



Session 1

MATERIALS

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Universidade do Minho



**Road
Materials
and
Pavement
Design**

Road Pavements: Materials, design and performance
Lisbon, LNEC, 25 March 2010



Objectives of research on road materials

- > To deliver **environmental and sustainability benefits** through the advances in road materials engineering (problems of resources availability)
- > To **develop new binders**, additives and mixtures to improve performance at low costs
- > To improve the methods to **measure and model the performance** of road materials
- > To solve public **expectations of quality, safety and noise** on roads
- > To develop **innovative high-technology** materials



Current/future research on road materials

- > **Performance evaluation of road materials** (binders, aggregates, additives, mixtures) using new scientific and multidisciplinary advances
- > **New/enhanced tests or devices** to simulate *in situ* conditions and obtain more accurate results
- > Use of **new models** (viscoelasticity, plasticity) to simulate and predict road materials behaviour
- > Implementation of **new technologies** to produce good performance mixtures with low energy consumption (WMA, half-WMA)



Current/future research on road materials

- > New products/approaches to **reduce wastes** from road pavements and better use of materials
- > Use of **high RAP content** in recycled mixtures (cold or hot recycling in place or in the plant)
- > New methods and tests to **characterize RAP material and design recycled mixtures** (recycling of AR or polymer modified mixtures)
- > Use of alternative or currently **marginal materials**, or wastes from other industries



Current/future research on road materials

- > **Assessment of risks** linked to the use of less conventional materials in road pavements (leaching, emissions, health problems, recycling)
- > Use of **new materials** adjusted to the desired properties in the pavement (rutting or fatigue resistance, low noise, low roughness)
- > Development of **new binders** (bio-binders)
- > Development of **new additives** and treatments for flexible road pavements



Current/future research on road materials

- > **Micro/nano evaluation of the interactions** (physical and chemical analysis) between the constituents of road materials
- > **Soil stabilization** with non-traditional stabilizers (Bio-stabilization of soils)
- > Use of **thermally optimized mixtures** (open graded surfacings, cool pavements)
- > Research of **innovative** high-risk, high-reward **materials development** (photoelectric roads)



Contents of session 1 – Materials

Advances in performance evaluation of asphalt binders

(10:30-10:50) > Hussein Bahia

Cyclic behaviour of bituminous materials: new results and modelling

(10:50-11:10) > Hervé di Benedetto

Use of binder additives in different Warm Mix Asphalts

(11:10-11:30) > Joel Oliveira and Hugo Silva

Asphalt mixtures with high RAP content: design and performance

(11:30-11:50) > Maria de Lurdes Antunes, Fátima Batista, Luis Picado Santos,
Paulo Pereira and Jorge Pais

Long term flexible pavement performance modelling

(11:50-12:10) > Andrew Collop

(12:10-12:30) > Discussion



Advances in performance evaluation of asphalt binders

Hussein Bahia

Int. Journal RMPD speaker: Editor-in-Chief
University of Wisconsin, UW Madison, USA
Professor, PhD

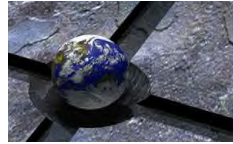
Research on pavement materials and design, modified asphalt, emulsions and mixtures

Summary of the presentation

Performing grading (PG) background

New concepts: damage resistance characterization

New tests: creep and recovery



Cyclic behaviour of bituminous materials: new results and modelling

Hervé di Benedetto

Int. Journal RMPD speaker: Editor-in-Chief
Ecole National des Travaux Publics de l'Etat, France
Professor, PhD

*Study of mechanical, thermo-mechanical and structural
behaviour of geomaterial; experimental and modelling research*

Summary of the presentation

- > Challenge of bituminous materials; complex modulus tests (quasi static): mixes, mastics & bitumen); linear viscoelastic domain



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CENTRO RODOVIÁRIO PORTUGUÊS

Use of binder additives in different Warm Mix Asphalts

Joel Oliveira et al.

Portuguese invited speaker

University of Minho, Dep. Civil Engineering, Portugal

Assistant Professor, PhD

Interests: Sustainable pavements, Recycling, Energy efficiency

Summary of the presentation

- > Comparison (lab and trial) between HMA and WMA mixes produced with (1) Synthetic waxes or (2) Surfactants
- > Further use of waxes in less usual binders (hard and soft)
- > Further use of surfactants in AR and recycled mixtures
- > WMA additives usually maintained/improved the performance





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Asphalt mixtures with high RAP content: design and performance

Maria de Lurdes Antunes et al.

Portuguese invited speaker

LNEC, Portugal

Principal Researcher, PhD

Interests: Pavement materials; Pavement design; Pavement monitoring, evaluation and modelling; Pavement performance evaluation

Summary of the presentation

- > Mixes design and performance evaluation





Long term flexible performance modelling

Andrew Collop

Int. Journal RMPD speaker: Editor-in-Chief
University of Nottingham, Director NTEC
Professor, PhD

Summary of the presentation

- > Investigate the effects of dynamic loading on long term pavement performance (move away from the 4th power law)
- > Aggregate damage approach; damage prediction; spatial repeatability; full-scale experiment