EME After Five Years on South Coast Road - Durban

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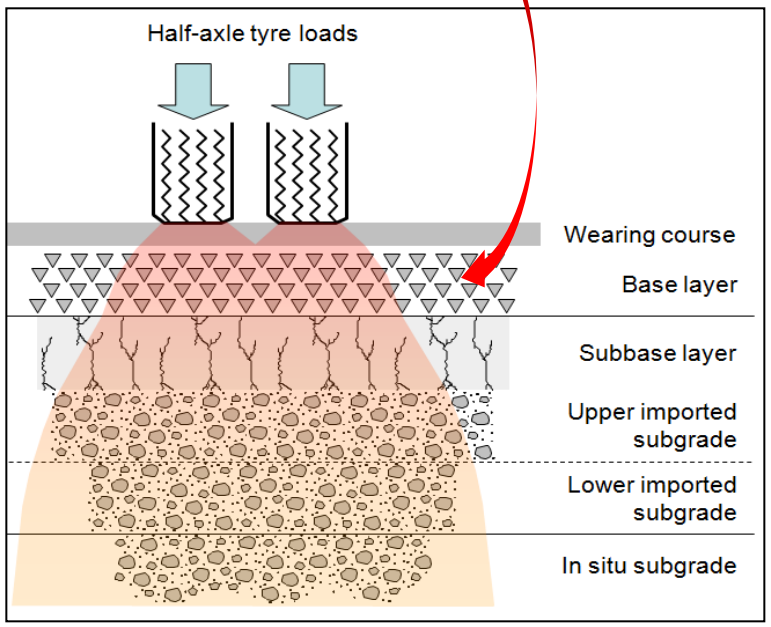
Acknowledgements

Outline of presentation

- **Background**
- **Overview of EME transfer to South Africa**
- South Coast Road LTPP section
  - **Visual condition assessments**
  - **FWD measurements**
  - **Profilometer survey results**
- **Conclusions**

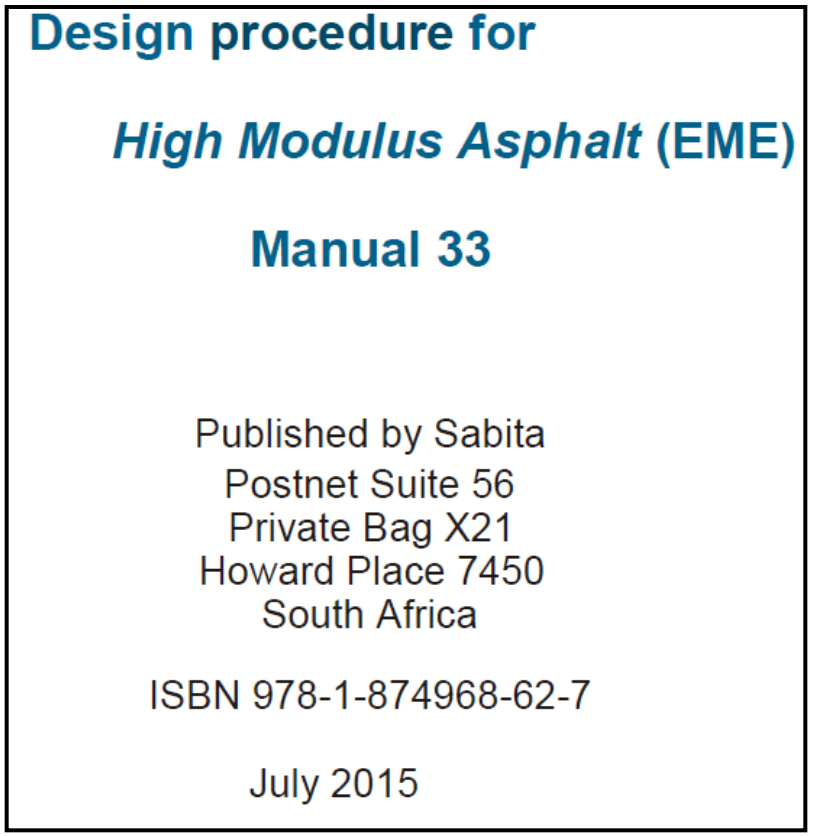
Background: What is EME ?

