Task 2.2:

Impact of RA on asphalt mix design and laboratory performance

Joëlle De Visscher - BRRC
Re-Road Final Conference
November 13, 2012
Brussels

Participants task 2.2

Participant	Role in task 2.2
TU Braunschweig (**ISBS**), Germany (WP leader)	• Laboratory mixing and specimen compaction • Performance testing
IFSTTAR, France	• Laboratory mixing and specimen compaction
Danish Road Institute (**DRI**), Denmark	• Laboratory mixing and specimen preparation • Optical Image Analysis
University of Nottingham (**Unott**), United Kingdom	• Laboratory mixing and specimen compaction • CT-scanning
ZAG, Slovenia	• Analysis of mixtures
Belgian Road Research Centre (**BRRC**), Belgium (task leader)	• Laboratory mixing and specimen compaction • Performance testing

Overview

- Problem statement
- Objectives
- Summary of the work done
- Conclusions

Problem statement

Impact of RA on mix design:

- Binder selection to be based on characteristics of recovered binder
- RA aggregate to be considered as additional aggregate
- Same volumetric composition as for mix without RA
- Homogeneity of RA determines maximum amount of RA

Impact of RA on laboratory performance testing:

- Same performance tests, same specifications

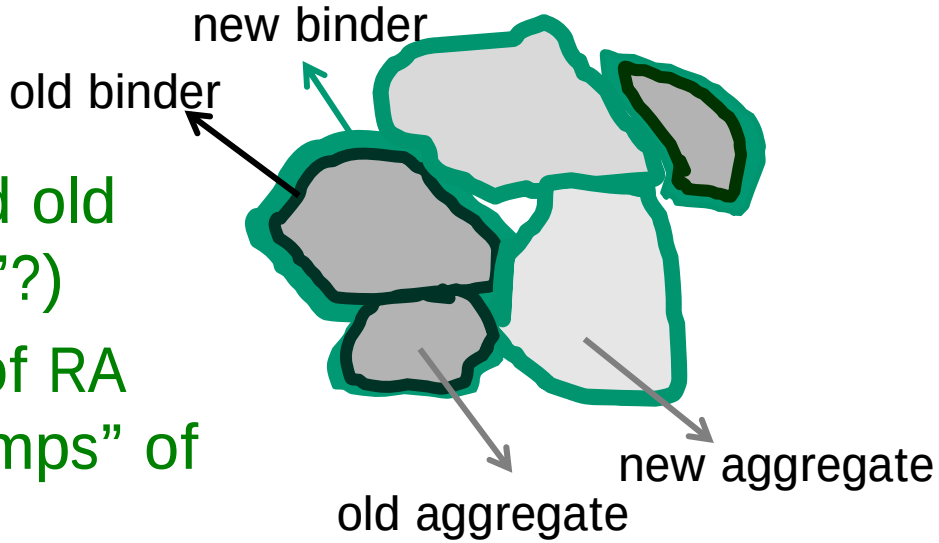
Impact of RA on laboratory mixing?

Laboratory mix ~ plant mix? Initial type testing!!!

Problem statement

Issues in laboratory mixing with RA:

- sufficient mixing of new and old binder? (or “double coating”?)
- Homogeneous distribution of RA within the new mix? (or “lumps” of RA?)
- Additional ageing of RA due to mixing procedure?
- Changes in RA grading due to mechanical or thermal shocks?



Highly critical for surface courses containing PmB!

Objectives of task 2.2

- To study the impact of laboratory mixing procedures on the mix quality and the mix performance test results
- To develop laboratory mixing procedures that simulate the mixing process in the plant
- To study the impact of RA containing PmB on the mix performance

Summary of the work done

"Lab mixing study "

Test mix:

SMA 8 with 15 % RA containing PmB

(German asphalt plant)

Variants in mixing procedure:

x
- 5 labs (different mixers, other equipment technicians, ...)
- 2 mixing times (normal and double)

= 10 different laboratory mixes

+ plant produced mix sampled at the plant

Summary of the work done

Mixing and preparation of test specimens (5 labs)

