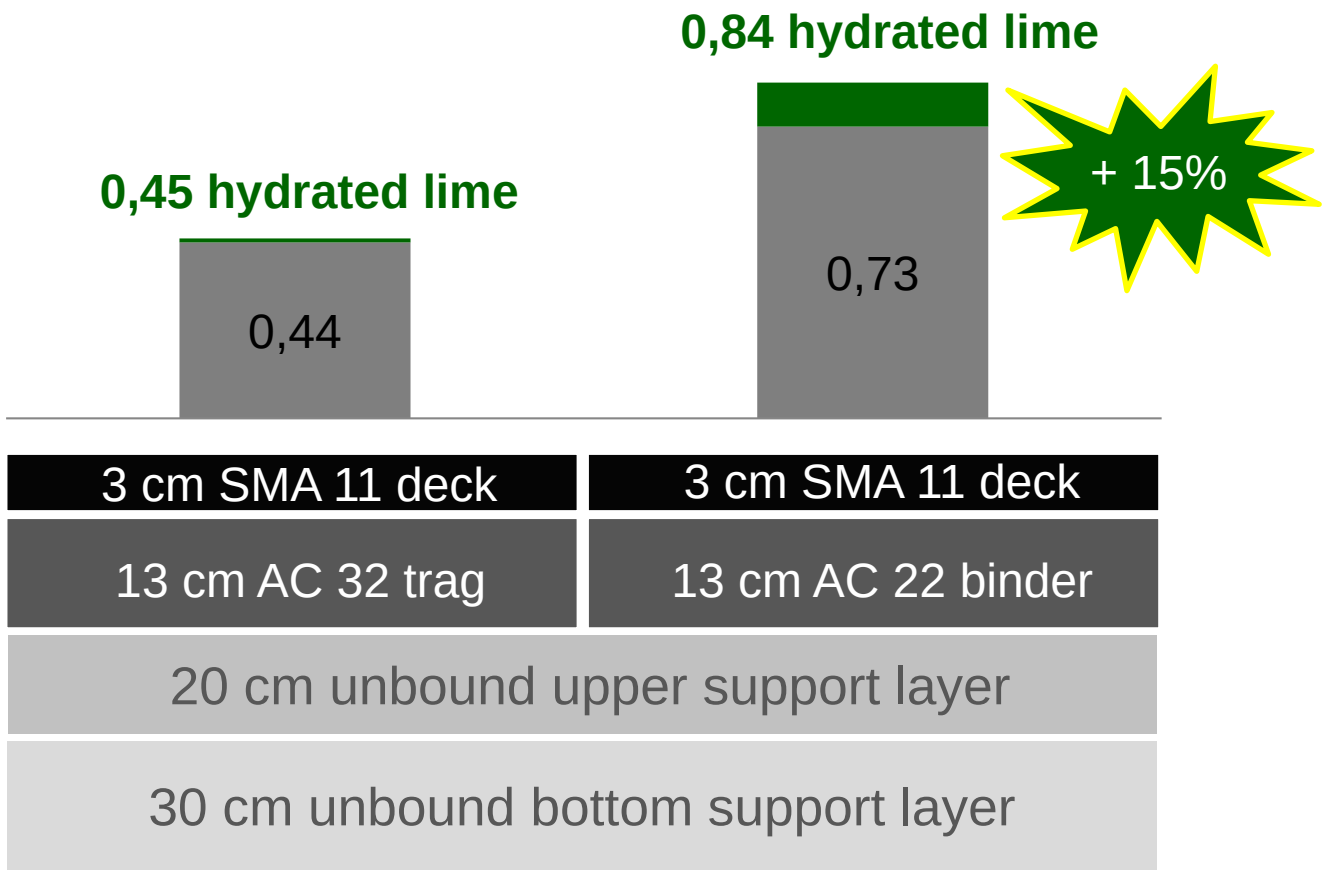
Result: Up to 15% longer service life of layer structure for highway roads

