AAPA Study Tour to Europe & 5th Eurobitume & Eurasphalt Congress

Robert Vos
AAPA
Presentation Overview

AAPA Study Tour

- Itinerary, Delegates
- Key Topics
- Feedback and early observations

5th Eurasphalt and Eurobitume Congress

- Congress, Themes
- USB Congress proceedings
- Details of Sessions 1 to 8
Itinerary

- 2\textsuperscript{nd} to 21\textsuperscript{st} June 2012
- Tour group 9 Australian roads people
- Six countries & 5\textsuperscript{th} E&E
  - France / Belgium / Netherlands / UK / Turkey / Germany
- Five key topics
  1. Long life pavements
  2. High performance asphalt & binders
  3. Sustainability
  4. Health & Safety
  5. Procurement Systems
Study Tour Delegates

Warren Carter
Nation Technical Manager
Downer Australia
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New South Wales 2113
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M: warren.carter@downerediworks.com.au

Why on tour: To learn what is happening in Europe on Perpetual Pavements, WMA and RAP; to understand the future direction of binders regarding sustainability; testing regimes to assess quality; networking and establishing international contacts.

Background: 25th year in the industry and had exposure to bitumen emulsions, polymer modified binders, sprayed sealing, asphalt and slurry/microsurfacing. Originally commenced in a laboratory role. The majority of my career has been in a technical role but have also held project management roles.

Qualifications: B.Sc.(Industrial Chemistry), MBA

Khar Yean Khoo (Dr)
Research Scientist
Pavements & Surfacings, Sustainable Infrastructure Science
ARRG Group Pty Ltd
500 Burwood Highway VERMOUNT SOUTH, Victoria 3133
P: +61 3 9881 1602 M: +61 423 800 811
E: khar.khoo@arbg.com.au

Why on tour: To broaden my knowledge, skill base, establish contacts and to learn about new developments in bituminous materials of importance to Australia, principally bitumen properties, polymer modified binders and sprayed sealing.

Background: Last four years with ARRG binders & sprayed sealing research team. Focussed on the chemical and physical properties of bitumen and the performance of polymer modified binders.

Qualifications: B. Eng (Chem), PhD (BioChem Eng)

Graham Wilson (Dr)
Technical Manager
BP Bitumen, BP Australia (Pty) Ltd
GPO Box 5222 MELBOURNE Victoria 3001
P: +61 3 8368 8740 M: +61 419 200 238
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Why on tour: Personal and professional development opportunity. Also, what is happening outside of Australia in the area of sustainability?

Background: Varied: 2 years Post Doctoral Research Fellow, Physics Department Monash Uni; 5 years with South Pacific Tyres (DunlopOlympic & Goodyear) working on real time data acquisition systems; 11 years at Kodak Research Lab as Research Scientist and then Research Group Leader; 6 years (and counting) with BP Bitumen, first as Bitumen Technical Projects Manager then as Technical Manager.

Qualifications: BSc.(Hons), PhD In Chemistry

Rob Vos
Queensland Executive
Australian Asphalt Pavement Association
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Why on tour: Learn about the status of the key issues in Europe. Meet the lead practitioners and share knowledge and contact. Seek details on Procurement systems.

Background: 13 years at Cape Provincial Roads (South Africa) 10 years Technical Director Sabita, last 12 years in AAPA in Queensland as State Executive.

Qualifications: BSc.Eng.Civil, Pr.Eng, C.Eng, MSAICE,MICE

Australian Asphalt Pavement Association
2012 Study Tour to Europe and 5th Eurasphalt & Eurobitume
2 to 21 June 2012
www.aapa.asn.au
John Lambert
Chief Executive Officer
Australian Asphalt Pavement Association (AAPA)
Level 2, 5 Wellington Street, KEW, Victoria 3101
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Why on tour: At E&E Congress to meet & further develop relationships and exchange key information with industry association colleagues. In Germany to capture their developments in HSE and recent fumes reports.

Background: Previously in Government & the private sector as consultant & in management positions w.r.t. energy & petroleum products including their development and environmental norms.

Qualifications: Mechanical Engineer & M.Env.Studies

Nigel Preston (Dr)
Bitumen Technical Manager
The Shell Company of Australia Limited
GPO Box 872K, MELBOURNE, Victoria 3001
P: +61 3 8823 4451 M: +61 419 564 596
E: nigel.preston@shell.com

Why on tour: To understand the European approach to long life pavement design and utilisation of high modulus asphalt. Interested in the use and trends in EME binders and PMBs.

Background: Career professional in highway engineering. 21 years experience in bitumen technical roles with Shell in the UK and Australia.

Qualifications: PhD Nottingham University and BENG Bradford University, FIAT.

Greg Stephenson (Dr)
Senior Engineer – Civil Infrastructure
Asset Management Branch, Brisbane Infrastructure
Brisbane City Council
GPO Box 1434, BRISBANE Queensland 4001
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Why on tour: To understand trends in long life pavements, long term performance, sustainability, reuse and recycling to optimise the whole of life performance of our road network into the future.

Background: 32 years experience working for local government authorities, federal government and consulting engineers mostly in the road and airport construction and maintenance areas. Before joining BCC, I spent 5 years at Queensland University of Technology in a range of pavement and asphalt research related activities.

Qualifications: B.Eng-Civil, M.Sc, Ph.D in Civil Engineering

Hugo van Loon
Senior Asphalt Engineer
Spatial Intelligence & Road Assets Section,
Transport Services Division: Department of Planning, Transport & Infrastructure, South Australian Government
PO Box 1533 ADELAIDE South Australia 5001
P: +61 8 8343 2524 M: +61 417 853 394
E: hugo.vanloon@sa.gov.au

Why on tour: Investigate the ‘rules’ for addition of RAP, understand high modulus asphalt, SMA mix design and fatigue of asphalt.

Background: Hugo has been asphalt engineer for the state road authority in South Australia for 17 years.

Qualifications: B Eng, Civil from Uni SA

Ian van Wijk (Dr)
Technical Director, Competency Leader: Roads
Aurecon
Locked Bag 331, BRISBANE Queensland 4001
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Why on tour: To gain a better understanding of European and UK structural pavement design systems and performance inputs such as material properties and fatigue. Also to get additional info new technologies, new binders and their inclusion in structural design procedures.

Background: Pavement design for 30+ years, practiced in Africa, Middle East, India, Malaysia and Australia. Previously 4 years in a South African Provincial Roads Authority and 5 years at Purdue University, USA (from which MSc and PhD were obtained). Worked in academia, and for consulting engineers Van Wyk & Louw, African and now Aurecon.

