Pavement design for cold recycled materials

Helena I. Lacalle Jiménez

J. Tuck, J.P. Edwards, N.H. Thom

SUP&R ITN
Sustainable Pavement & Railway Initial Training Network

www.superitn.eu
helena.lacalle@aecom.com
@helenailj
esr1.superitn.eu

Background of the problem

- **Presence of tar in old pavements:** cannot be recycled into hot mix or as unbound materials, classified as Hazardous waste.
- **Sustainability approach:** reduce raw material consumption and waste generation.
- **No design guide for using cold recycled materials in airfields**

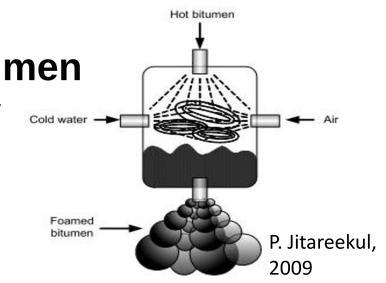
Project objectives

- Literature review of cold-mix asphalt and design methods
- Design the most appropriate laboratory test programme
- Measure effects of key variables on performance
- Develop a pavement design methodology
- Establish practical limitations on the use of cold recycled materials
- Propose appropriate specifications and design guidance for authorities and practitioners

Literature review Conclusions

✓ **Design guide for airfields**
Current practice to be improved

✓ **Use of foamed bitumen**
Cold technique commonly used in UK



P. Jitareekul, 2009

✓ **Curing procedure: 20°C 28 days**
Reproduce field conditions

Research Plan

- Cold recycled bound materials (CRBM) characterisation
- Comparison with hot mix (HMA)

New design guide needed

Develop design model

- Select design software
- Reproduce conventional design guides
- Analyse pavement structure with cold mix

- Fatigue
- Crack propagation
- Dissipated energy

Study failure mode

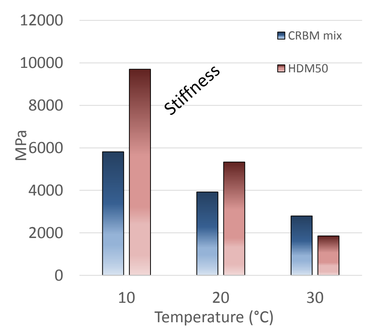
Specifications

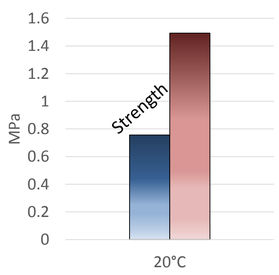
- Variability of the model
- Guidance

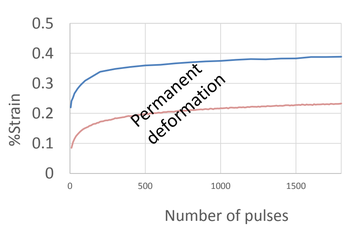
Design guidance

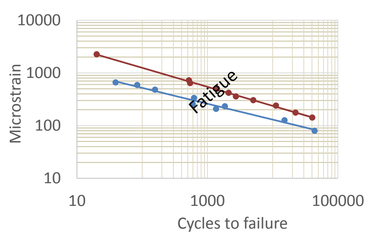
Results

Design guide needed: CRBM behaviour differs from HMA

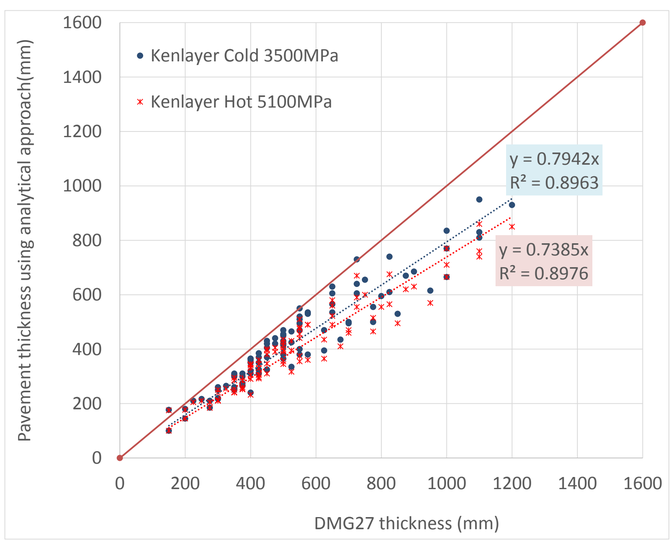




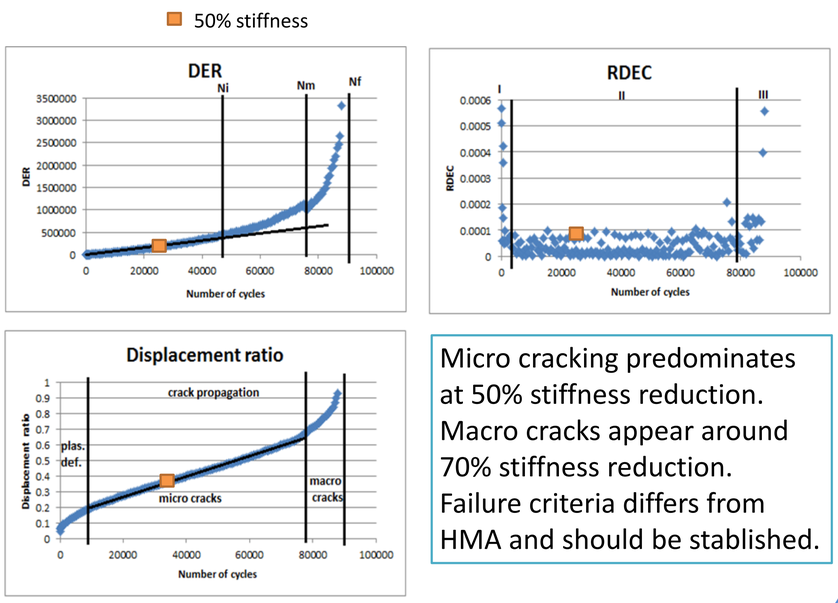




Conventional guides reproduced with design software (Kenlayer): design model and inputs obtained



Failure and crack propagation studied: failure occurs at 30% stiffness instead of at 50% (HMA)



Micro cracking predominates at 50% stiffness reduction.
Macro cracks appear around 70% stiffness reduction.
Failure criteria differs from HMA and should be stablished.

Future work

- Include fatigue study into design model
- Obtain design guide and specifications
- Thesis submission

The research presented in this presentation was carried out as part of the Marie Curie Initial Training Network (ITN) action, FP7-PEOPLE-2013-ITN.
This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement number 607524.