

FEHRL



WP2:

Impact of RA quality and characteristics on mix design and performance of asphalt containing RA

Partners:

BRRC, DRI, IFSTTAR, **TUBS**,
TRL, UNOTT, VTI, ZAG

WP Leader: Konrad Mollenhauer



WP2: Objectives

Optimisation of RA-proportions in new surface layer asphalt mixes

- Need for high quality material components:
Compatibility of new / recycled (modified) binders
- Consideration of high specification needs (mechanical properties (low/high temperature))
- Analysis recyclability of high quality asphalt layers

Mix design with high proportions of RA

- Test methods for analysing binder compatibility
- Laboratory methods to simulate site mixing

WP2: Work tasks

Work Task 2.1 (**IFSSTAR**, *BRRC*, TUBS, ZAG):

RA compatibility with new binder (conventional and modified)

- Laboratory aging method to simulate RA
- Multiple Recycling
- Compatibility of new and RA binder (binder stage)
- Rejuvenators

Work Task 2.2 (**BRRC**, LCPC, TUBS, DRI, UNOTT):

Impact of RA on mix design and laboratory performance

- Influence of mixing process on asphalt mix performance
- Compatibility of new and RA binder (effect on asphalt performance)
- Analysis of mix homogeneity and double coating
- Improve mix design procedures

Work Task 2.3 (**TRL**, DRI, VTI):

Field validation

Task 2.1 Current work

Aging of loose asphalt mix in a heating cabinet at controlled temperature for prefixed duration.



Materials analysed:

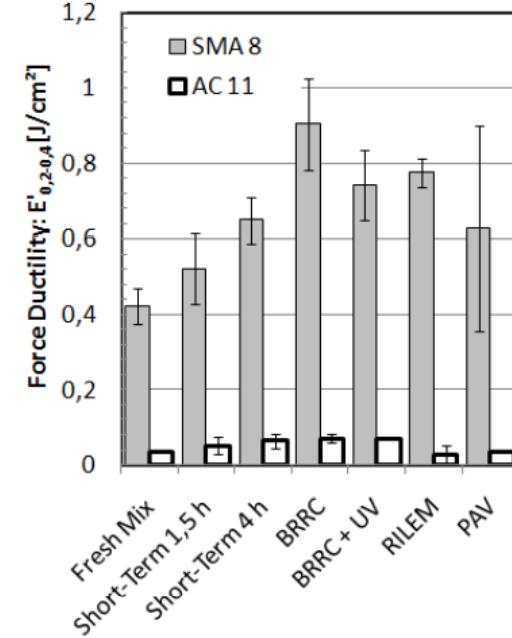
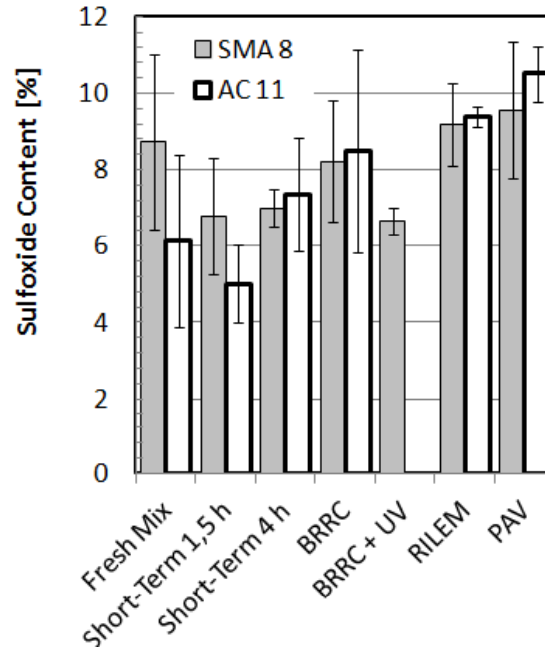
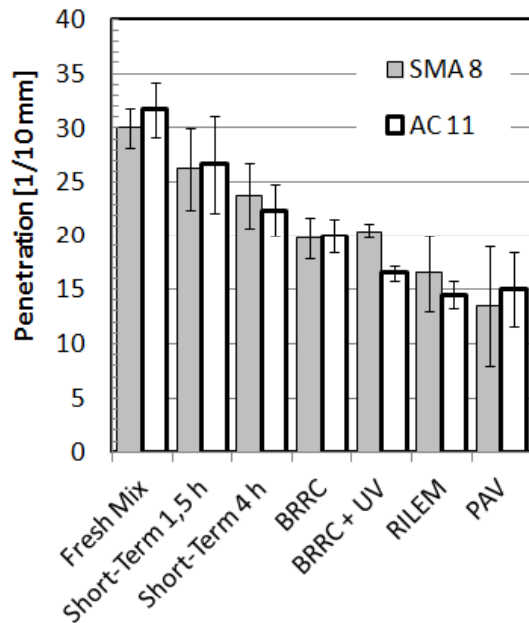
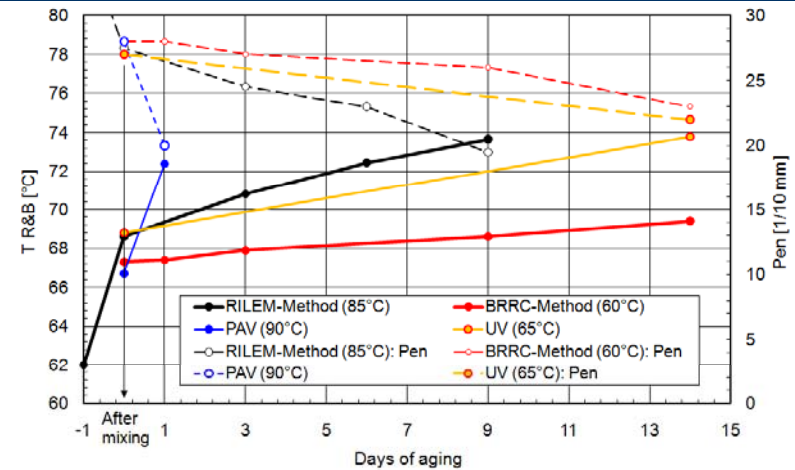
SMA 8 (PmB 25/55-55), AC 11 (35/50)