Qualifications: BEng, MSCE, PhD, Pr Eng, MIEAUST CPEng, RPEQ
Key topics 2010, 2011, 2012

1. Perpetual Pavements / Long life pavements
2. Warm Mix Asphalt
3. Recycled Asphalt Pavements
4. Accelerated Pavement Testing

1. Surface Treatments
2. Binders
3. Improving Pavement Performance
4. Sustainability

1. Long life pavements
2. High performance asphalt & binders
3. Sustainability
4. Health & Safety
5. Procurement Systems
1. Long life pavements
   - Experience, design systems, use, durability & performance

2. High performance asphalt & binders
   - High modulus asphalt (EME, HiMA), modifiers

3. Sustainability
   - RAP/WMA, bitumen substitutes, carbon calculators & energy analysis
climate change impacts, societal concerns

4. Health & Safety
   - Construction of road works, health considerations for bitumen and asphalt products

5. Procurement Systems
   - Proprietary products (Avis Technique, HAPAS, etc.), “green” procurement, REACH, responsible sourcing, PPP and contract models
Topic 1: Long life pavements

Overview of reasons

• A revision to the Austroads pavement design guide is required to keep flexible pavements competitive against rigid pavements

• The proposed revision will take into account the ‘perpetual pavement concept’ underpinned by the asphalt fatigue endurance limit and healing which is widely accepted in the literature (mainly NCAT test track findings)

• A number of issues hinder implementation in Australia, e.g.
  o evidence of successful implementation by Road Authorities
  o proven structural and material design procedures
  o appropriate laboratory testing and criteria (moduli and fatigue properties)
  o specification, construction and quality control requirements.

• European performance data will facilitate the validation and calibration of the limiting cumulative distribution of asphalt strain for long life pavements.
**Topic 1: Long life pavements**

**Questions**

- **Usage and performance records**
  - Examples and case studies
  - Composition, traffic, deflection history
  - Typical maintenance

- **Design aspects**
  - Design procedures
  - Most appropriate approach - mechanistic or catalogue
  - Prioritisation of focus – design models or construction

- **Material properties**
  - Types of materials typically used
  - Relevant material properties
  - Measurement of material properties
  - Laboratory curing and testing
  - Incorporation of “non standard” materials, e.g. PMB, EME, RAP

[www.aapa.asn.au](http://www.aapa.asn.au)
Topic 1: Long life pavements

Questions

• Fatigue & healing
  o Definition of fatigue/failure
  o Fatigue testing and the determination of endurance limit
  o Correlation between laboratory test results and field performance
  o Effect of binder type on fatigue/endurance
  o Healing of asphalt mixes – testing, effect of traffic loading frequencies

• Contract and construction
  o Initial construction cost – flexible vs. rigid
  o Specification requirements in D&C contract
Topic 2: High performance asphalt & binders

Overview of reasons

• Bituminous binders – key component in the performance and service life of bituminous surfacings & asphalt pavements
• About 90% of the Australian all weather road network length is surfaced with sprayed seals – about 50% of binder usage
• Need to ensure optimum asphalt and seals performance in the field, and to promote best practices suitable to be adapted and adopted in Australia. Seeking details on:
  o new developments and test methods in high performance asphalt and bituminous materials (e.g. HiMA /EME, PMB, Emulsion)
  o actions taken by European and others (e.g. binder manufacturers, asphalt producers and researchers) to overcome field problems (e.g. climate change)
  o correlation between laboratory test results and field trials
Topic 2: High performance asphalt & binders

Questions

• Asphalt
  o EME/ HiMA - specification, testing, field links, pavement & subgrade requirement, binder selection & processing
  o Performance & Construction
  o Reinforced, Modified Binders & SMA – design & composition, service life, pros & cons
  o Moisture Susceptibility: measures, tests & approaches
  o PGA/PA: maintenance & performance

• Specifications and Test Methods
  o Approaches to proprietary mix design, types of modifiers used, low temperature test methods, control of segregation & degradation, etc
Topic 2: High performance asphalt & binders

Questions

• Binders
  o concerns: climate change, quality & characteristic of imported material
  o testing level, lab-field correlation, stabilisation of unbound material

• Emulsions
  o test methods
  o types used in sprayed chip sealing
  o performance based specifications

• Surfacings
  o cost benefit of thin surfacings, reasons of application & modelling
Topic 3: Sustainability

Overview of reasons - Challenges

- Climate Change – Green House Gases
- Future Carbon Tax
- Increasing Demand - Limited Resources
- Ageing Infrastructure - Rehabilitation
- Waste Reduction - Focus on Recycling
- Reduced Construction Periods – Minimise Delays
- Society’s Perceptions & Funding Constraints

“Twice the Task”
Topic 3: Sustainability

Questions

• Recycled Asphalt Pavement (RAP)
  o How Extensively Used / Percentage Added
  o RAP Materials – QA, Binder Types, Ownership
  o Mix Design Changes – Binder Type & Quantity
  o Production Issues – Blending, Mixing, “wet” RAP
  o Placing Issues

• Warm Mix Asphalt (WMA)
  o How Extensively Used
  o What Technologies – Most common
  o Design & Testing Changes
  o Problems / Performance Issues

• RAP in WMA

• Other Low Temperature Technologies
Topic 3: Sustainability

Questions

• Bitumen Alternatives
  o Long Term Binder Availability
  o Reliance on Oil

• Carbon & Energy Calculators
  o What, When, Where & Why are they used?

• Climate Change
  o Is it being considered?
  o What Material / Specification changes?

• Societal Concerns
  o Perceptions of Asphalt Industry
  o Other Recycling Opportunities
Overview of reasons

• Australia has high expectations & legal requirements for a healthy & safe operating environment – key operating focus
• Europe is considered to aware and sensitive to this requirement
• Recent changes to the European operating environment (REACH, IARC, austerity) may have impacted and lessons learnt could be shared
  • Specific issues and implications for Australia
    o Improving road work site safety
      – full closure / contraflow / automatic aids / speed
    o Increased environmental awareness & society friendly treatments
      – new developments | emerging concerns
      – impact of REACH on products and operations
      – IARC classification of bitumen
Topic 4: Health & Safety

Questions

• Health
  o Impacts of IARC classification of bitumen on industry?
  o Has REACH impacted on the supply and use of products?
  o Drive for healthier products? What products?
  o Noise – measured, surfacing options, maintenance?