- Asphalt base mix manufactured using hard asphalt bitumen (pen 10-25) and, fully crushed aggregates with good quality
- Origin: France early 90s
  "Enrobés à Module Elevé" (EME)
- Key performance characteristics
  - ➢High modulus/stiffness
  - ➢High resistance against permanent deformation/rutting
  - ➢Good fatigue cracking resistance
  - ➢High film thickness / richness modulus
  - ➢Low air voids content
  - ➢Impermeable and durable
- Used for construction of heavily trafficked routes, airports and container terminals
- EME benefits
  - ➢Extend pavement life
  - ➢Reduce layer thickness



Introduction of EME to South Africa (SA)

- Southern African Bitumen Association (SABITA) identified EME as a solution to premature failures due to increase in volume and tyre loads
- CSIR was tasked to conduct a study to transfer EME to SA
- A major outcome was the EME design guide (Sabita Manual 33) with local performance specification;
- EME mix performance evaluation;
  - Workability,
  - Durability,
  - Stiffness
  - Rutting resistance,
  - Fatigue cracking resistance



EME Technology Transfer Programme

Feasibility study
- Familiarise with mix composition and design methodologies
- Typical properties

Preliminary design guidelines
- EME performance evaluation methods – lab testing
- Structural design

Field validation
- Accelerated pavement testing (APT)
- Long-Term Pavement Performance (LTPP) monitoring

Finalisation
- Final design guidelines
- Specifications

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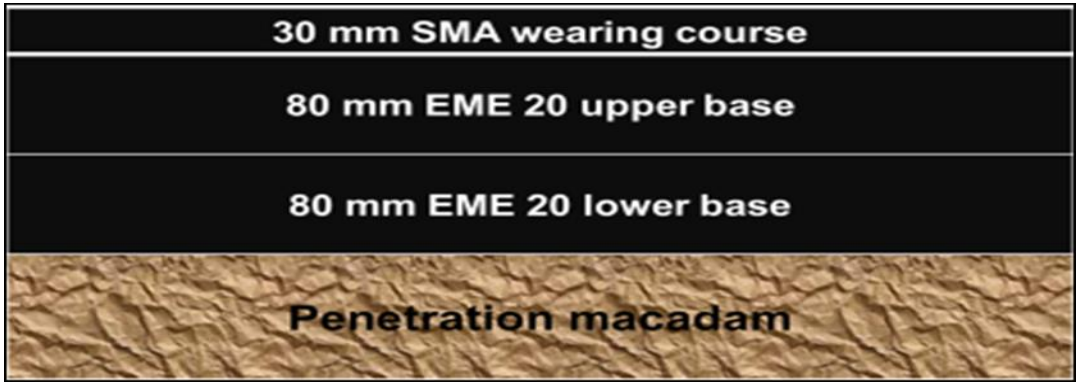
EME Technology Transfer: Field Validation

- Accelerated pavement testing – HVS…??
  - Ideal to obtain results quickly, but insufficient funds were available
- Long-Term Pavement Performance monitoring section – LTPP…??
  - Simulates actual field condition, but takes too long to obtain results
- The approach adopted for the field validation was to select a section with extreme heavy traffic loading to accelerate LTPP results
  - South Coast Road – Route for heavy vehicles travelling to the Durban harbour
  - Estimated 23 million ESAL in five years (September 2011 to November 2016)

South Coast Road LTPP Section

- Owned by eThekwini municipality
- Major access road to the Durban harbour
- Several attempts to rehabilitate the section using conventional asphalt mixes had failed
- CSIR tasked by SABITA to provide EME implementation advice
- EME mix design
  - EME 20 mix with10-20 penetration grade binder
  - EME mix designed at CSIR and manufactured at National Asphalt plant in Durban
- Structural design – CSIR



South Coast Road: EME Construction

- EME Construction completed in September 2011
- Some lessons learned
  - The EME mix is fairly easy to compact in the field
  - However, the mix tends to stiffen suddenly under the rollers, as the temperature of the layer decreases resulting in little effect on compaction

