ISAP Technical Committee APE "Asphalt Pavements and Environment"

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Outline

• General Info
• Working Groups
• Motivation
• GAP-Materials
• Goals of ISAP TC APE
• Research Topics for TC APE…
• Achievements/ Output
• Ongoing Actions
• Web Page
General Info

• Annual Meetings at TRB (ISAP day)
• Sister of ISAP TC's:
  • Constitutive Modeling (*T. Scarpas, TU Delft*)
  • Pavem. Field Eval. (*E. Dave, Univ. of New Hampshire*)
• Organization
  • Chair: Manfred N. Partl (*EMPA & KTH*)
  • Secr.: Gabriele Tebaldi (*Univ. of Parma & Florida*)
  • Actual Members: 28
  • Actual Working Groups: 7
Working Groups

**WG 1** Hot Recycling of RAP  
Chair: **Elie Hajj** *(U. Nevada)*

**WG 2** Cold Recycling of RAP  
Chair: **Kim Jenkins** *(U. Stellenbosch)*,  
Secr: **Alessandro Marradi** *(U. Pisa)*

**WG 3** Life Cycle Assessment  
Chair: **John Harvey** *(U. California, Davis)*

**WG 4** New Technologies & Special Environmental Aspects on Asphalt Pavements  
Chair: **Gordon Airey** *(U. Nottingham)*,  
Secr: **Ellie Fini** *(NC A&T State U.)*
Working Groups

**WG 5** Shingle Recycling
Chair: **Gerry Huber** *(Heritage Research Group)*

**WG 6** By-products & Secondary Materials Recycling in Asphalt Pavement
Chair: **Marco Pasetto** *(U. Padova)*,
Secr: **Zhanping You** *(Michigan TU)*

**WG 7** Energy Harvesting
Chair: **Wayne Lee** *(U. Rhode Island)*,
Vice Chair: **Rajib Mallick** *(WPI)*,
Secr: **Linbing Wang** *(Virginia Tech)*
Motivation

Promote Sustainable Development

- Do NOT live at costs of future generations
- Live even for the benefit of future generations (if you know what it is)!
  Turn sustainable to extra-sustainable
- Care for resources & environment

Don’t rob your kids!

Otherwise... ... Bye Bye!!
Motivation
Sustainable Development means
• qualitative NOT quantitive growth

Qualitative growth needs connections & mobility

e.g. Roads

No Roads = No Economy & No Prosperity = No Sustainable Development
Motivation

Quantitative questions regarding qualitative growth:

• How much mobility do we really need & can we afford?
• Should/can we reduce towards a more local way of life?

For Asphalt Roads qualitative growth means

• Less maintenance, less material resources, less energy consumption, etc → GAP Green Asphalt Pavements
• Resilient against exceptional events (from climate change)
• Multi-functional use: drive & more (e.g. energy harvest.)

GAP-Materials

Material Concepts for Preserving Material Resources:

- Recycling of Pavement Mat.
  - Re-Use old **Pav. Mat.** in new pav. (avoid: **Downcycling** !)

- Re-Use of Waste Materials
  - Re-Use **Non-pav. Mat.** (demol. & industr. waste...**no linear landfill**!)

- Marginal Materials
  - Use of available **Low Quality In Situ** materials
GAP-Materials

Material Concepts for Material Improvement

- **Substitution of Materials.**
  - Replace traditional components (e.g. bitumen ↔ polymer)
- **Adaptive Materials**
  - Smart material ("self-healing")
- **Combined Materials**
  - Compose traditional material for pooling different properties
GAP-Materials Questions

- Requirements?
- Long-Term Performance?
- Production & Application Technology?
- Availability?
- Environmental Impact?
- Health?
- Acceptance (Public-Politics)?
- Costs?
- Re-Use?
- Life Cycle?
Goals of ISAP TC APE

- Find new solutions & new techniques to improve the environmental compatibility of asphalt pavements
- Holistic approach: Improve the state of practice of LCA for enhancing the environmental sustainability of asphalt pavements

LCA: From Cradle to Grave

What about:
Tools: From Idea to Cradle?
Goals of ISAP TC APE

• Promote **recycling-asphalt** as sustainable material of high value by considering technical, environmental & economical aspects.
  ⇒ Re-use as much as possible at quality levels as high as possible.
• Promote safe & beneficial **re-use of secondary material** in asphalt (e.g. shingles, other selected waste)
• Promote safe & beneficial **use of marginal materials** in asphalt
Goals of ISAP TC APE

• Find new solutions & new techniques for asphalt pavements to **improve environment** (e.g. multi-functionality)
• Find new solutions & new techniques to **understand & handle material** behavior due to
  • aging: durability, maturing, degrading, rejuvenating

Prop

Aging (t)

Better (Maturing = Positive Aging)

Durable

Worse (Degrading = Negative Aging)

3rd ISAP APE, 2015, Sun City, SA
Goals of ISAP TC APE

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• Find new solutions & new techniques to **understand & handle material** behavior due to
  • aging: durability, maturing, degrading, rejuvenating
  • environmental & load effects: healing, damaging, ....
Goals of ISAP TC APE