• Safety
  o Statistics – injuries & fatalities? How measured & collected?
  o What are the greatest road worker risks?
  o What training is available?
  o What techniques / methods for safer maintenance?
  o Communicating road worker safety needs to the public – how?
  o Urban & multi accessed sites – any special safety approaches?
  o Are higher safety road surfacing products preferred?
**Overview of reasons**

- Australia has tried to set up systems like Avis Technique & HAPAS but have been unsuccessful.
- The benefits of innovation and declining skills in the road authorities point to its greater use.
- Lessons learnt, benefits of the systems used, changes to purchasing to accommodate and implications for road authority expertise is sought.
- Use of the systems to promote innovation and product development in new areas such as CO₂ reduction, energy efficiency, nose reduction etc.
- The use of procurement systems from PPP, Alliancing, DBOM, ECI including normal contracts, long & short term contract maintenance systems.
  - What key performance characteristics over time?
  - How to retain the culture of stewardship in the contracting agency?
  - How to retain expertise on the road authority to manage / ensure value-for-money?
Topic 5: Procurement Systems

Questions

• Systems
  o Avis-Technique systems – are they working / cost effective?
  o Lessons learnt, still promoting innovation?
  o How are underperforming products addressed?

• Functional and performance requirements
  o Are performance based specifications used?
  o What test methods used to measure performance / proprietary?
  o Functional specifications and fitness-for-purpose assessed over time – how is this done?
  o How are environmental / traffic loading changes included in the assessment?
  o Define what a “warrantee” means, for how long, end state?
  o Can proprietary product systems replace performance-based specs?
  o Can “green procurement requirements fit into the system (C02, energy)
Topic 5: Procurement Systems

Questions

• Product sourcing and life cycle assessment
  o Has REACH impacted on the product selection and use in Europe, are their benefits?
  o Are there any “responsible sourcing” influences on product selection?
  o What methodologies and inputs are used to assess WOLC for pavements?

• Contract & procurement models
  o Are PPP widely used to fund and deliver European road projects?
  o Do PPP affect the products chosen and warranties required?
  o What are the dominant contract models for services, construction & proprietary products? Are there case studies showing cost differences?
  o Are non-price criteria used in assessing tender submissions –and how?
  o On contracted maintenance:
    • How is culture of ownership or stewardship for the network retained?
    • How do road authorities retain skills to be an informed client?
Paris, France: USIRF, IBEF, Colas
Brussels, Belgium: Eurobitume & Eurasphalt
Netherlands, Amsterdam: Andre Molenaar & Kraton

Netherlands, Delft: DVS & VBW-Asphalt
UK, London: Highways Agency

UK, London: TRL
Germany: Construction site
Germany: traffic lanes cleared for construction
AAPA Study Tour to Europe & 5th E&E Congress

Feedback sessions
November 2012
Adelaide, Melbourne, Sydney & Brisbane
• Three Day Congress held every 4 years
• Premier European event for binders & asphalt
• Over 1000 delegates
• Moderated sessions & selected presentations
• Eight sessions covering the selected paper themes

CONFERENCE USB PROCEEDINGS AVAILABLE
Themes

• Energy & Carbon
• Durability & Performance – mixtures & binders
• Resource use & recycling
• Adapting to climate change
• Societal impact
• Responsible sourcing and green procurement
• Improving health and safety
• Financing road infrastructure and maintenance
Proceedings of the 5th Eurasphalt & Eurobitume Congress
Asphalt, the sustainable road to success

13-15 June 2012, Istanbul, TURKEY

USB memory stick of the congress proceedings
Wednesday 13 June 2012 (Day 1)

08.00 - 18.00  Registration
08.30 - 18.00  Exhibition and posters
09.00 - 10.00  Opening Session
               Session Chair: Simon van der Byl
               Welcome by president of Eurobitume on behalf of EAPA and Eurobitume  Alberto Madella
               Welcome by Turkish minister of Transport  Binali Yildirim
               Welcome address by president of EAPA  Jean-Louis Marchand
10.00          Opening of Exhibition
10.00 - 10.30  Coffee break
10.30 - 12.30  Session 1: Introduction to congress themes by keynote speakers
               Session Chair: Mike Southern
               Social issues
               Prof. Dr. Mustafa Karasahin
               Roads and Their Social Impacts CV
               Social economic impact
               Vilrid Fermoen
               The positive impacts of roads Underestimated and ignored in decisionmaking? CV
               Financing of road infrastructure and maintenance:
               André Broto, Vice-President of Cofiroute in France
               Financing of road infrastructure and maintenance CV
               Responsible sourcing and green procurement
               Shamir Ghumra (Aggregate Industries - Head of Sustainability)
               Responsible Sourcing and Green Procurement CV
               Health & Safety in the 21st century
               
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Road transport is necessary, but not sustainable, Why?

- Traffic accidents,
- Air and noise pollution,
- Traffic congestion,
- Consumption of non-renewable natural resources (25% of energy resources)

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<td>Coating mixes</td>
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Period: 50 years / Traffic: 20,000 vehicles per day

Source: USIRF, France

The cost of transport externalities ranges between 4-8 per cent of the GDP in the OECD countries
Market Penetration of Fuel and Propulsion Systems

Use of HEV, BEV, FCEV powered cars will decrease CO₂ emissions considerably.

GHG-TransPoRD, 2012
Mode Choice and Income

Sperling, 2002

Asphalt, the sustainable road to success
Metrobus System in İstanbul

- Time saving: 109 min/day/person
- Travel cost saving: 61%
- Number of public transport out of service: 209 buses, 1,296 minibuses
- Accident reduction: 64%
- Savings from fuel: 242,000 lt/day
- Number of cars out of traffic: 80,000/day
- Decrease in CO2 emission: 623,000 kg
- Average number of passengers: 500,000/day

Asphalt, the sustainable road to success
What to do for sustainable asphalt pavements?

**Developed Countries**

- Use warm mix asphalt technology,
- Use more recycled material for road construction (if possible 100%),
- Search for effective and long life maintenance technologies,
- Use more porous asphalt,
- Production of low cost but sustainable vehicle technology for developing countries,
- Improve road geometric standards and road surface for less fuel consumption (radius, grade, macrotexture, microtexture etc.)

