

ISAP TC APE Working Group 2 Cold Recycling of RA(P)

**Kim J. Jenkins
Alessandro Marradi**

**Feedback to ISAP TC APE at TRB
22nd January 2012**

Outline

- Objectives of ISAP WG2 Cold Recycling
- Global perspective – CR research
- Progress to date
- Future activities

Minutes from TRB 2010: ISAP TC Asphalt Pavement and Environment

- **WG1 on Recycling (Chantal de la Roche)**



WG1

Hot Recycling-RAP
(Peter Sebaaly)

WG2

Cold Recycling-RAP
(Kim Jenkins)

Purpose of ISAP WG2

- **Global interface for needs analysis regarding cold recycling**
- **Coordinate research by sharing findings, identifying needs and technical solutions**
- **Promote CR technology by:**
 - **Coordinate publications, guidelines, specifications**
 - **Create a database of research/ project data**
 - **Gather & share info on enviro & sustainability**

ISAP WG2 Members 2011



WG2 Membership = 32

Continent	Members	Countries
Africa	3	1
Asia	9	2
Australasia	1	1
EU	14	5
North America	3	1
South America	2	1

Focus of WG2 discussions

- **Research focus areas (Global)**
 - Laboratory
 - Field (APT and LTPP)
- **Key findings and developments**
 - Mix design
 - Structural design
 - Specifications
- **Publications, documents and manuals**

Way forward of WG2

Synthesis of Global Research and Publications

FOCUS AREA

RESPONSIBILITY

1. Research

- D Jones

2. Mix Design

- K Jenkins

3. Structural design

- G Tebaldi & F Long

4. Construction & QC

- D Collings

“State of the Art”??



Is this going anywhere?

- Where are the challenges in research?
- How to manage these challenges?

One Recycler Manufacturer alone

Cold Recyclers and Soil Stabilizers



Can we afford to ignore the technology?

How to address the recycling needs (manage the process)

1. Awareness
2. Acquiring knowledge
3. Develop the tools
4. Implementation

1. Awareness: Issues to address

- Challenges for Cold Recycling of RA?
- Distress mechanisms (rutting, fatigue, durability)?
- Key areas for future research to address needs
 - High percentage RA
 - Appropriate tests
 - Lab versus field behaviour
- Harmonisation of mix & structural design
- Global research cooperation? **Energy?**