Aging protocols:

Name of Aging Procedure	Mixing temperature T [°C]	Short-term aging		Long-term aging			
		Temperature T [°C]	Duration [h]	Temperature T [°C]	Pressure p [MPa]	UV-Radiation	Aging duration t [days]
BRRC	165	135	4	60	-	-	0; 1; 3; 9; [14]
RILEM			1,5	85	-	-	0; 3; 6; [9]
PAV			1,5	90; 100	2,1	-	[1]; 5
UV			4	60	-	x	[14]

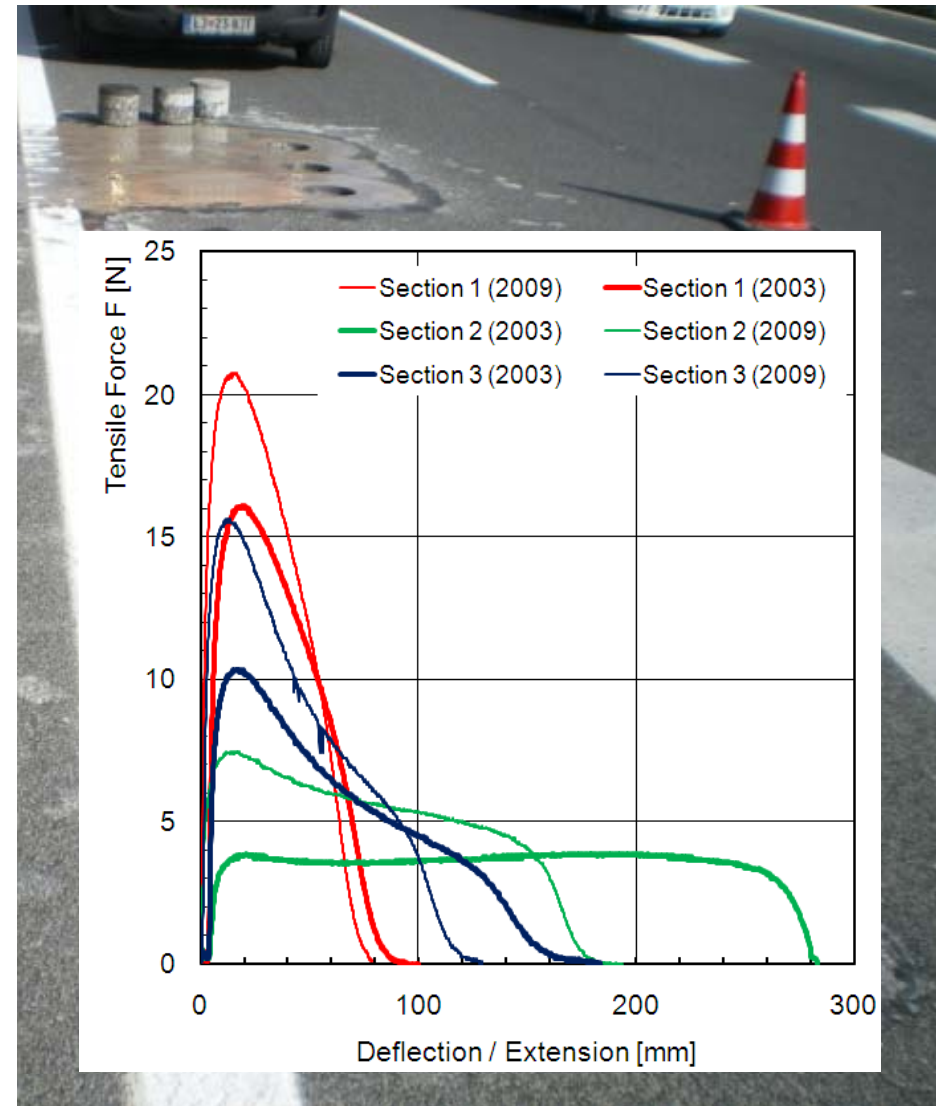
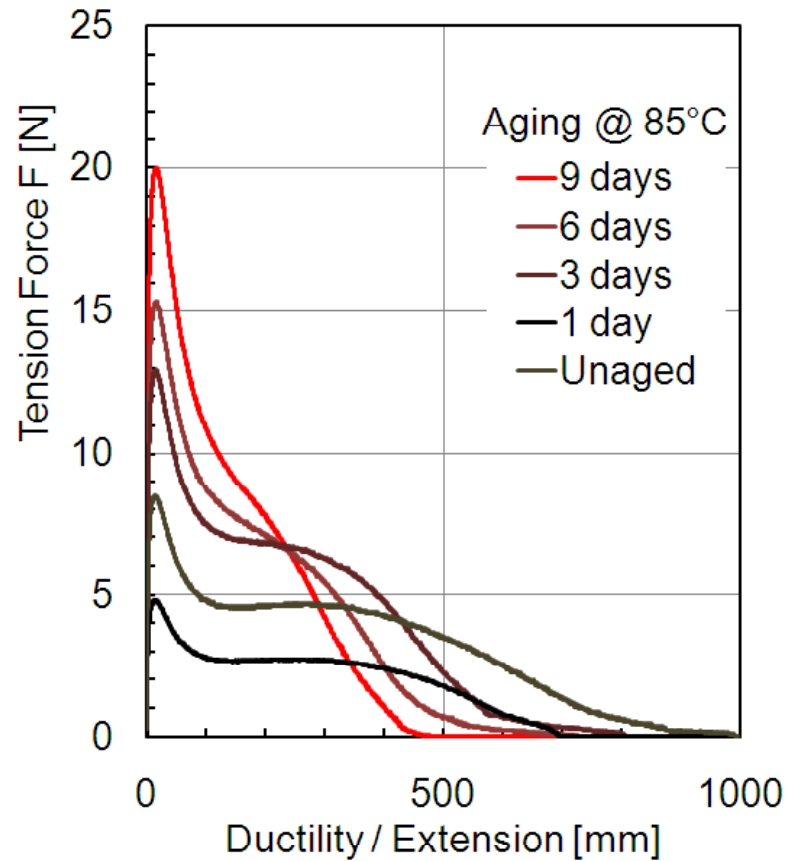
Task 2.1 Current work

