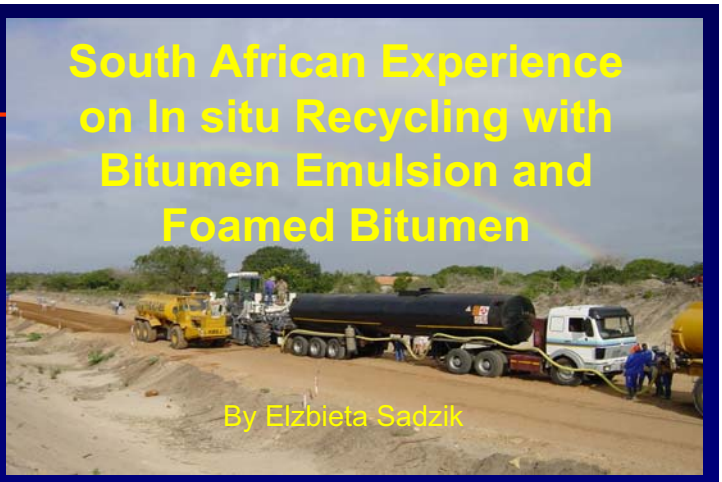
South African Experience on In situ Recycling with Bitumen Emulsion and Foamed Bitumen



By Elzbieta Sadzik

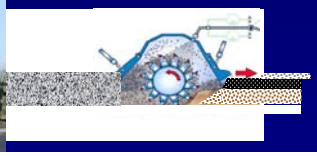
Gauteng Department of Public Transport, Roads & Works

Contents

- Introduction
- Issues related to design
- Issues related to construction
- Political and social issues
- Conclusions

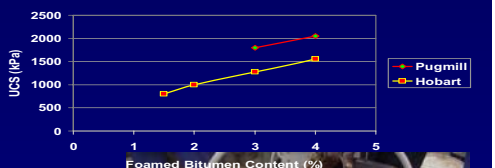
Introduction

- South African road network
- Environmental legislature
- Arrival of high speed recyclers
- Foamed bitumen = emulsion ?



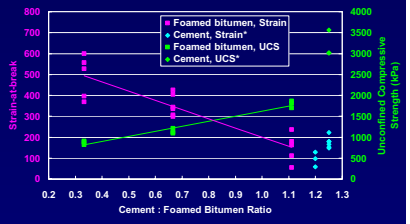
Issues related to design

- Lack of lab. mixers simulating field conditions



Issues related to design

- Optimum bitumen and active filler ratio



- Appropriate performance tests

Material Code		ITS (kPa)	
		100-300	300-500
UCS (kPa)	700 - 1400	FB4	FB3
	1400-2000	FB2	FB1

Issues related to design

- Pre-design pavement investigation
- Sampling of material

Issues related to design

- Comparison between emulsion and foamed bitumen treated layers

Proffered conditions for use of foamed bitumen :

- Early opening to traffic
- High initial moisture content

Proffered conditions for use of emulsion :

- Inadequate foaming properties
- Material temperature < 15°C
- Inadequate fines in the material (< 5%)

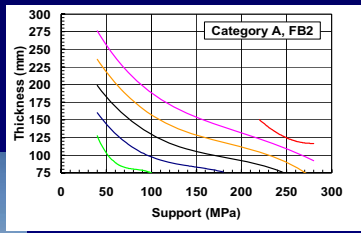
Issues related to design

- Mechanistic-empirical design method

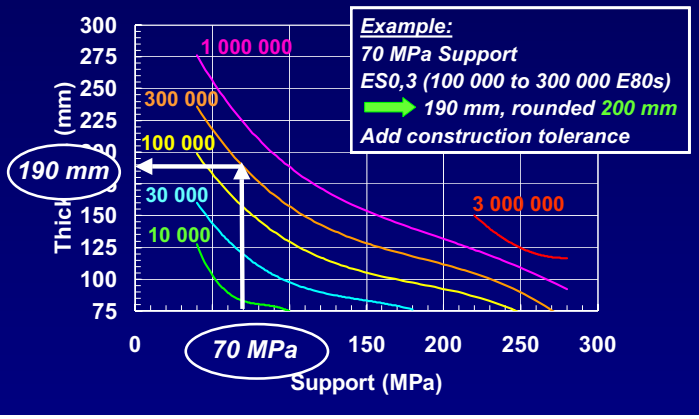
Distress mechanisms:

- Effective fatigue
- Permanent deformation

Development of transfer functions



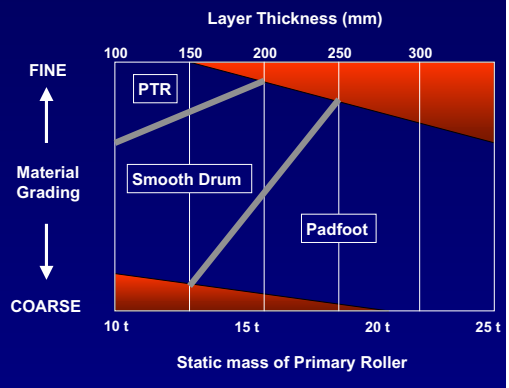
Deep in situ reycling, design charts



Issues related to construction

- Differences between conventional and high speed recycling
  - Cross or forward blend of material
  - Application of cement
  - Limited time for corrections

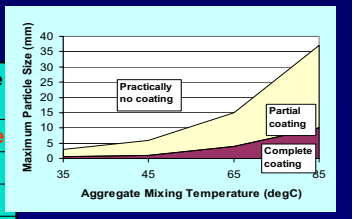
Issues related to construction: compaction



Issues related to construction

- Construction in temp. < 15°C
  - Influence of aggregate temp. on particle coating
  - Foam suitability

Foam Index (sec)	Aggregate 15°C	Aggregate 25°C
<75	Unsuitable	Unsuitable
75 – 100	Very poor	Poor
100 – 125	Poor	Moderate
125 – 175	Moderate	Good
75 – 200	Good	Very good
>200	Very good	Very good



Political and social issues

- Labour intensive construction (LIC)
- Development of small, micro and medium entrepreneurs

Political and social issues

In-plant mixing

- New / upgrading projects
- Control of input materials
- Quality of mixing
- Stockpiling

Labour-intensive construction

Labour Intensive Construction

- Quality of road surface finish
- Compaction
- Quality control
- Construction duration

Political and social issues

- LIC construction cost
- Social benefits of LIC

Recycling with Foamed Bitumen and Emulsion

Conclusions

- In place deep recycling and in plant recycling were successfully used in South Africa
- This technology can also be used for labour intensive construction
- Effective when carefully controlled

SA Experience on Recycling with Foamed Bitumen and Emulsion

- Interim Technical Guidelines:
  The Design and Use of Foamed Bitumen Treated Materials
  Published by Asphalt Academy
  www.asac.csir.co.za
  asac@csir.co.za