



# Perpetual pavements and Sustainability

Brian Ferne

ISPW January 2010



# Table of contents

## Perpetual pavements and Sustainability

- 1 Introduction and state of the art/practice
- 2 Contribution to sustainable pavement solutions?
- 3 Knowledge gaps in perpetual pavements?
- 4 Priority research questions

# Introduction and state of the art/practice (1)

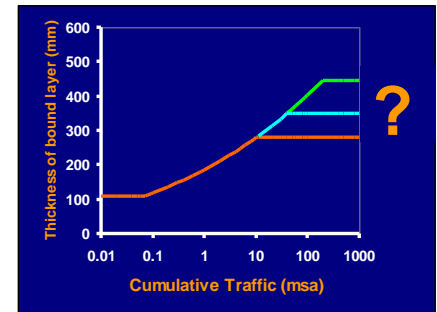
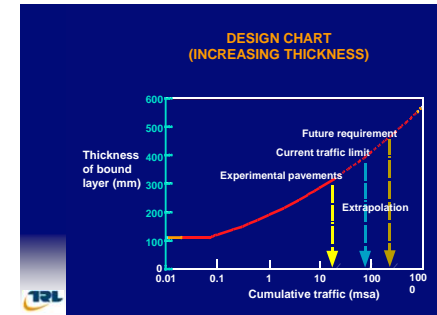
- Traditional understanding of flexible pavement deterioration
  - Fatigue cracking (from bottom up)
  - Deformation throughout pavement

Therefore:

- Higher traffic levels = Thicker designs
- In 1990's studies suggested a different behaviour
  - For 'thick' well-constructed pavements
    - No fatigue cracking (only top down surface cracking)
    - Deformation only in surfacing

Therefore:

- No structural deterioration
- Higher traffic levels ≠ Thicker designs



## Introduction and state of the art/practice (2)

- Pavements without structural deterioration are called:
  - Perpetual pavements – in USA
  - Long-life pavement – in Europe - **LLP**
- Initially only applied to fully flexible pavements – (*Phase 1 Report*)
- ELLPAG (European Long-Life Pavement Group)
  - *A long-life pavement is a well designed and well constructed pavement where the structural elements last indefinitely provided that the designed maximum individual load and environmental conditions are not exceeded and that appropriate and timely surface maintenance is carried out.*
- Now, in Europe, ELLPAG suggests also can apply to
  - Flexible composite/Semi-rigid pavements (*Phase 2 Report*)
  - Rigid pavements (*Phase 3 Report*)

## Introduction and state of the art/practice (3)

- Cost benefits of LLP's over 50 years
  - DLP NPV/LLP NPV = over 2 for Fully flexible or semi-rigid
- Network management of LLP's
  - Design
  - Maintenance
- LLP's are structurally long life but need timely surface maintenance

Therefore:

  - Further savings if surfacings longer life economically
- Current usage of long-life pavements
  - Europe
  - USA

# Contribution to sustainable pavement solutions?

- How do we assess such a capability?
  - Whole life value?
  - Ecological economics?
- Full methodology does not yet exist?
- **asPECT documents and software are freely available as downloads from the project website. Visit:**
- [www.sustainabilityofhighways.org.uk](http://www.sustainabilityofhighways.org.uk)

However:

- If long-life designs = determinate life designs
  - In terms of initial construction
- Since long-life pavements only need surface maintenance
- Long-life designs >>>> determinate life designs
  - In terms of sustainability
- But what if future traffic levels don't match expectations?

# Knowledge gaps in perpetual pavements?

Lack of:

- Tools to assess sustainability impact of alternative pavement management methodologies
  - i.e. long-life vs determinate life design and maintenance
- Full understanding of pavement deterioration
  - All pavement types
  - Long-life vs determinate life
  - Threshold design concept
- Full understanding of effect of pavement quality on pavement performance
- Network and scheme level tools to evaluate long-life status with minimum traffic disruption

## Priority research questions

For all main pavement types:

- Develop sustainability indicator
- Confirm threshold design concept and identify threshold levels
- Define importance of construction variables on pavement life



# Long life = 2000 years?

**ELLPAG Chairman**

Brian Ferne

☎ +44 1344 770668

💻 [bferne@trl.co.uk](mailto:bferne@trl.co.uk)

# **“Long Life Surfacing for busy roads”**

**published by  
OECD in November 2007**

**For further information, see :**

**<http://www.cemt.org/JTRC/WorkingGroups/Pavements/index.htm>**

# Indicative Cost Estimates: Comparison of EA, HPCM & Reference mixes

Table : Comparison of costs between materials

<b>TYPICAL SURFACING COSTS IN €/M<sup>2</sup> FOR WESTERN EUROPE</b>			
<b>Description</b>	<b>Epoxy Asphalt 30mm wearing course</b>	<b>HPCM 10mm wearing course</b>	<b>Conventional 30mm asphalt solution</b>
<b>Expected Lifespan</b>	30 years?	30 years?	7-15 years
Milling 50-100mm	0.75-1.25	0.75-1.25	0.75-1.6
Binder course (50mm)	6-10	8-12	6-12
Tack/bond coat	0.25		0.1
Wearing course	18-31	20	6-12
<b>Total costs</b>	25-42.5	29-33	13-25

## Phase III Field Trials: Overall Aims

The overall aims of a coordinated programme of field trials of the Epoxy Asphalt and HPCM surfacings are:

- To demonstrate that the performance envisaged on the basis of the laboratory tests and the accelerated testing will hold within the period of the trial under real traffic and environmental conditions.
- Collateral aims include to: develop construction methods, improve cost estimates, optimise material mixes and increase contractor experience levels.