- Find new solutions & new techniques for resilient asphalt pavements enduring extreme climatic & weather changes:
  - Freezing & Snow
  - Melting Perma-Frost
  - Flooding & Heavy Rain
  - Heat (Forest Fires)
  - Land-Slides & Rock-Fall

Example: Land-Slide & Heavy Rain
Oeschgen Switzerland

Example: Flooding Tunesia
Goals of ISAP TC APE

• Care for links with other internat. groups (e.g. RILEM TC 237-SIB, 241-MCD, TC 252-CMB, & new TC RAP on Recycling)

• Care for internat. discussion, standardization, research directions & professional formation through dissemination
  • APE Symposia ca. every 3-4 years,
  • Special APE sponsored sessions during ISAP Conferences,
  • Workshops in connection with partners,
  • Web, Webinars
  • Publications (Journal Papers, STAR)
  • Alliances with AAPT, RILEM,…

3rd ISAP APE, 2015, Sun City, SA
Research Topics for TC APE...

- **Material**
  - Asphalt *production* technologies
  - *High-rate* recycling (performance and equipment)
  - Perpetual *repeated* recycling
  - *New* recycling technologies
  - *By-products & secondary* materials (mix design, mech. prop., temp., emulsion type, pav. design, constr. Tech., in-place, in-plant,...)
  - *Alternative* binders, vegetal additives

- **Construction**
  - *All-weather construction* (very low temperature, rain)
  - *Pre-fabrication* (durability & quality increase)
  - *In situ automatization* (reduced construction time, durability & quality increase)
Research Topics for TC APE...

- **Performance**
  - RAP in relation to *durability* and structural stability
  - **Moisture** damage
  - **Aging** (mechanism and laboratory techniques)
  - **Interaction** structure & performance

- **Environment**
  - **Energy saving** & warm/half-warm & cold recycling (mix design, mech. prop., temp., emulsion type, pav. design, constr. Tech., in-place, in-plant,…)
  - **Emissions** (fume, water, CO₂)
  - Asphalt pavement for **energy production** (solar, thermal,…)
  - **Noise** reduction
  - Unconventional **multi-functionality** (e.g. photocatalytic effects, self healing, self de-icing)
...Research Topics for TC APE

• Life Cycle Issues
  • Life cycle assessment tools
  • Life cycle cost analysis of new technologies
  • Sustainability of construction & maintenance of asphalt pavements
  • Environmental restorations of abandoned alignments

• Implementation
  • Strategies to awaken Road Authorities toward sustainable asphalt pavement
  • Development of common standards/guidelines across the world
Achievements/ Output

• Symposia
• Dissemination through individual WG's
• Proceedings, Special Issues, STAR

Publications

Symposia:
2008 Zurich
Europe:
2012 Fortaleza
S. America:
2015 Sun City
Africa:

Proceedings  Special Issues  RMPD

2012: Cold Recycling
2014: Fortaleza Sympos.
Achievements/ Output

• APE Sponsored Session at ISAP Conferences
  • 2010 Nagoya (2 sponsored Sessions)
  • 2014 Raleigh (1 sponsored Session)
• Summary Info during
  • ISAP (@TRB), AAPT, and RILEM annual meetings
• Workshops organized by WG's (examples):
  • VARIREI, AMC, Pavement LCA Davis & Nantes, SIIV, MAIREPAV, EATA, CAPSA, ISAP, AAPT, RILEM,…
• ISAP Day @ TRB (example 2015):
  • Recycling in Germany - A Cannone Falchetto.pdf
  • RAP-RAS in Texas - F Zhou.pdf
  • Sustainable Materials - R Williams.pdf
  • Energy Harvesting - K Wayne Lee - part 1.pdf
Ongoing Actions

• STAR
  • WG2 "Mix Design of Cold Recycled Mixtures with RAP"
  • WG6 "The use of marginal (by-products and secondary) materials in asphalt pavements”
• Individual work of WG's following their strategic plans
• Other WG’s?
  • Discussion on other topics (proposals welcome), such as
    o Resilient pavements,
    o All-weather construction
    o Healing
• Preparation of ISAP Day 2016
• Call for 4th International APE Symposium
  • Asia/ India/ Middle East?
sustainable development are key factors where asphalt pavement technology can play an even more positive active role in the future. Asphalt is ideally suited for recycling and re-use of materials, meeting the challenges of limited material resources. It has potential to reduce global warming through low energy concepts for mix production and placing. Furthermore, it allows meeting specific environmental demands of denser populated agglomerations, such as reduction of traffic noise by introducing new innovative materials and designs as well as reductions of congestion from road works by improving durability and aging resistance. Hence, it is now time to establish a holistic way of approach and introduce this concept in life cycle analysis as well as research and development.

In order to form a coordinate platform for progress in this field and based on the achievements of the Symposium ISAP2008 August 18th to 20th in Zurich (http://www.empa.ch/isap2008) a new ISAP Technical Committee TC APE Asphalt...
Join the Team
Thank You !