Variability

Changing Technologies helps Environment

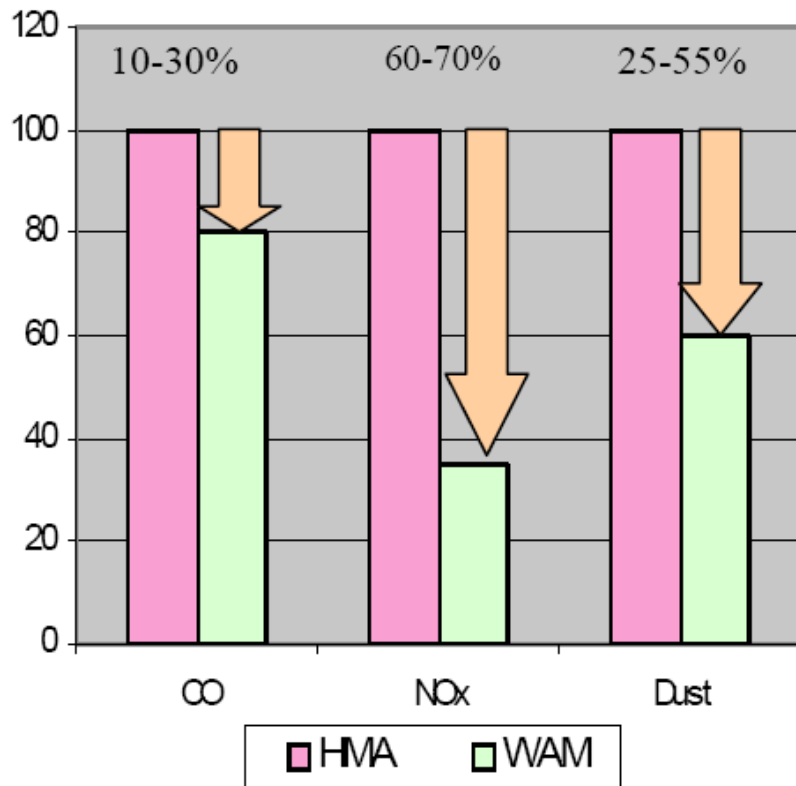
HOT MIX

WAM Foam

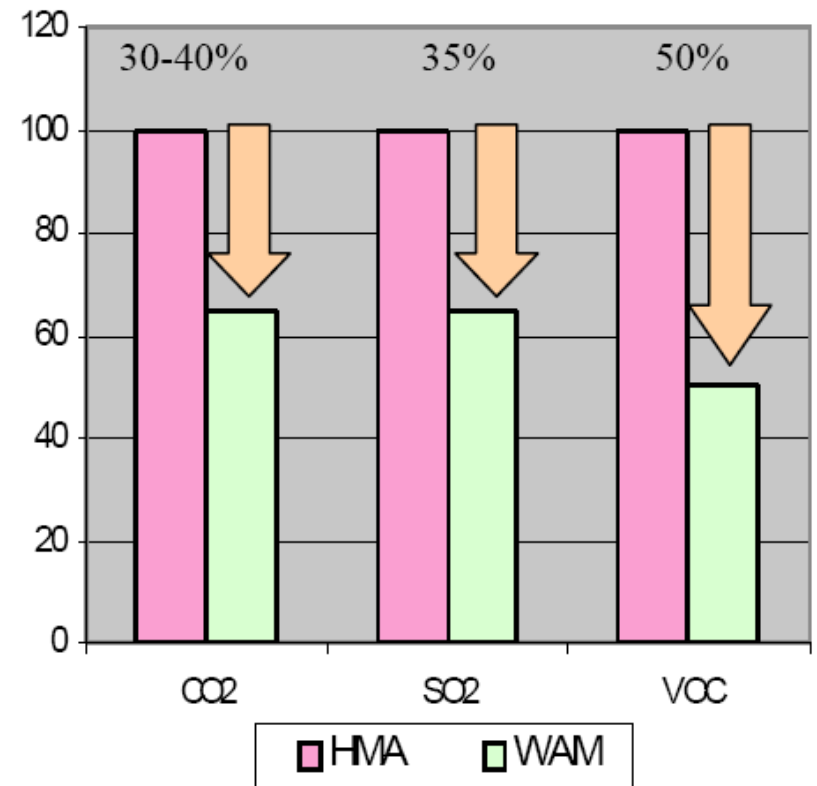


Emissions at the Chimney

Reduction of emissions



Reduction of emissions



BSM -emulsion versus -foam

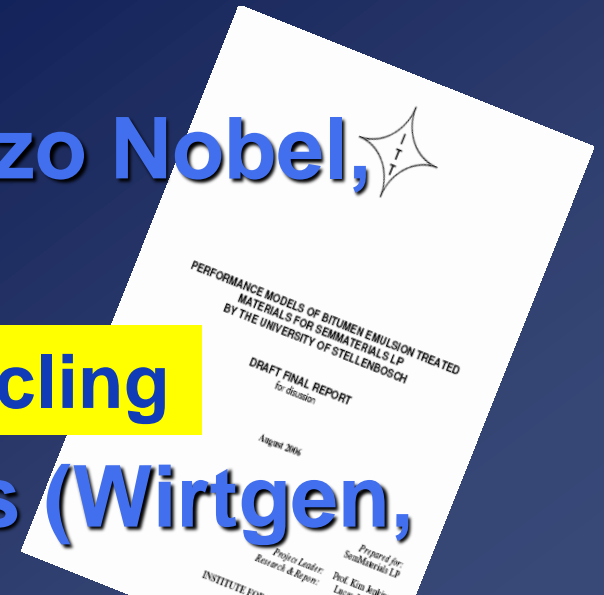


Who is the custodian of strategic research?

- Emulsion: Koch/Sem, Akzo Nobel, Colas, Mead Westvaco

ISAP WG2 Cold Recycling

- Foam: Recycler suppliers (Wirtgen, Bomag etc)...who else?



Awareness 😊😊😊😊😊

2. Acquiring knowledge

- Universities and Research Institutes
- Research initiatives
 - Laboratory research
 - Accelerated Pavement Testing
 - LPTT
- International Cooperation? (WG2)
- Database of research?