**Developing Countries**

- Transfer know-how from developed countries
- Research for low cost and sustainable road building materials
- Find finance for new production factories and infrastructure
Energy & Carbon:
Jan van der Zwan: How to minimise the carbon footprint of asphalt roads

Q&A
12.30 - 14.00  Lunch
14.00 - 15.30  Session 2: Introduction to congress themes by keynote speakers
               Session chair: Egbert Beuving

Energy & Carbon
Jan van der Zwan, DVS, The Netherlands
_How to diminish the carbon footprint of asphalt roads CV_

Adapting to climate change
Rudi Bull-Wasser, BASi, Germany
_Adapting asphalt roads to Climate Change – Views and needs of the Road Authorities CV_

Resource use & recycling
John Barritt, WRAP (Waste & Resources Action Programme), UK
_Resource efficiency, regulation and recycling CV_

Durability & Performance
Prof. Dr. Ir. André A.A. Molenaar, Delft University of Technology, the Netherlands
_Durability, a Prerequisite for Sustainable Asphalt Pavements CV_

Q&A
15.30 - 16.00  Coffee Break
16.00 - 17.30  Session 3: Health Safety & Social issues
               Session Chair: Harry Roos

IARC Decision
Henri Molleran
Contractor

- Investigate the total production chain, define the carbon footprint of all activities.
  - (A.o.) better supply chains
  - Isolation of asphalt plant
  - Low temperature asphalt
  - Increase recycling
  - Low emission engines
  - Green energy
CO2 emission and Asphalt

- CO2 emission transport app. 4700 Mton
- Global annual asphalt production 1600 million ton / year
- Equals app. 96 Mton CO2
- ~2% of emission of road transport
Asphalt and other products

- Carbon footprint asphalt
  60 g CO2e /kg
- Carbon footprint orange jus
  1600 g CO2 e/kg
- Carbon footprint cheese burger
  6000 g CO2 e
Other possibilities?

- Highest emissions by traffic
- How to influence energy use by traffic?
  - Reduce rolling resistance
  - Reduce aerodynamic resistance
  - Traffic management
  - Speed
Conclusions

- Yes, we can ........ reduce the carbon footprint of roads
- Always take the life cycle effects into account
- Large effect by reducing amounts of asphalt (increase quality, rethink design and maintenance strategies)
- Reduce energy use in total production line
- Be clear about ambition and costs
- There is a need for standardisation in instruments and quality management of data
- Use the possibilities to reduce energy use by traffic
Durability & Performance:
Andre Molenaar:
Durability, a prerequisite for sustainable asphalt pavements

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IARC Decision
Henri Molleran
Durability, a Prerequisite for Sustainable Pavements

André A. A. Molenaar

Delft University of Technology
The Netherlands
Quickest Way to Reduce CO₂ is by Using less Asphalt Concrete

- Thinner Structures and Longer Lifetime
- Better Quality
- Extension lifetime by use of e.g. “Beauty Creams”
- High RAP % in new mixtures
- Warm asphalt mixtures (foam) especially in combination with recycling

CAN WE DO THIS?
Better Quality

- We build our pavements with too much variability
- This results in:
  - too early maintenance
  - need for higher maintenance budgets
  - more delays due to maintenance and rehab works

Frequency distribution bitumen content

Cooling of the asphalt when the paver stopped

Roller passes
Conclusions

- Perpetual asphalt base courses can easily be built using high % of RAP and other bituminous “waste”
  - fractionize the RAP
  - “green” modifiers are effective
- Energy needs to produce asphalt mixtures can be reduced further
- Recycling using half-warm techniques is “green” asphalt technology
Sustainable AND Durable Pavements

- Thinner Structures and Longer Lifetime
- Better Quality
- Extension lifetime by use of e.g. "Beauty Creams"
- High RAP % in new mixtures
- Warm asphalt mixtures (foam) especially when recycling

CAN WE DO THIS? YES WE CAN!
Health & Safety in the 21 century: 
Carl Robertus: Bitumen Health & Safety

Durability, a Prerequisite for Sustainable Asphalt Pavements

Q&A

15.30 - 16.00  Coffee Break

Session 3: Health Safety & Social issues

Session Chair: Harry Roos

IARC Decision
Henri Moller

Summary of animal skin carcinogenicity test results with bitumen fume condensate samples
James Freeman

Status of bitumens under the REACH regulation
Peter Boogaard

Moderator report
Christine Leroi
PowerPoint Slides

Simulation of tyre/road noise as a tool for the evaluation of the acoustic behaviour of road surfaces
Thomas Beckenbauer

An assessment of the evolution of the skid resistance of proprietary asphalt surfacings in the UK
David Woodward

Q&A

Thursday 14 June 2012 (Day 2)

08.45 - 18.00  Exhibition and posters

09.00 - 10.30  Session 4: Sustainability, Energy use and Climate Change

Session Chair: Sophie Limborg
Bitumen
Health & Safety

Carl Robertus
Eurobitume
Context

Is working with bitumen safe?

- scientific studies
- society demands rigour & reassurance
- aim for zero impact on people & environment

Yes, when used correctly, working with bitumen is safe
Hazard, Exposure and Risk

Risk is a function of Hazard & Exposure
Risk = Hazard * Exposure

Risk ~ Health Impact
~ Likelihood of a Health Effect

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat / high Temperature</td>
<td>Dermal Contact</td>
</tr>
<tr>
<td>H₂S in fumes</td>
<td>Inhalation</td>
</tr>
<tr>
<td>Cancer (due to PAH in fumes)</td>
<td>Inhalation, Dermal Contact</td>
</tr>
<tr>
<td>Fumes (respiratory tract irritation)</td>
<td>Inhalation</td>
</tr>
</tbody>
</table>

No Exposure
No Risk, No Health Impact

Destination Istanbul
Eurasphalt & Eurobitume 9th CBE Congress 2012
Asphalt, the sustainable road to success
IARC & REACH

IARC is all about HAZARD

IARC Preamble, Part A, Section 2:
“The distinction between hazard and risk is important, and the Monographs identify cancer hazards even when risks are very low at current exposure levels, because new uses or unforeseen exposures could engender risks that are significantly higher.”