Field Performance Monitoring Programme

- Field monitoring at six-month intervals over the first two years, followed by 12 month intervals
  - Visual condition surveys
  - Deflection measurements
  - Profilometer surveys
    - Rutting measurements
    - Macro-texture measurements
    - Roughness measurements
- Approximately 23 million ESAL estimated to be carried over five years
  - Based on available traffic data (November 2008, May 2010 and February 2013)

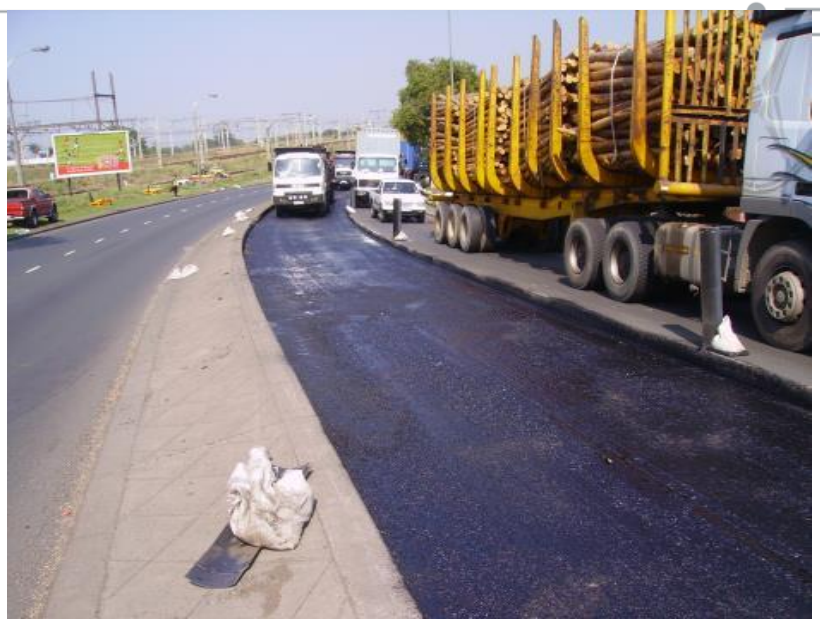
Visual Condition Survey

- Overall, the structural condition of the section is good
- Isolated longitudinal cracking (limited at the joint of slow and fast lane)
- SMA surfacing has fully densified due to heavy traffic loading
- Fuel spillages, particularly near the intersection