New LTPP Sections (SA)

- Very limited background info
 - Mix designs?
 - As built details?
 - Traffic
- BSM-emulsion all on CTSBs
- BSM-foam all on granular
- Some new LTPP sections planned
 - Same materials, subgrade, climate
 - Cement, emulsion, foam binders

3. Develop the Tools

4. Implementation

- Role of ISAP WG2 for inputs into Manuals, Guidelines, Specifications
- Training / Education / Updating practitioners

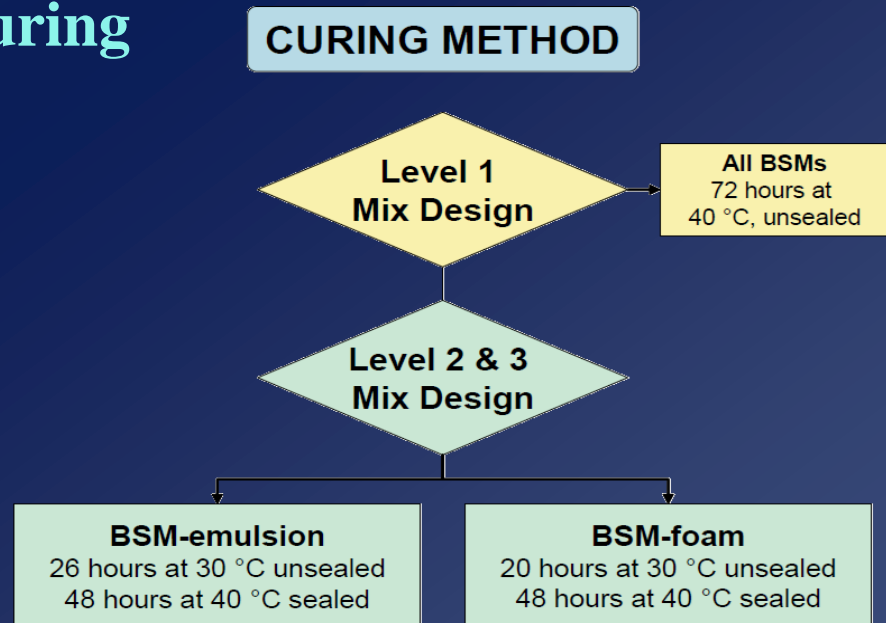
ISAP Workshop Programme Drakensberg 2011

- **Rilem TG6 – Gabriele Tebaldi**
- **CR Projects: Climate – Dave Collings**
- **Enviro, Energy, Emissions – Martin vdV**
- **SusCoM, Wuhan – Liantong & Andre Mol**
- **Deflections on BSMs – Alessandro Mar**
- **Marginal materials – Mohd Hizam**
- **Discussion (incl Allen Browne)**

Rilem TG6: Cold Recycling (Gabriele Tebaldi)

I. RAP Classification

II. Specimen preparation/curing



Rilem TG6: Cold Recycling (Gabriele Tebaldi)



Pen @25°C



T_{R&B}



Asphaltene contents
(ASTM D 3279-97)