REACH is all about RISK

EC Regulation [(EC) No 1907/2006]
1. Ensure a high level of protection of human health and the environment from the risks that can be posed by chemicals,
2. Industry responsible for assessing and managing the risks posed by chemicals and providing appropriate safety information to downstream users.
IARC Output (HAZARD)

- Monograph 103
- Press Release, Lancet Article
  - occupational exposures to oxidized bitumens and their emissions during roofing are ‘probably carcinogenic to humans’ (Group 2A);
  - occupational exposures to hard bitumens and their emissions during mastic asphalt work are ‘possibly carcinogenic to humans’ (Group 2B);
  - occupational exposures to straight-run bitumens and their emissions during road paving are ‘possibly carcinogenic to humans’ (Group 2B).
- Awaiting FINAL report
- It is what it is: identified the cancer HAZARD (even when risks are very low at current exposure levels)
- It is about the occupational exposure and NOT about the substance bitumen itself

2B also: carbon black, coffee, gasoline, lead, marine diesel, pickled vegetables
## REACh Output (RISK) Today

1. Bitumen & asphalt oxidized are not classified as hazardous for Health and the Environment
2. 

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Exposure</th>
<th>Risk at high exposure</th>
<th>Risk Management Measures</th>
<th>Risk after Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat / high T</td>
<td>Dermal Contact</td>
<td>Skin damage ... death</td>
<td>PPE, Equipment, Procedures</td>
<td>Low</td>
</tr>
<tr>
<td>$\text{H}_2\text{S}$ in fumes</td>
<td>Inhalation</td>
<td>Acute toxicity ... death</td>
<td>Procedures, Equipment</td>
<td>Very low</td>
</tr>
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<td>Inhalation</td>
<td>Respiratory irritation Breathing problems</td>
<td>Lower emissions, temperature, fume extractions, etc</td>
<td>Very low</td>
</tr>
</tbody>
</table>

3. Workers expectations grow => Progress
4. Risk Management Measures => Control Exposure

Asphalt, the sustainable road to success
Emission & Exposure

Emission

- Aerosols and vapours from hot Bitumen
- Fume condensates
- Organic Vapour
- PAH (in fumes)

Mainly a function of temperature

Exposure

This is where we are in control!

Techniques:
- Systems, Equipment, Workers
- Duration, Hygiene, Quantity, Procedures

Measures:
- Temperature Control
- Innovative Technologies
- Engineering Controls
- Additives

Asphalt, the sustainable road to success
Historic Exposure

Exposure Reduction

- Warm mix technologies
  - More than a dozen
  - Application temperature reduction (from 10 to 100°C)
- Increased use since 2000
- Technology plays along the whole supply chain
  - raw materials and additives
  - production equipment
  - laying technologies
  - working practices

Asphalt, the sustainable road to success
Safety

- Safe loading & delivery
- Transportation
- Safe Handling, Burns Card
- Maximum Safe Handling Temperature

- Environment
Recycling & Reuse

- Success Story
- Use, use and use again!
- Fit for Tomorrow

Asphalt, the sustainable road to success
Conclusions

Health
- Bitumen is not classified as hazardous to health or to the environment
- Hazards of working with bitumen are now defined
- Risks are very low and can be reduced further through exposure reduction

Safety
- Bitumen is usually handled and applied hot
- Workers can be adequately protected by
  - following good practices and
  - using the right equipment (PPE)

Environment
- Bitumen is Green
- 100% recyclable
- known eco footprint

Asphalt, the sustainable road to success
Finally

When used correctly, working with bitumen and asphalt is and remains safe.
<table>
<thead>
<tr>
<th>Time</th>
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<tr>
<td>08.45 - 18.00</td>
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<td><strong>Henny Ter Heurne</strong></td>
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<td><strong>Adaptation measures to the challenges of climate change in Hungarian road construction</strong></td>
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<td><strong>Lazlo Gaspar</strong></td>
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<td></td>
<td><strong>Session Chair</strong>: Gerbert van Bochove</td>
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</table>
World in CO₂ emissions

GRAPHIC: MARK MCCORMICK, PAUL SCRUTON. SOURCE: EIA

Asphalt, the sustainable road to success
Practical examples for lowering environmental loads

Reducing emissions and consumption of virgin aggregates through cold in-place recycling.

*B. Eckmann, F. Delfosse, E. Chevalier, France.*

- Natural resources: -29%
- Energy: -33%
- GHG emissions: -30%
- Virgin aggregates: -47%
- Direct fuel consumption: -47%
- Local road transport: -66%

Asphalt, the sustainable road to success
Conclusions

- Sustainability with three pillars balanced
  - Environment, Society, Economy.
- Sustainable development gives opportunities, not only threads.
- CO$_2$ emission reduction
  - Energy efficiency
  - Durability
  - Recycling
Sustainability, Energy use and Climate Change:

Lazlo Gaspar: Adaption measures to the challenges of climate change in Hungarian road construction

Thursday 14 June 2012 (Day 2)

08.45 - 18.00   Exhibition and posters

09.00 - 10.30   Session 4: Sustainability, Energy use and Climate Change

Session Chair : Sophie Limborg

Moderator report
Timo Blomberg
PowerPoint Slides

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Adaptation measures to the challenges of climate change in Hungarian road construction
Lazlo Gaspar

Q&A

10.30 - 11.00   Coffee Break

11.00 - 12.30   Poster session

12.30 - 14.00   Lunch

14.00 - 15.30   Session 5: Resource use and Recycling
Adaptation measures to the challenges of climate change in Hungarian road construction

Laszlo Gaspar - Ferenc Rajcsanyi
KTI, Budapest, Hungary
2 Climate change challenges in road sector I.

- Dangerous climate elements for highways:
  - extreme low temperature,
  - extreme high temperature,
  - extreme precipitation,
  - extreme hydraulical features,
  - excessive wind storms.
## 2 Climate change challenges in road sector II

<table>
<thead>
<tr>
<th>Climate change elements</th>
<th>Effect</th>
<th>Possible answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global warming</td>
<td>Pavement deformation</td>
<td>High modulus asphalt</td>
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<td>Concrete pavement</td>
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<td>Light reflection on surface</td>
<td>High macrotexture</td>
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<tr>
<td></td>
<td></td>
<td>Light aggregate</td>
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<tr>
<td></td>
<td></td>
<td>Concrete pavement</td>
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<tr>
<td>Excessive rain</td>
<td>Skidding</td>
<td>Good microtexture</td>
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<tr>
<td></td>
<td></td>
<td>High macrotexture</td>
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<td>Flooding or inland inundation</td>
<td>High embankment</td>
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<td>Durable embankment</td>
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<td>Slope stability</td>
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<td>Efficient drainage</td>
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<tr>
<td>Climate change elements</td>
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<tr>
<td>Drought</td>
<td>Embankment slope cracking</td>
<td>Paved slope</td>
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<td>Special grass on slope</td>
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<tr>
<td>Intensive (heavy) rain</td>
<td>Slope erosion</td>
<td>Slope protection</td>
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<td>Shoulder erosion</td>
<td>Paved shoulder</td>
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<td></td>
<td>Accumulated water on surface</td>
<td>Proper longitudinal fall</td>
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<td>Proper crossfall</td>
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<td>Water penetration into pavement</td>
<td>Dense asphalt course</td>
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<td>Choking of ditches and/or culverts</td>
<td>Drain asphalt</td>
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<td>High capacity drainage</td>
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<td>Maintenance of drainage</td>
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</tbody>
</table>
3 Proposal for road specifications I.