Gyratory compaction to target density

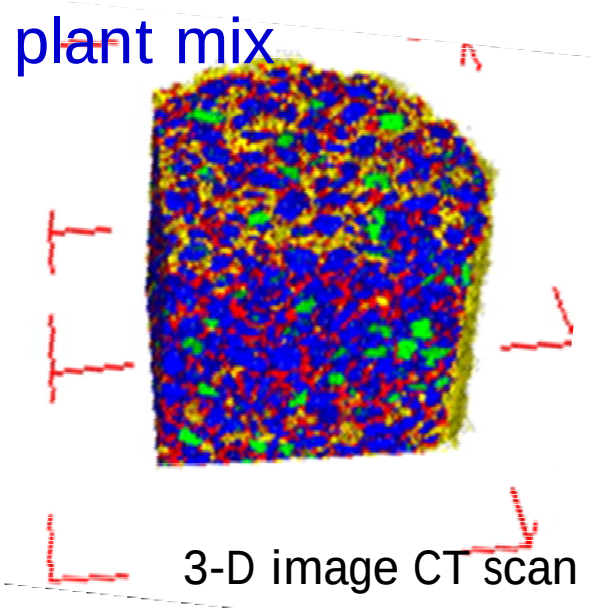
Analysis of 11 mixtures by 1 laboratory (ZAG)

Binder content, grading, binder characteristics: no significante differences between laboratory mixes and plant mix

X-ray CT scans (UNott)

Optical Image analysis (DRI)

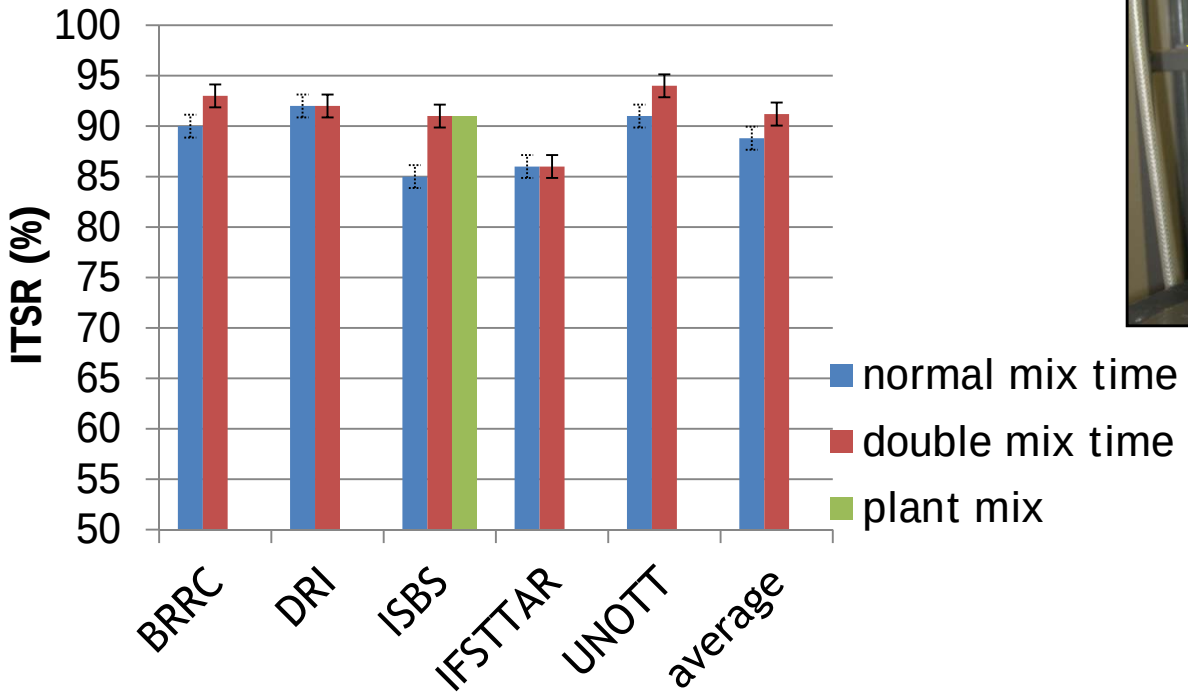
Homogeneous distribution of the constituents