DSR

RAP bitumen's characteristics

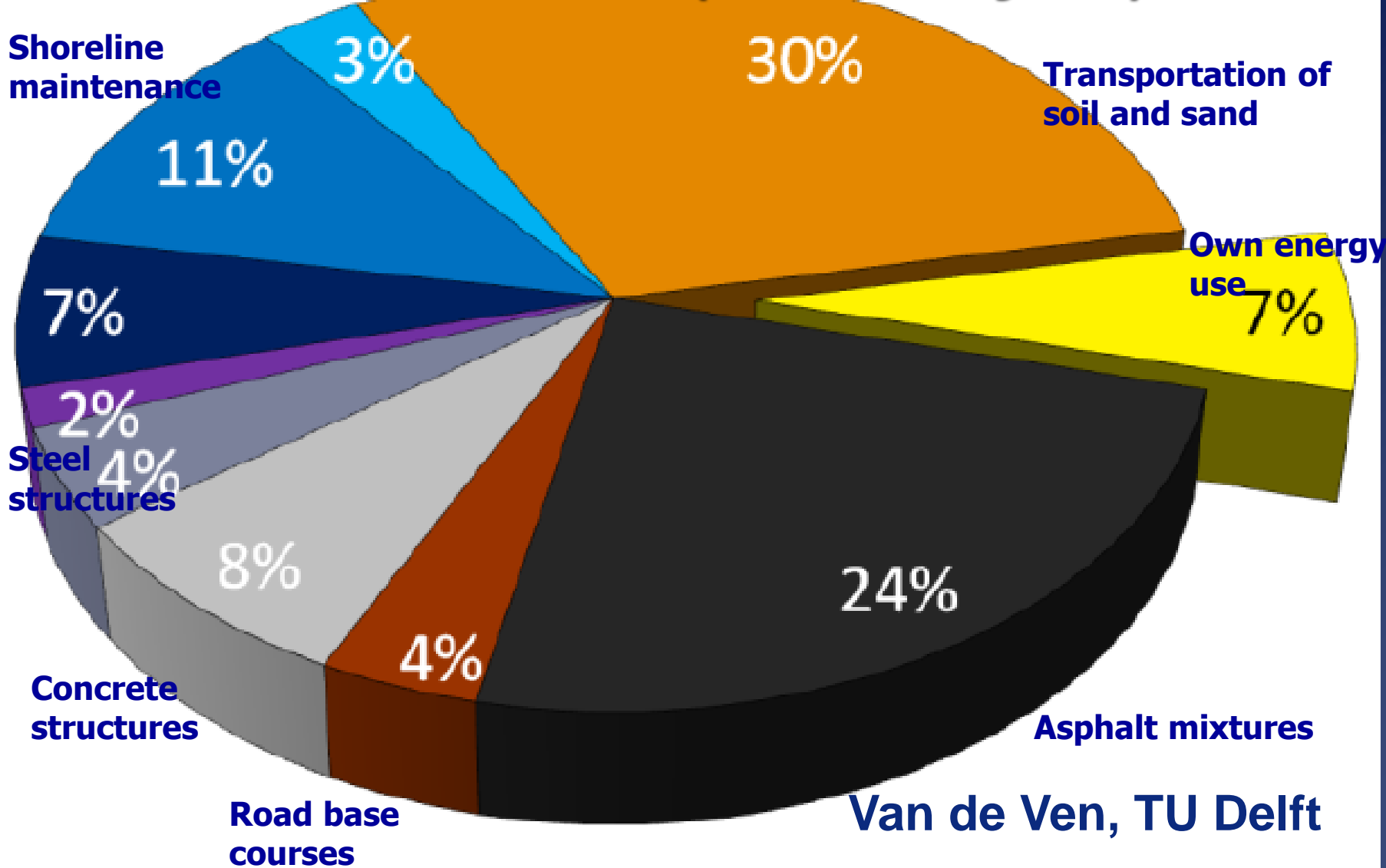
**Environmental Considerations for Cold
Recycling, Energy and Emissions:
an EU perspective**

Martin van de Ven

ISAP Working Group WG2

CO₂ Footprint Division

DutchDoT (0.9 Mton/year)



Target in CO₂ Reduction the coming decade

- Pavements 28%
- Earth and sand transportation 30%
- Dredging 21%

CO₂ Production Asphalt Mixtures

- 44% production and transportation raw materials
- 31% production of the asphalt mixture
- 18% transportation and laying/compacting asphalt mixture
- 7% maintenance/milling
- Do we have this information for cold mixes???

Important considerations

- **Cold recycling needs to have available all information for an LCA, this also means:**
 - **Good design method to be able to compare with other designs**
 - **Information on service life of cold recycling solutions to support the design**

1st International Conference on
Sustainable Construction Materials:
Design, Performance and Application

August 10-12, Wuhan, China

Feedback on pavement recycling

Dr. Liantong Mo

State Key Laboratory of Silicate Materials for Architectures
Wuhan University of Technology (China)

Sustainable Construction Materials Wuhan, China



The 1st International Conference on Sustainable Construction Materials: Design, Performance and Application, August 10-12, 2010, Wuhan, China

Dr Liantong Mo

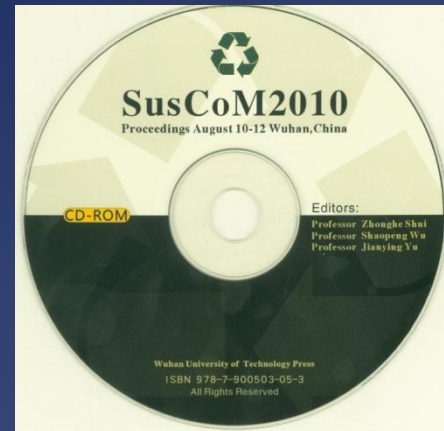


90 delegates

12 different nations and regions

Main topics, but not be limited to

- Mix design methodology of concrete
- Hydration of cement and cementitious by-products
- Processing, testing and application of recycled materials
- Innovative application of industrial by-products in concrete
- High-tech concretes
- Technical durability of concrete
- Performance of bitumen and its modification
- Construction technologies
- Warm Mix Asphalt Technologies
- Recycled asphalt pavement engineering
- Functional asphalt pavement
- Constitutive modeling and simulation