- Review of Hungarian road-related standards and technical specifications

- Examples:
  - Design (minimum pavement and embankment slope crossfall, structure resistance to thaw damages etc.)
  - Construction (qualifying water pressure and freezing/thawing effects, asphalt behaviour under extreme temperatures, rheological characteristics in changed environment, drain asphalt durability, etc.)
  - Maintenance and operation (special winter pavement maintenance techniques, techniques after flood, improved cold and hot pot-hole repair measures, new rut repair techniques against aquaplaning etc.)
4 Case studies II.

In 2010, 8 m² paved shoulder of new motorway M6 collapsed with embankment slope.

**Reason:** very intensive rain + poor construction quality

Asphalt, the sustainable road to success
Resource use and Recycling:
Jean-Pascal Planche: Moderators report

Session 5: Resource use and Recycling

Session Chair: Gerbert van Bochove

Moderator report
Erik Nielsen
PowerPoint Slides

Viscoelastic properties of bitumen blends obtained from pure and RAP-extracted binders
Salvatore Mangiafico

On a laboratory experimental protocol for qualitative characterization of high rate recycled asphalt mixtures
Anissa Eddahak Ouni

Moderator report
Jean-Pascal Planche
PowerPoint Slides

Unlocking the full potential of Reclaimed Asphalt Pavement (RAP) – High quality asphalt courses incorporating more than 90% RAP; a case study
Matthias Nötting

A New Method for Hot Recycling of Asphalt
Selim Emre Gencer

Q&A

15.30 - 16.00
Coffee Break

16.00 - 17.30
Session 6: Warm Mix Asphalt and Low Temperature Techniques

Session Chair: Richard Taylor

Moderator report
Bernard Eckmann
PowerPoint Slides
E&E 2012 - Session 5
Resource use and Recycling

Jean-Pascal Planche
Istanbul, 06/14/2012

Western Research Institute

Asphalt, the sustainable road to success
Main Theme: Waste recycling in Asphalts

- Waste recycling: a worldwide issue, and now a worldwide awareness
- Addressed in this session:
  - Ground tire rubber - GTR (7)
  - Recycled Asphalt Pavement - RAP (4)
  - Sulfur (3)
  - Waterproofing membranes (2)
  - Plastics (2)

End of life tire recovery in Europe since 1996

Asphalt, the sustainable road to success
Ground Tire Rubber

7 papers: Butz, Cabanillas, Geiger, Lo Presti, Vasilica, Viman, Widyatmoko

- **Principle**: Wet or Dry process to mix GTR into resp. binder or mix – dosage 12 to 20% wt binder, process dependant

- **Issues**:
  - GTR compatibility with asphalt – swelling, phase separation (storage, handling) / GTR chemistry & size
  - Production: high temperature and high shear mixing
  - Performance
  - Recyclability? Not addressed in the papers

- **Solutions**
  - Binder Mixing Process:
    - GTR mixing conditions (continuous stirring or recirculation, high T up to 210C)
    - Cross-linking additive package
  - GTR Composition
    - Truck tire or natural rubber more compatible
    - GTR compounds with {Oil +Wax} or Polyoctenamer
Ground Tire rubber (cont’d)

- **Main Effects on properties**
  - Binder phase separation seen in binder rheology (not R&B), worsening during storage or aging
  - Mix: Improved resistance to crack propagation, wear (studded tires), rutting and improved modulus
  - Mix workability close to control SMA, Porous, Dense
    - Mechanical properties retained / 2h mix storage

- **Potentialities / economics / environment**
  - Growing usage worldwide, particularly in Europe (US >25y)
  - Increased pavement life for high volume roads
  - Traffic noise reduction (OGFC)
  - Environmental risk when using GTR in asphalt
    - No hazardous substances leaching
    - Fewer particles released to the atmosphere, but different fume composition
Sulfur recycling

3 Papers: Nicholls, Nazarbeygi and Masegosa

- **Principle**: Sulfur extended bitumen or extended asphalt
  - Dispersion of sulfur in bitumen: dissolved below 20%, evaporated or segregated as solid crystalline.
- **Issues**: Compatibility with bitumen, H2S emission at production and during hot recycling (not addressed in the papers), characteristics / performances
- **Solutions**: Temp. control <145°C, pref. WMA below 130°C
  - Emissions (DSC, TGA): around 10% at T above 140°C
  - Pelletized sulfur (IP) added to aggregate-bitumen mix
- **Main Effects on properties**
  - Stiffening: modulus, Marshall stability, rut resistance
  - Slight effect on low T. fracture properties (ductility)
- **Potentialities / economics / environment**
  - Use in Canada, USA, Saudi Arabia, Qatar, China, Iran
  - Carbon footprint / LCA close to bitumen, but
    - Positive if layer thickness reduction allowed
  - Iran: potential to reduce paving binder cost by 25%
Plastic waste recycling

2 Papers: Malkoc and Villegas

- **Principle:** Recycling of PET, HDPE, LDPE, PP, PS... by addition in binder as a modifier or in mixes to replace filler

- **Issues**
  - Compatibility with bitumen or asphalt mix
  - Binder characteristics / Mix performance

- **Solutions**
  - Direct addition to asphalt mix: 10-20% vol. PET, replacing agg. filler
  - Addition to the bitumen: 3% PE from banana production waste bags, treated to remove insecticide

- **Main Effects on properties**
  - PET: Improvement in Rutting resistance, Marshall stability
  - Banana bag PE: improvement in permanent deformation & moisture damage resistance (comprehensive study)

- **Potentialities / economics / environment**
  - Plastic G prod: 230Mt in 2009 - Plastic waste: USA: 31Mt/y, EU 25Mt/y
  - 8% recycled only: mechanical, chemical, thermal processing & fillers
Conclusions

- Recycling revival or golden age: a worldwide awareness
  - Asphalt = the sustainable road to success in recycling
  - Nothing really new, but much progress being made
- Economics & environmental awareness = the driving force
- Technical issues are identified for most wastes
- More science is used to understand the issues
- Solutions are proposed to mitigate the issues, either at the binder level or at the bitumen-aggregate mixture level
- RAP, RAS, GTR, polyolefin plastics and sulfur are the most recycled and studied wastes in asphalt pavements
Warm Mix Asphalt and Low Temperature Techniques