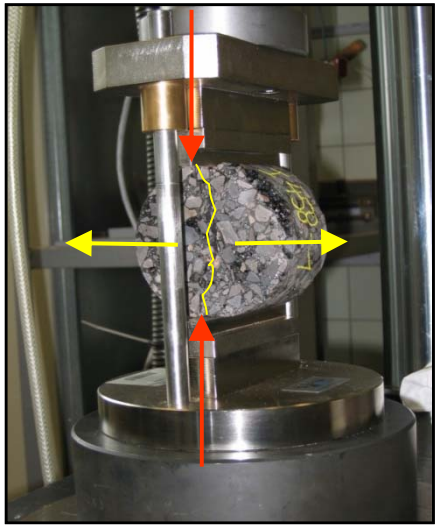


3-D image CT scan

Summary of the work done

Water sensitivity



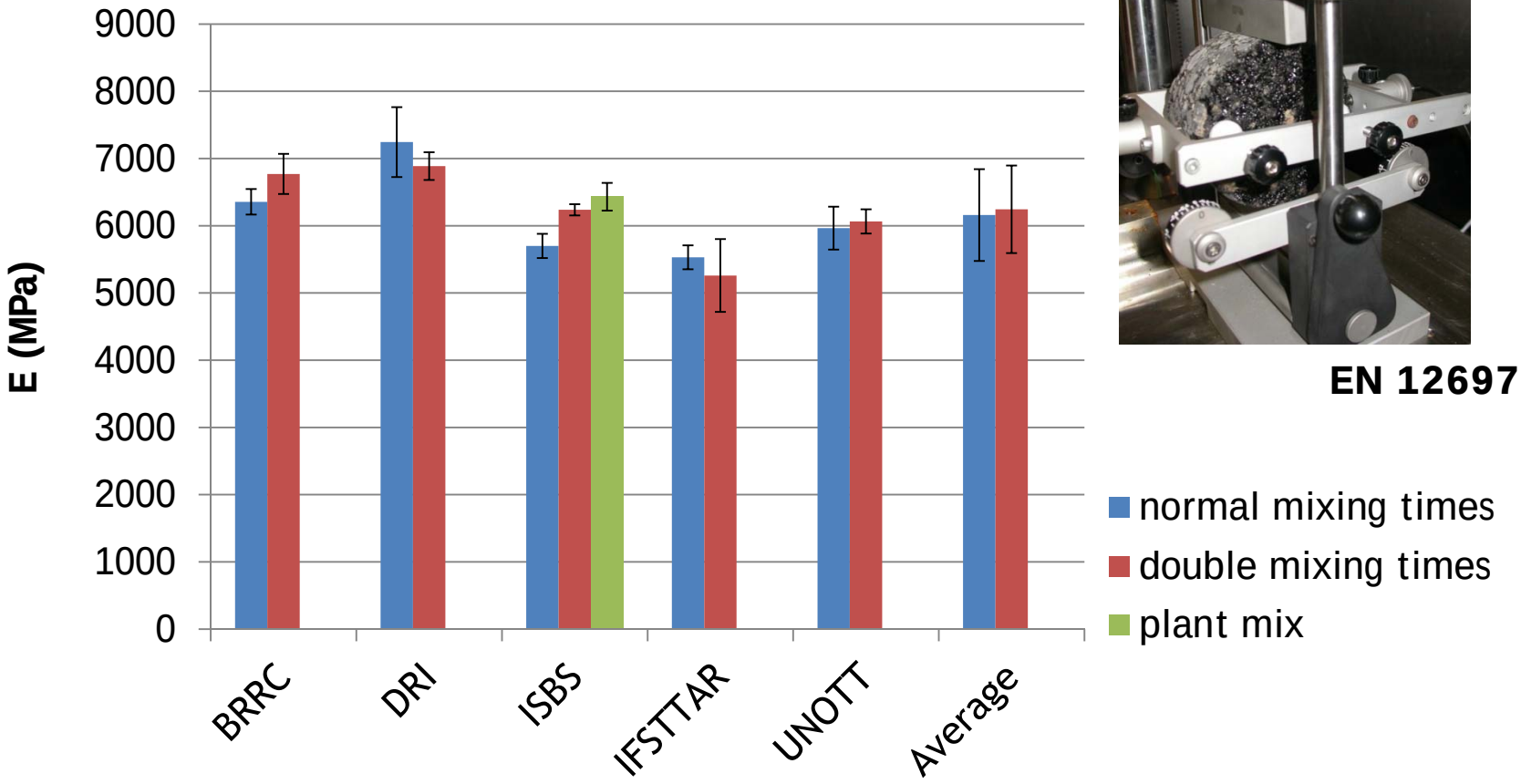


EN 12697-12
EN 12697-23

- No or very small increase by doubling mixing times (not significant)
- Lab has more impact than mixing time
- Average ITSR= ITSR of plant mix