Effect of mix aging on binder properties, estimation of precision achievable



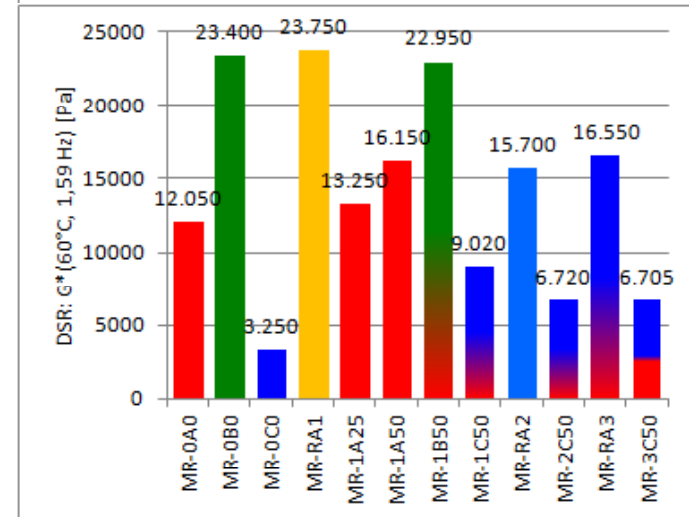
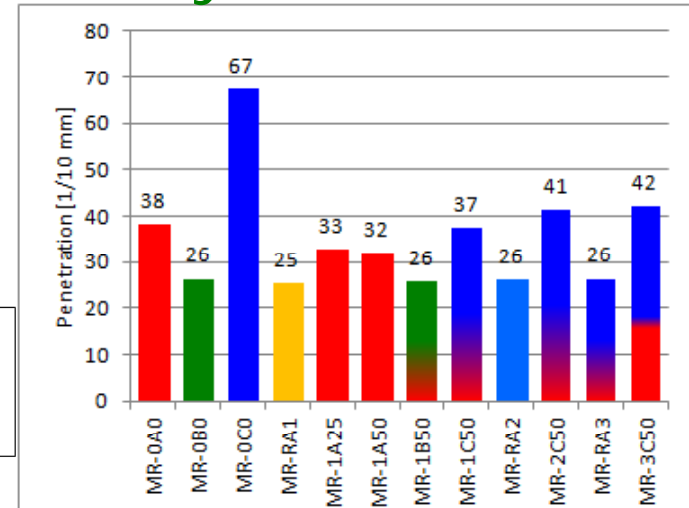
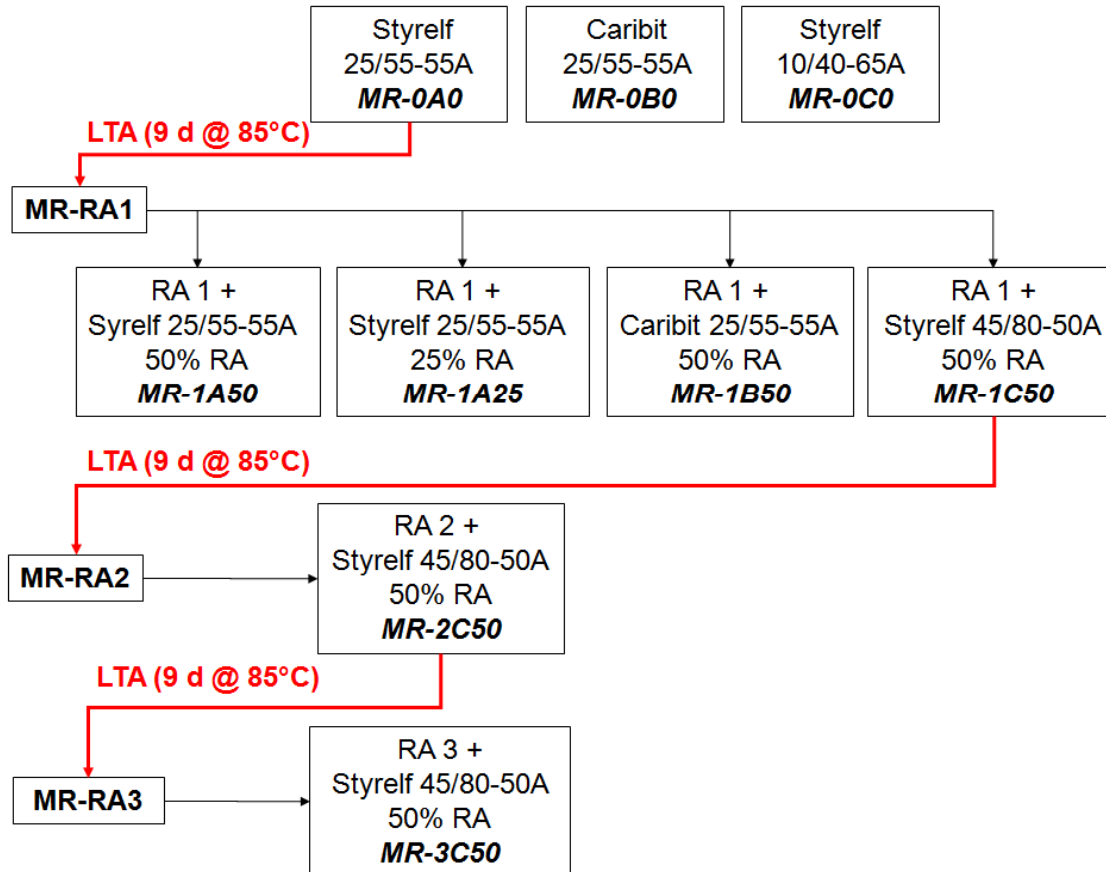
Task 2.1 Current work