Bernard Eckmann: Moderator Report

A New Method for Hot Recycling of Asphalt
Selim Emre Gencer

Q&A

15.30 - 16.00 Coffee Break

16.00 - 17.30 Session 6: Warm Mix Asphalt and Low Temperature Techniques

Session Chair: Richard Taylor
Moderator report
Bernard Eckmann
PowerPoint Slides

Warm asphalt mixes made with a "ready to use" bitumen: an experimental field trial
Laurence Lapalu

Environmental aspects of warm mix asphalts produced with chemical additives
Juan Gonzalez Leon

Moderator report
Malcolm Simms
PowerPoint Slides

Impact of loose mix aging time and temperature on the mechanistic performance of hot and warm bituminous mixtures produced as virgin mixes or mixes containing 20% rap
Gerald Reinke

Energy in warm mix asphalt
Nicolas Bueche

Q&A

Friday 15 June 2012 (Day 3)

08.45 - 14.30 Exhibition and poster session

09.00 - 10.30 Session 7: Durability & Performance: Binders
Warm Mix Asphalt and Low Temperature Techniques

Session 6-1

Bernard Eckmann
Warm & Low Temp. Techniques – 6.1
Lower energy costs & environmental benefits

Carbon footprint

AC 20 - WMA
44 kgCO$_2$/t

AC 20 - HMA
97 kgCO$_2$/t

SMA 10 - WMA
51 kgCO$_2$/t

SMA 10 - HMA
90 kgCO$_2$/t

Material cradle-to-gate
Transport to plant
Plant Electricity
Plant Gas Oil
Laying & Compacting

Asphalt, the sustainable road to success

Paper [0146]
Warm & Low Temp. Techniques – 6.1
Tribology: friction at interfaces

- Foam technology:
  Thicker binder film on coarse aggregate ➔ easier compaction at lower temp.

- Chemical or wax additives:
  Similar « lubricating » behaviour as unmodied bitumen at higher temp.
Warm & Low Temp. Techniques – 6.1
Short term ageing: RTFOT still OK?

Binder hardening: RTFOT (Temp., Time)

Performance of WMA - Zeolite technology

Performance of WMA - Wax technology

Performance of WMA - Surfactant technology

Performance of WMA - Compared technologies

Cold mixes (emulsion)
Warm & Low Temp. Techniques – 6.1
Performance of WMA - Emulsion technology

- Test trial – use of a bituminous emulsion

Specifically designed emulsion: 69% - 50/70 – special emulsifier

$T_{\text{mix}} \sim 87^\circ C$

$T_{\text{paver}} \sim 77^\circ C$

Studies on lab manufactured and re-compacted field samples

- GC samples, Marshall, ITSM, ITSR, WT
- Satisfactory and essentially comparable

Paper [0138] Asphalt, the sustainable road to success
Warm & Low Temp. Techniques – 6.1
Some conclusions

• WMA - Performance in comparison to HMA
  - Stiffness & permanent deformation (less oxidative ageing)
  - Sensitivity to level of applied stress (MSCR test)
  - Water sensitivity

• WMA - Relation between binder and mix characteristics
  - Standard RTFOT procedure needs to be adapted
  - Are extracted binders truly representative?
Some conclusions

- **WMA** - Some problems have however hardly been addressed
  - Mix performance at low service temperature
  - Modifications to manufacturing equipment (working of burners at reduced temp., water condensation, ….)
  - Incorporation of RAP material: limitations and end performance

- **Cold (emulsion) mixes**

  The need for a specific design and evaluation methodology is now well recognized
  - Workability and compacting ability
  - Manufacturing of representative laboratory samples
  - Laboratory curing procedures
## Durability & Performance: Binders

### Session 7: Durability & Performance: Binders

**Moderator report**

Gordon Airey  
**PowerPoint Slides**

- Bitumen chemical modification by thiourea: rheological behaviour at low in-service temperatures and microstructure  
  *Javier Navarro*

- Comparing cold performance results using Fracture Toughness test, Asphalt Binder Cracking Device, Fraass Breaking point and Bending Beam Rheometer  
  *Erica Jellema*

**Moderator report**  
*Ignacio Perez*  
**PowerPoint Slides**

- Thin film oxidative aging and low temperature performance grading using small plate dynamic shear rheometry: An alternative to standard RTFO, PAV, and BBR  
  *Michael Farrar*

- Bitumen emulsions: Meeting the pavement preservation challenge  
  *Etienne Lebouteiller*

**Q&A**

10.30 - 11.00  
Coffee Break

### Session 8: Durability & Performance: Mixtures

**Session Chair:** J-P Michaut  
**Moderator report**  
Ann Vanelstrets
Worth noting . . . .

- Significant work on binder rheology
- Frost / thaw damage & impact on design
- Specification harmonisation
  - Standardisation of test methods
  - Selection of tests & round robin testing
- Dynamic Shear Rheometer DSR and MSCRT
  Multiple Stress Creep Recovery Test
Session 7. Durability & Performance: Binders
Moderator’s Report

Gordon Airey
NTEC, University of Nottingham
Themes (key observations)

- Rheological testing
  - 3 papers

- Rheological characterisation (modification & performance)
  - 5 papers

- Permanent deformation – binder parameters
  - 6 papers

- Fatigue & fracture
  - 5 papers

- Ageing of binders
  - 4 papers

- Importance of robust testing techniques
- Wide range of modifiers
- Increased interest in MSCRT
- New devices/techniques to measure fatigue, fracture & thixotropy
- Work to be done on long-term laboratory ageing
Rheological testing (0157)

- French mirror group of CEN/TC336 – WG1 (10 labs)
- Round robin study
  - Parallel plate ‘DSR’ (11)
  - Annular shear (2)
  - Reference product (PDMS)
  - 50/70 pen & PmB2 (difficult)
- Waiting time
- Bonding temperature
- Gap setting
- Sample trimming
- Thermal history
- Linear domain

Asphalt, the sustainable road to success
Permanent Deformation (0402)

- Binder parameters vs WTT
  - R&B softening point, ZSV, DSR (G* & G*/sinδ)
  - Small scale WTT (BS EN 12697-22)

- Binders
  - Large data base
  - Penetration grades, multigrade & wax modified (9)
  - Elastomeric & plastomeric PMBs (11)