Summary of the work done

Stiffness (IT-CY)

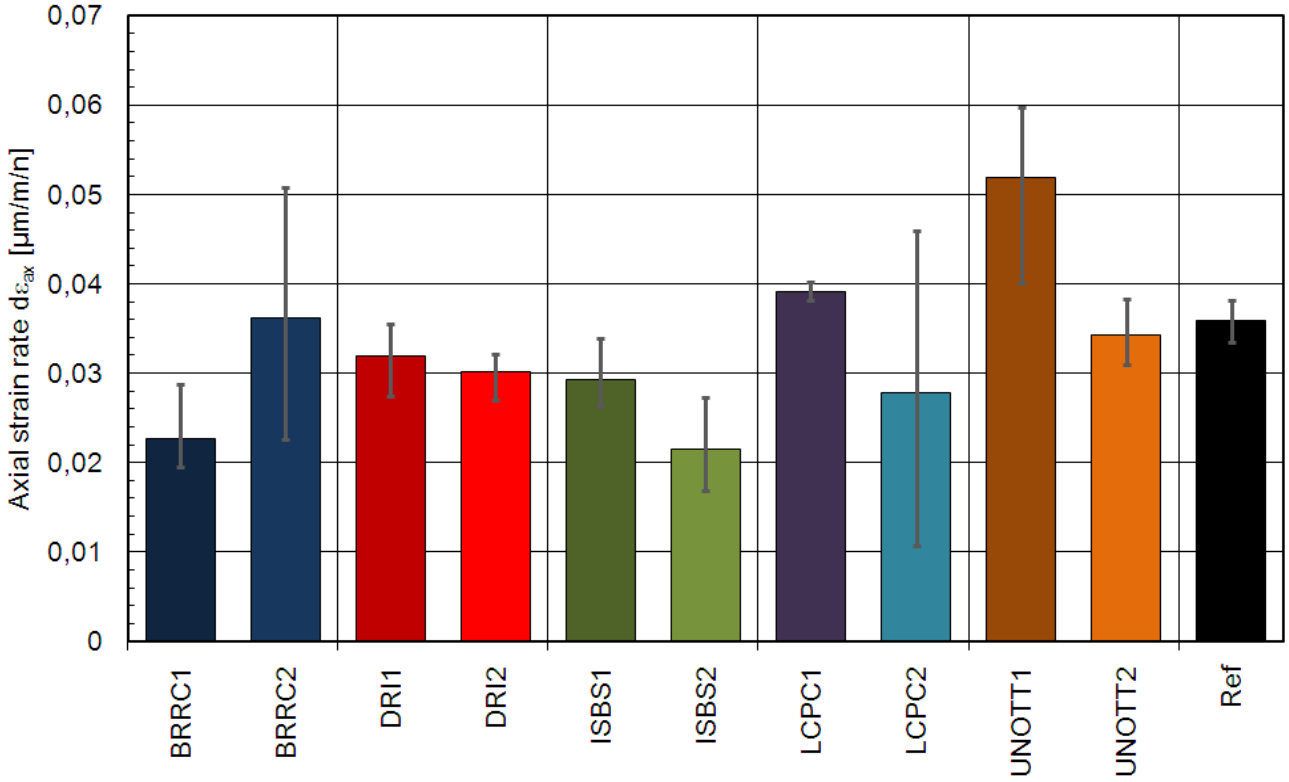


EN 12697-26

- No significant differences, lab has more impact than mixing time
- Average stiffness ≅ stiffness plant mix

Summary of the work done

Permanent deformation (Cyclic Triaxial Compression)