Validation to site aging of SMA containing PmB



Task 2.1 Current work

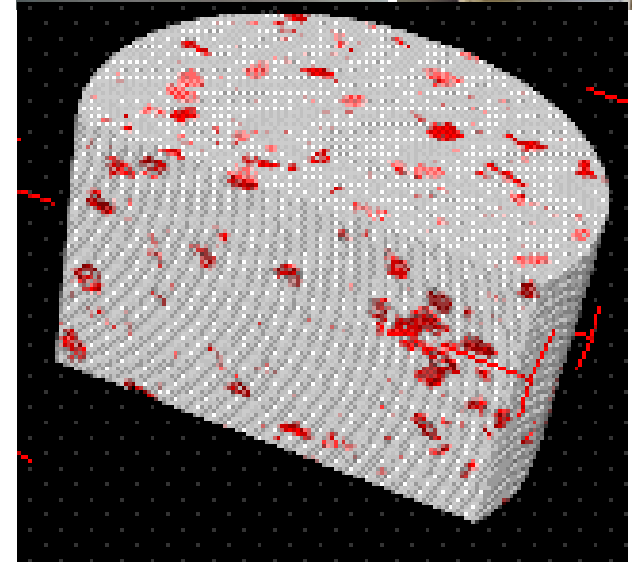
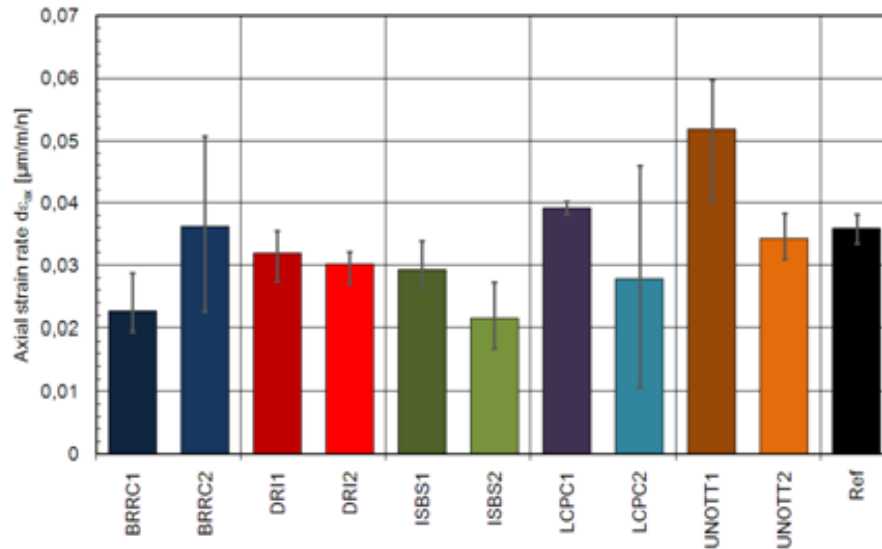
Multiple Recycling / Binder compatibility



Task 2.2 Current work

Laboratory mixing methods :