- MSCRT
  - 1 sec loading, 9 sec recovery
  - Stress levels (30, 100, 300, 1000 Pa)
  - 10 cycles @ each stress level
  - 45°C & 60°C temperatures

- WT rut rate vs Jnr

Jnr “non-recoverable creep compliance”

Asphalt, the sustainable road to success
Accumulated Strain Testing

- New test procedure to evaluate binders on a DSR

Multiple Stress Creep Recovery Test (MSCRT)

$J_{nr}$ has a very high correlation to WTT and pavement rutting incl
- PMB
- Aged binder
Durability & Performance

• Development of new tests and techniques.
  – More than 10 new or not widely knew tests

• Binders characterization
  – Performance properties related to mix properties

• Validation with asphalt mixes
  – Different experiences at laboratory and field level

• Development of new binders
  – New promising additives (organoclay, prepolymer or supramolecular)
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<td><em>PowerPoint Slides</em></td>
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<td>A single rheological model to describe low temperature behaviour of asphalt mixtures assessed in different laboratory test methods</td>
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<td>Stephan Büchler</td>
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<td>Interlaboratory experiment of asphalt concrete using indirect tensile fatigue test</td>
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<td>Safwat Fadhil Said</td>
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<td>Lothar Drueschner</td>
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<td><em>PowerPoint Slides</em></td>
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<td>LOT Winter Damage Theory: Validation and Understanding of Winter Damage in Porous Asphalt</td>
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<td>12.30 - 13.00</td>
<td><strong>Closing session</strong></td>
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<td>Short speech by Eurobitume president Alberto Madella</td>
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<td>Summary of the Congress</td>
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Durability & Performance: Mixtures

Moderator report

Ann Vanelstraete
Belgian Road Research Centre
Adhesion
Binder - aggregate

Paper 197: M.Wistuba et al.
- The rolling bottle test EN12697-11 (part A) is a suitable procedure
  - Visual estimation of the stripping degree is a draw-back of the method, which can be overcome by the use of digital images
- The static method of EN12697-11 (part B): standard testing conditions were inappropriate (e.g. longer times are needed)

Paper 141: M.Hugener et al.
Static method EN12697-11 (part B): suggestions for better differentiation:
- Lower mixing temperature (-15 °C)
- Water conditioning: 40 °C instead of 19 °C or longer times
→ Recommendations taken up in revised EN12697-11

Asphalt, the sustainable road to success
Session 8: Durability & Performance: Mixtures

- Road structural design
- Asphalt mix design
- Asphalt production
- Transportation to the site
- Paving

Asphalt, the sustainable road to success.
General overview

- About 45 papers in total (so not possible to mention all papers here)

- Subtopics:
  - Testing methods to assess performance and durability
    - Tests for adhesion is an important item
    - Testing of: fatigue, stiffness modulus, permanent deformation, low temperature cracking, ageing
    - New testing methods and equipment

- Performance models: few papers
- Products added to bitumen or mix to improve performance
- Importance of production, laying and approval system
- Monitoring of durability in the field

Asphalt, the sustainable road to success
Testing methods and modeling
Modulus - Low temperature cracking

Testing methods and modeling
Adhesion and cohesion

Adhesion and cohesion
Binder level

Adhesion
Binder - aggregate

Cohesion and Adhesion
on asphalt

Testing methods and modeling
Resistance to fatigue
Products to improve performance

Mostly confirmations of earlier findings:

- The advantages of PmB’s:
  - Highly modified binders in either thin performing wearing courses or wearing courses with high demands for durability (185 – S. Simard et al., 336 – D. Timm et al.)
  - Direct addition of polymer powder into the mixer: good experience and interesting for small job sides (paper 152 – B. B. Jensen et al.)

- The positive impact of crumb rubber; the increase in performance in fatigue and/or rutting depends highly on the technique used for blending (paper 463 – H. Ozturk et al.)

- Addition of polypropylene fibres: increase of stiffness modulus and resistance to permanent deformation (paper 179 – S. Tapkin et al.)
Products to improve performance

Mostly confirmations of earlier findings:

- Polyphosphoric acid: as additive especially to improve the stiffness and ageing performance (paper 140 – O. Shulga et al.)

- Advantages of applying hydrated lime:
  - positive impact on the stripping potential, on winter damage and ageing (papers 272 - Dony; 355 - Iwanski; 437 - Mollahosseini)
  - an appropriate and precise method to determine the quantity of hydrated lime (paper 230 – Lesueur)

No really new materials reported.
11.00 - 12.30  
**Session 8: Durability & Performance: Mixtures**

**Session Chair:** J-P Michaut

**Moderator report**
Ann Vanelstraete  
*PowerPoint Slides*

A single rheological model to describe low temperature behaviour of asphalt mixtures assessed in different laboratory test methods  
Stephan Büchler

Interlaboratory experiment of asphalt concrete using indirect tensile fatigue test  
Safwat Fadhil Said

**Moderator report**
Lothar Drueschner  
*PowerPoint Slides*

LOT Winter Damage Theory: Validation and Understanding of Winter Damage in Porous Asphalt  
Rien Huurman

Laboratory tests for internal cohesion and raveling of thin and ultra-thin wearing courses  
Joëlle De Visscher

Q&A

12.30 - 13.00  
**Closing session**

Short speech by Eurobitume president Alberto Madella  
Summary of the Congress  
Best Poster Award  
Best Picture Award  
Speech by EAPA President Jean-Louis Marchand and the announcement of the location and date of the 6th E&E Congress.

13.00 - 14.00  
**Lunch**

15.00  
Dismantling exhibition and posters
Social impact / issues

Prof. Dr. Mustafa KARAŞAHİN

- A good road network is essential for the development of regions
- The asphalt industry has their challenges to create more sustainable pavements and to lower rolling resistance
**Congress - Concluding remarks**

- Asphalt, the sustainable road to success
- Asphalt is 100% recyclable
- By reducing the risks of failure and by providing a high(er) quality, at reduced production and paving temperatures . . . and . . .
- Sustainability is a real challenge that can be realised by using the techniques and knowledge presented at the congress in Istanbul
- We have to move forward
- Road authorities: If you want higher quality: Ask for it
- We need to change attitude to move forward

Yes . . . . Just do it
Thank you for your attention
Proceedings of the
5th Eurasphalt & Eurobitume Congress
Asphalt, the sustainable road to success

13-15 June 2012, Istanbul, TURKEY

USB memory stick of the congress proceedings
AAPA Study Tour to Europe &
5th E&E Congress

Feedback sessions
November 2012
Adelaide, Melbourne, Sydney & Brisbane