EN 12697-25

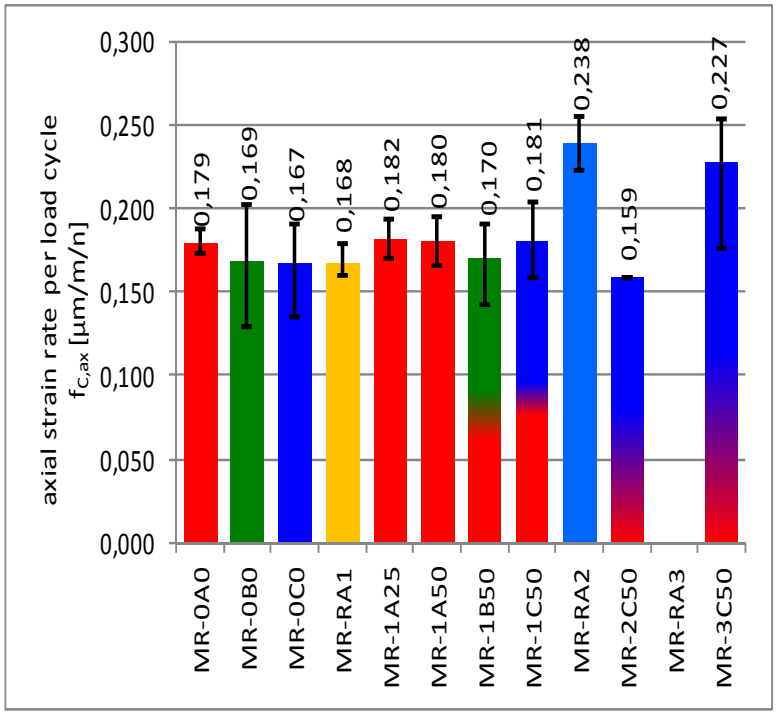
- No significant differences
- Average deformation ≅ deformation plant mix

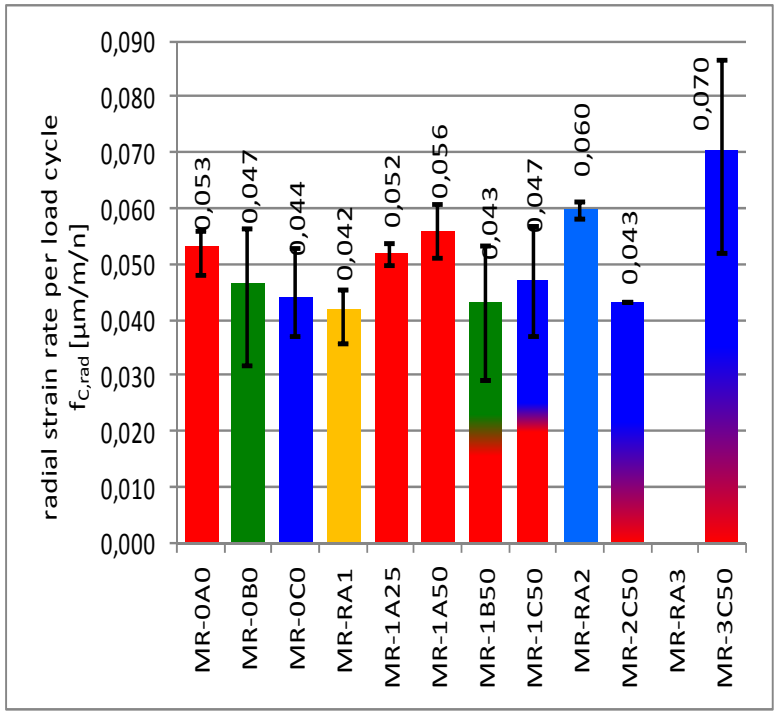
Summary of the work done

"Multiple recycling study" (see Task 2.1)

Impact on mix performance (permanent deformation)

Cyclic Triaxial Compression Tests (by ISBS)





Conclusions

"lab mixing study"

- Procedures for preparing lab mixes (based on EN 12697-35, but more specific) and compaction of specimens (based on EN 12697-31) allowed to produce specimens, representative of specimens made from plant mixed material

- Differences between specimens from different labs were not significant (compared to precision of the tests)

- The mixing times were not critical (within limits set by EN 12697-35)

"multiple recycling study"

- Multiple recycling (up to 3 cycles!) with 50 % of RA resulted in mixes with similar performance (permanent deformation) as mix with 100 % new materials

Thank you for your attention!