Introduction

- Increased durability at a lower price is an ageless aspiration
- This research aimed at extremely high fatigue life surfacings
- Delivery attempted in compliance with progressive performance specification across four Australian states
- Trials took place to test production mix and field performance

Aims of High Performance Surfacing

- Durable (designed to extend service life)
- Customised and highly engineered
- Highly textured
- Applied as a thin layer (asphalt pavement surfacing)
- High fatigue life
- Exceptional skid resistance

Layer Thickness

- 25mm – 35 mm
- 15mm – 18mm

New Technology Thin Asphalt Surfacings

- Ultra-thin Noise Abatement
- Ultra-thin Excellent Deformation Resistance
- Excellent Fatigue Life
- Excellent Deformation Resistance
- Structural Significance
- Ultra-thin Noise Abatement
- Excellent Deformation Resistance
- Excellent Fatigue Life
- Excellent Deformation Resistance
- Ultra-thin Noise Abatement

The Mix Design Process

- Manufactured using high quality hard wearing aggregates
- Specially modified binder to ensure the long term performance
- Binder manufactured exclusively to give high fatigue life
- DURAPAVE binder intended to help resist reflective cracking
- Grading gives stone on stone interlock similar to SMA
- Grading aims for excellent macro texture and so good skid resistance

Performance Testing The New Mix

Durapave aims for simultaneous high performance with parameters that usually counteract each other
**Property** | **Test Method** | **Unit** | **Limit** | **Value**
--- | --- | --- | --- | ---
Rut resistance by wheel tracking test (mm rut depth) | TRL 221 | mm | Maximum | ≤ 2
Skid resistance by brinell fatigue test (cycles to failure condition at standard reference test conditions) | TRL 223 | cycles | Minimum | ≥ 8,000,000
Rut resistance of laboratory compacted plant sample (mm rut depth) | RPA 165 | mm | Minimum | ≤ 10

**Performance Surfacing Rut Results**

- Durapave has achieved results < 2.0 mm
- Compared to 10 DGA (typically) < 11 mm

**Performance Surfacing Fatigue Results**

- Durapave fatigue life > 8,000,000 cycles
- 10DGA fatigue life ~ 150,000 cycles

**Support From NSW & QLD Results**

<table>
<thead>
<tr>
<th>State</th>
<th>Fatigue Life</th>
<th>Strain Level</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>QLD</td>
<td>&gt; 1.0 x 10³</td>
<td>600 µɛ</td>
<td>November 2010</td>
</tr>
<tr>
<td>NSW</td>
<td>&gt; 8 x 10³</td>
<td>400 µɛ</td>
<td>November 2010</td>
</tr>
<tr>
<td>VIC</td>
<td>&gt; 8 x 10³</td>
<td>400 µɛ</td>
<td>January 2012</td>
</tr>
<tr>
<td>WA</td>
<td>&gt; 8 x 10³</td>
<td>400 µɛ</td>
<td>October 2011</td>
</tr>
</tbody>
</table>

**Skid Resistance - NSW**

- Durapave trial site in NSW achieved SFC > 65

**Performance Surfacing - Application**

- Aim is to place it in 20 mm to 25 mm layers
- Weather must be conducive to thin layer construction (As the thin layers cool fast, latent ground heat in warm weather will give best performance)
- Regulation is required if rutting > 10 mm exists
- Suitable for challenging road geometry (grades, bends, high speed)
- Best performance when substrate is structurally adequate
- Might be suitable as granular pavement surfacing subject to further field trials
- Good tack coat is placed as a minimum
- Has been paved at night
Paving High Performance Surfacing

- Paving with conventional paver
- Rolling with steel drum but not multi-wheel roller
- Special conditions may need single pass spray-paver (thin layers)

Economic Benefits

- Reduces treatment cost due to reduced layer thickness compared to other mixes
- Milling cost is reduced because there is no need to remove existing pavement to maintain levels as DURAPAVE is placed as a very thin layer
- Reduced milling means less material goes to waste or landfill

Functional Benefits

- Excellent fatigue life so far based on lab testing
- Texture is expected to reduce water spray compared to standard mixes
- High binder content can be expected to reduce stripping potential
- DURAPAVE has greater noise reducing potential than DGA
- Can overlay existing pavements under light and heavy loading
- Does not ravel like OGA due to high tyre stresses

Trial Site Attributes (Traffic/Industrial Area)

Trial Site 1 - Existing Condition

Trial Site 2 - Existing Condition
Both trials completed in early 2012
Prior to trial R&D lab mix testing gave > 8 million cycles at 400 µε
Production mix testing pass specification
Included a control standard SMA mix at one site

12 million cycles and asymptotes to flat line – production mix

Met density requirements and had negligible densification over first year (average 1.6% lower air voids ≅ 0.5 mm)

Final rut depth on production mix < 2.5 mm

All mixes were better than target after 16 months service

Relative price index with a conservative factor for performance

<table>
<thead>
<tr>
<th>Thickness</th>
<th>AC 10</th>
<th>Novachip</th>
<th>Durapave</th>
</tr>
</thead>
<tbody>
<tr>
<td>40mm</td>
<td>20mm</td>
<td>25mm</td>
<td></td>
</tr>
<tr>
<td>PMB</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Price Index ($)</td>
<td>100</td>
<td>115</td>
<td>150</td>
</tr>
<tr>
<td>Price Index / m²</td>
<td>100</td>
<td>93</td>
<td>114</td>
</tr>
<tr>
<td>Fatigue</td>
<td>100%</td>
<td>100%</td>
<td>&gt;8,000%</td>
</tr>
<tr>
<td>Rut depth</td>
<td>&gt;5 mm</td>
<td>&lt;2 mm</td>
<td>&lt;2.5 mm</td>
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<tr>
<td>Performance Factor</td>
<td>1</td>
<td>0.8</td>
<td>2.0</td>
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<tr>
<td>Price Index / m² / Years Of Life</td>
<td>100</td>
<td>76</td>
<td>57</td>
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</table>
Key developments in this paper are:

- Fatigue life exceeding 12 million cycles (actual not extrapolated) was measured
- Production mix was used for this testing
- Field trials have shown that the mix is practical
- Other attributes meet or exceed those of standard mixes