Number of load changes depending on layer structures
(in Mio)

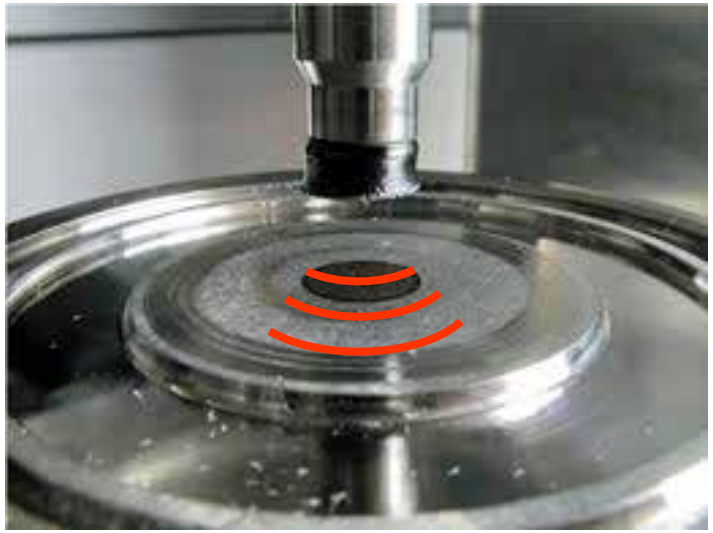


Result: Up to 15% longer service life of layer structure for country roads

Number of load changes depending on layer structures (in Mio)



Fatigue resistance of mastic with dynamic shear rheometer (DSR), developed for mastic at the TU Vienna



Fatigue at the mastic = number of load changes until fracture

+ 10 ° Celsius | 30 Hz

Bitumen + fine fraction (<0,125mm) mixture corresponds to that of the asphalt

108,000 load changes p. hour:
Results for mastic with bitumen 70/100 after 3 hours
Test specimen easy and fast to produce