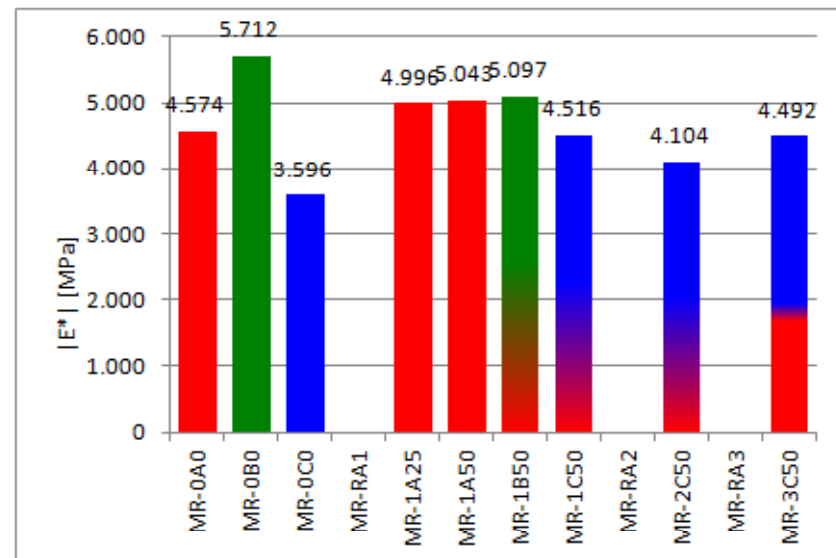
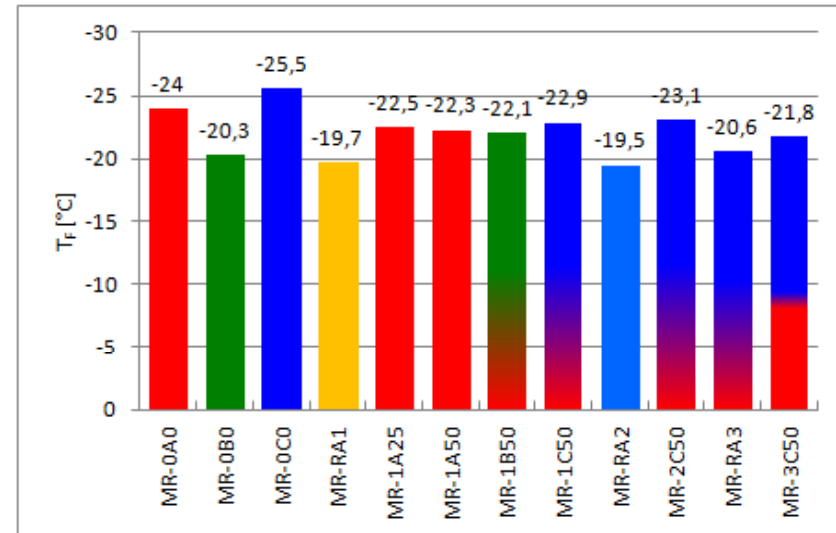
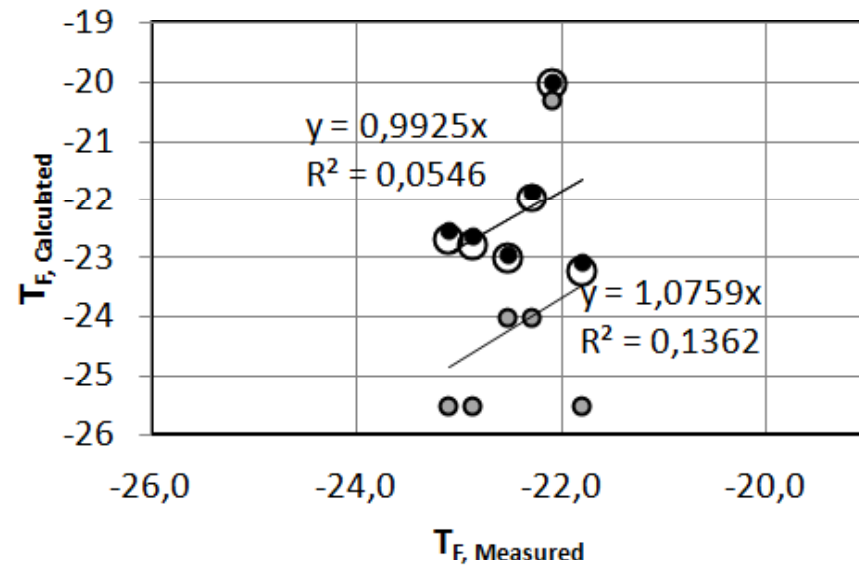
- 5 mixing methods and plant reference mix,
- Mechanical tests:
 - IDT (Stiffness, water sensitivity),
 - Cyclic Triaxial Test,
 - Compactibility
- Image analysis tests:
 - Aggregate orientation (CT & image)



Task 2.2: Current work

Multiple recyclibility,
performance of RA with PmB
Mixing law vs. Double Coating
Theory

● log mixing law ○ lin mixing law ● Double Coating



WP2: Dissemination activity

SUSCOM (Wuhan 2010):

Mollenhauer, Pierard, Tusar, Mouillet, Gabet:

Development and Validation of a Laboratory Aging Method for the Accelerated Simulation of Reclaimed Asphalt

Eecongress (Istanbul 2012):

Mollenhauer, Mouillet, Pierard, Tusar, Gabet:

Laboratory aging of asphalt mixtures – simulation of reclaimed asphalt and application as test method for durability

ISAP-symposium on Asphalt Pavements & Environment (2012):

Gabet, Mollenhauer, Mouillet, Pierard, Tusar:

Assessment of laboratory aging methods for bituminous mixtures