Good Luck,

Recycling in Climatic Regions

Dave Collings



Anchorage – Fairbanks, Alaska 2005

February 2006

- 45°C



DRY CONDITIONS

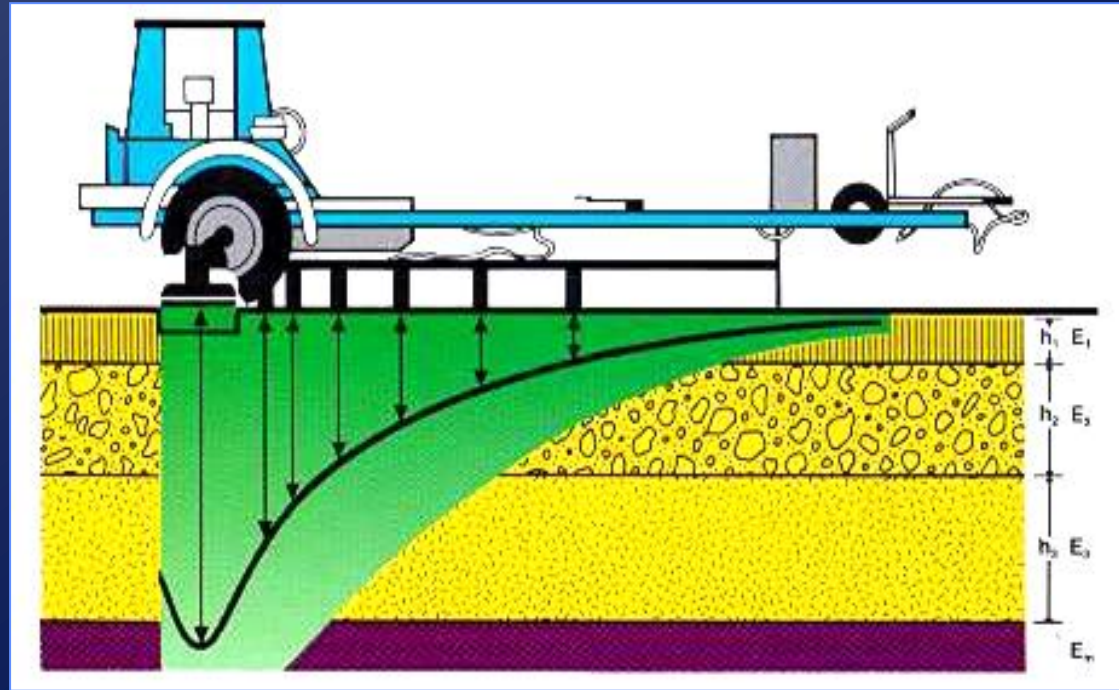
“Equilibrium moisture content”



DEFLECTION MEASUREMENT ON COLD RECYCLING PROJECTS AND FWD ANALYSIS

Alessandro Marradi





- 1. MAIN GOALS OF DEFLECTION MEASUREMENTS**
- 2. CHARACTERISTICS AND CAPABILITY OF COLD RECYCLING PROCESS**
- 3. SOME ITALIAN CASE HISTORIES: FREEWAY FLORENCE-PISA, CIAMPINO (ROME) INTERNATIONAL AIRPORT, ELBA ISLAND AIRPORT**
- 4. PROBLEMS RELATED TO BACKCALCULATION ANALYSIS IN PAVEMENTS CONTAINING COLD RECYCLED LAYERS**
- 5. POTENTIAL STRATEGIES AND SOLUTIONS**

Future Activities



ISAP Technical Committee on
Asphalt Pavements and Environment
ISAP TC APE

October 1st - 3rd, 2012 - Fortaleza, Brazil

- **TRB Feedback to ISAP TC - Jan 2012**
- **Fortaleza Brazil – Oct 2012**

**PLEASE JOIN US IN
FORTALEZA, BRAZIL**



THANK YOU