

2011 STUDY TOUR

Improving Pavement Performance

Part 2

AAPA 2011 Study Tour – Improving Pavement Performance #2

New technologies


- High Modulus Asphalt
- Ultra thin Concrete
- Foam bitumen and bitumen emulsion stabilised materials
- High quality granular bases
- Certification of non-standard products
- Ultra thin friction courses




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High Modulus Asphalt

- Developed & widely used in France (HiMA, EME)
- Very stiff binder
- Different and interesting mix design process
 - Specific grading
 - High binder content (> 6%)
- Initiatives in South Africa to transfer technology from France
- Initial trial sections
 - Rut resistant
 - Good fatigue resistance
 - $E \approx 14\,000\text{ MPa}$



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High Modulus Asphalt


- Different and interesting mix design process

```

    graph TD
      A[Select components] --> B[Formulate design grading]
      B --> C[Select binder content]
      C --> D[Compact gyratory specimens]
      D --> E{Workability criteria met?}
      E -- No --> A
      E -- Yes --> F{Durability criteria met?}
      F -- No --> B
      F -- Yes --> G{Dynamic modulus criteria met?}
      G -- No --> C
      G -- Yes --> H[Compact slab]
      H --> I{Rut resistance criteria met?}
      I -- No --> D
      I -- Yes --> J{Fatigue criteria met?}
      J -- No --> E
      J -- Yes --> K[Implement!]
  
```


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High Modulus Asphalt

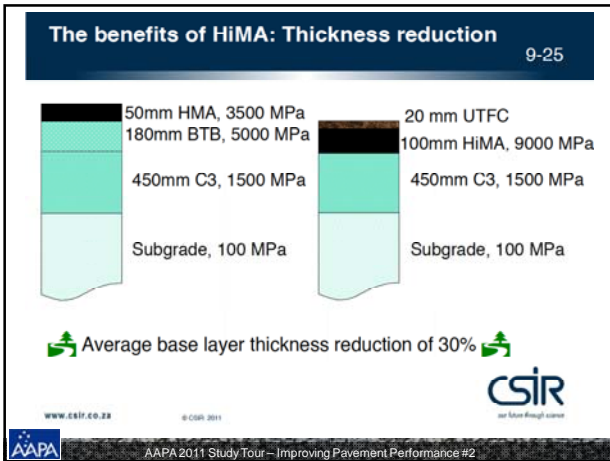


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High Modulus Asphalt



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Ultra thin concrete

- Thin ≈ 60 mm
- Very strong (100 MPa compressive strength)
- Continuously reinforced concrete with mesh and fibre
- Can accommodate
 - large (to 2 mm) deflections
 - high load repetitions (to 100 million E80' s under HVS)
- Trials now being monitored

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Ultra thin concrete

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Foam bitumen & bitumen emulsion stabilised materials

- Improving damage models
- Resilient response
- South Africa → lower net bitumen content (1.7 – 2.5%)
- < 3% net bitumen → behaviour more like granular material
 - Permanent deformation vs. fatigue
- Deformation dependant on:
 - Void content
 - Temperature distribution in layer

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High quality crushed rock

- Well established (1970' s)
- Widely used (> 2/3 pavements) → successful
- Dependant on:
 - Selection of rock
 - Grading
 - Good support
 - Very high density
 - 88% ARD
 - Unique construction process

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High quality crushed rock

- Updating damage models
- Updating resilient response (stress stiffening & elasto-plastic behaviour)
- Bitumen emulsion to improve durability???

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Certification of non-standard products

- Agreement process
 - (Based on British Board of Agreement)
- Based on UK Highways Agency Product Assessment system & French AVIS system
- Certifying non-standard products for built environment
- In South Africa: managed by CSIR & Agreement Board of SA



Certification of non-standard products



Certification of non-standard products



Certification of non-standard products

- How:
 - Historic data and track record
 - Inspections of test sites
 - Lab tests & trials
 - QC witnessed
 - → Interim certification
 - 2 year monitoring of Installation trials
 - → Certified for class of performance



Certification of non-standard products

- In South Africa – 3 road products certified:
 - Bridge deck joints propriety product
 - Ultra thin Friction Courses
 - Cold mix patching products



Ultra Thin Friction Course

- 20 to 25 mm thick surfacing layer
- Propriety product
- Superior riding quality and skid resistance
- IN RSA: Cost competitive with double seals
- SANRAL endorsed on major roads & freeways
- Airport applications?



Summary

- South Africa → constrained budget, isolation
 - Forced to develop quality local expertise
- Good subgrades (generally CBR > 10)
- Road network more nationally focussed
- SANRAL – commercialised approach to road & asset management
 - Collect toll
 - Collect government grant from DoT



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Summary (cont.)

- World leading skills in APT
- Embracing international technologies and adopt to make it work locally
 - EME (HiMA)
 - Warm mix Asphalt
- Assessment system successful
 - Introducing propriety products



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Recommendations

1. Maintain contact with SANRAL
 - Identify advantages of new SAPDM to Australia
2. Key research Areas to develop asset management towards commercial lines
3. Pavement performance prediction data to allocate funds
 - Asset preservation & maintenance
4. Promote benefit of APT and LTPP
 - Instrument, monitor, study & document



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Recommendations

5. Promote improvements to materials and use of new non-standard materials
 - High Modulus asphalt
 - UTFC
 - Warm mix asphalt
 - Reduced binder content foam and etb's
 - High quality granular bases

!!! Research required & taking managed + calculated risks !!!
6. Assessment system for non standard products



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