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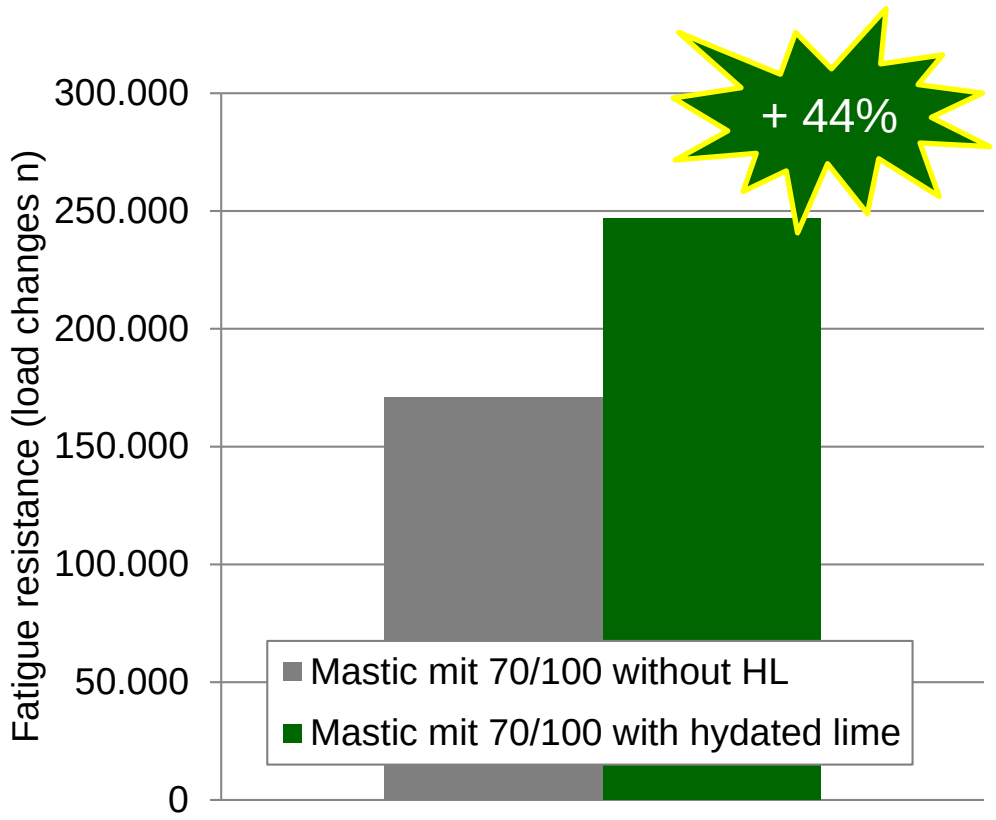
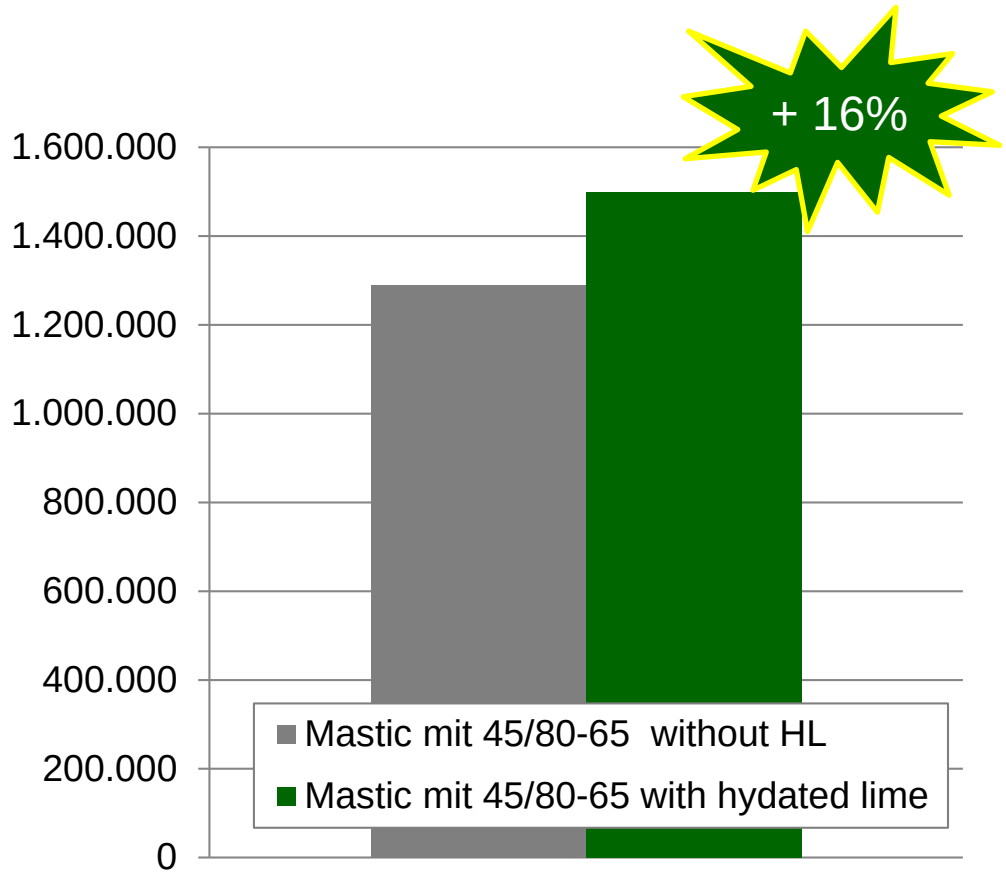
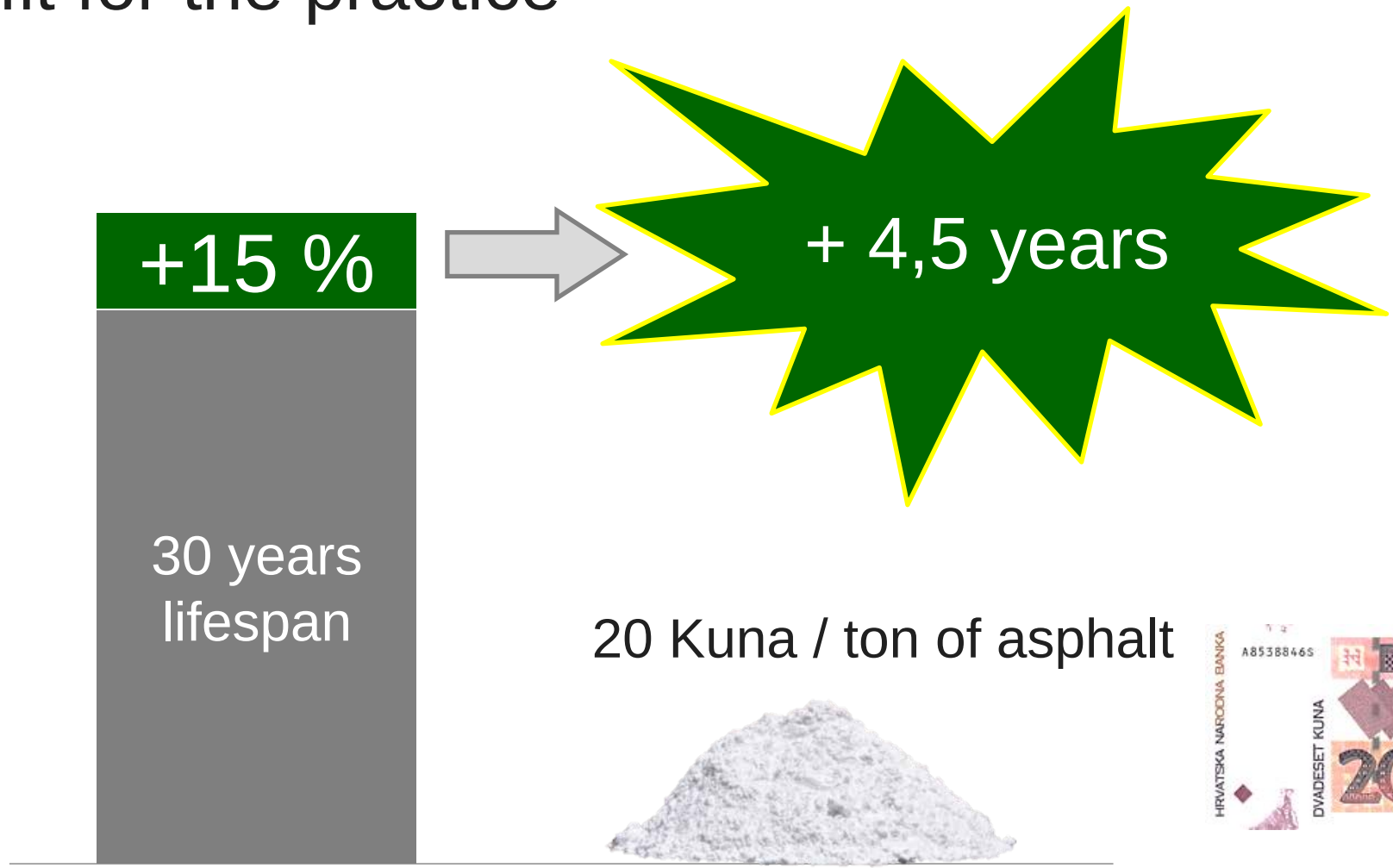
Up to 44% increase fatigue resistance of mastic with hydrated lime





Your benefit for the practice



At the age of 80 on Mount Everest

I look forward to the dialogue with you

Stefan Neumann s.neumann@baumit.com

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