Before rehabilitation

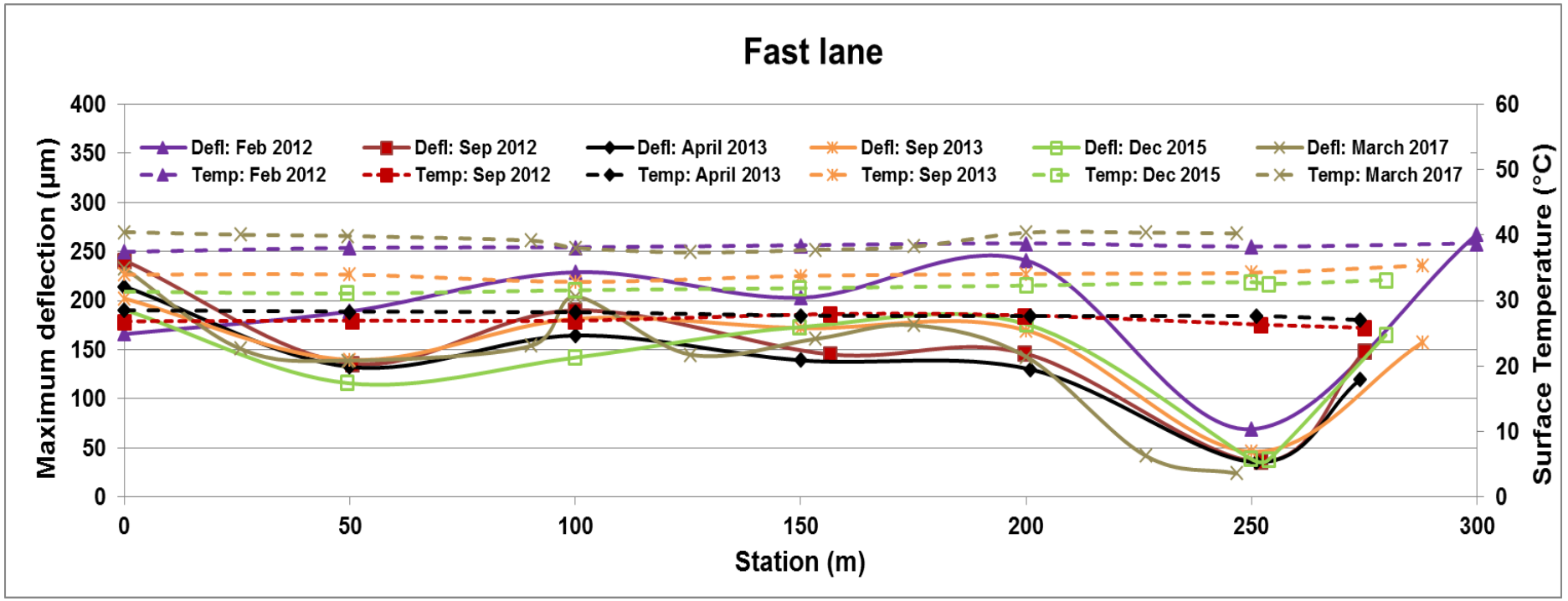
Five years after rehabilitation

Visual Condition Survey: Pictures



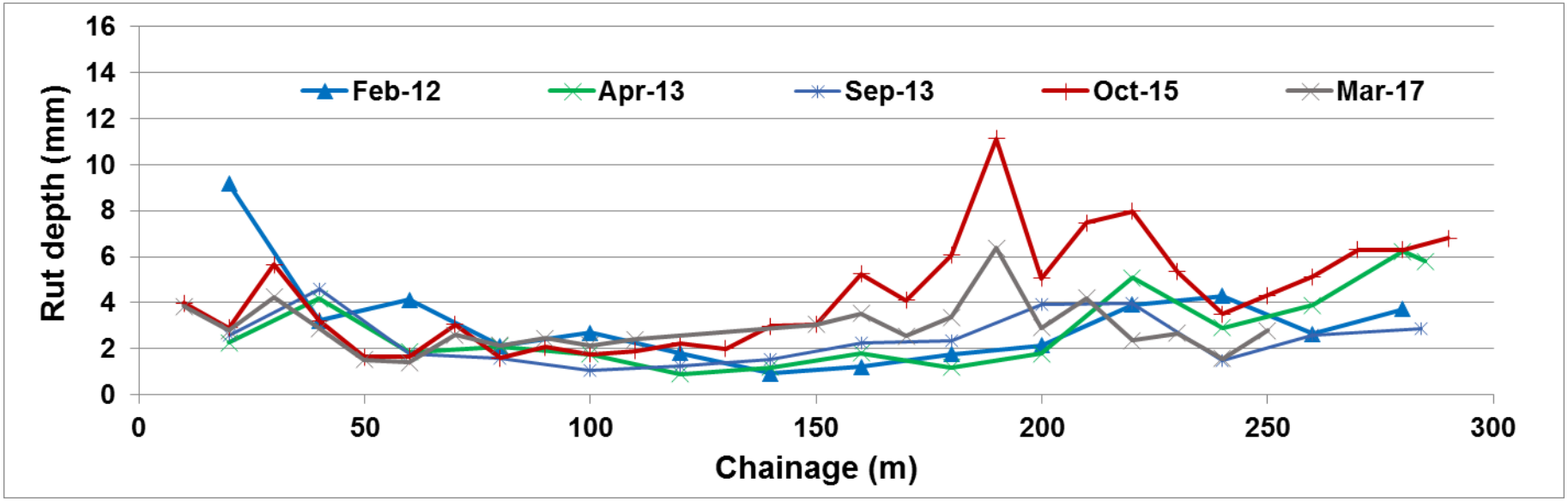
FWD Deflection Measurements

- Very low deflection values measured during the entire monitoring period



Profilometer Survey

- The rut measurements show an increasing trend on isolated locations



Conclusions

- During the five years monitoring period, the EME LTPP section carried approximately 23 million ESAL with minimal structural damage
- The LTPP monitoring results suggest that EME can withstand heavy traffic loading
- The observed longitudinal cracks necessitate more attention during the future surveys to ascertain whether the cracks are limited to the SMA surfacing or extend to the EME base layer

Thank you

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