Spray Sealing Using Bituminous Emulsions

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Background

Annual program of 500,000 to 800,000 m² reseal program

Long history in the use of hot polymer modified binders

Annual window for resealing with hot products
November to March

Temperatures range from -8 C to 42 C

High cutter use (5 to 8%)
Small amount of new works

Limited number of contractors tender for a contract which takes 3 to 4 months to complete
Problems faced in the ACT

Bleeding of multi coat and geotextile reseals (trapped cutter)

Reseal contracts extending into May

Low daily production in Urban areas

Little competition with tenders
Why use Emulsion

Following the 2007 AAPA Conference we trialled bituminous emulsions for resealing.

To extend the reseal season and reduce bleeding.

An attractive tender which was based on bituminous emulsion.
### Recent use of Binders

<table>
<thead>
<tr>
<th>Year</th>
<th>Area (m²)</th>
<th>% of emulsion</th>
<th>Emulsion sprayed (L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007/8</td>
<td>798,000</td>
<td>9%</td>
<td>95,000</td>
</tr>
<tr>
<td>2008/9</td>
<td>818,000</td>
<td>46%</td>
<td>667,000</td>
</tr>
<tr>
<td>2009/10</td>
<td>434,000</td>
<td>100%</td>
<td>792,000</td>
</tr>
<tr>
<td>2010/11</td>
<td>515,000</td>
<td>80%</td>
<td>716,000</td>
</tr>
<tr>
<td>2011/12</td>
<td>752,000</td>
<td>100%</td>
<td>1,561,000</td>
</tr>
</tbody>
</table>

Planned: 752,000

1,561,000
Product Used

High bitumen content emulsion (HBCE)

70 to 72% bitumen

Modified with 3% rubber

Increased viscosity of the product for stability on the pavement

Looks like a double chocolate thickshake

ECO Flex 70
The Clients View

Roads ACT
HBCE reseals to date have provided encouraging results:

- Good even stone distribution.
- Binder at least half way up the stone.
- No bleeding or stripping.
- Spraying HBCE requires a new set of skills.
- We have had challenges and problems.
Advantages
Environment

No cutter used and clouds of solvent when spraying.
Safety

Sprayed at 90°C
Extension of the Reseal Season

Allows an earlier start and later finish.
Single Product Use for Geotextile Reseals

Same product used for tack coat and two cover coats
Less Bleeding

No cutters trapped
Sprayer Turnaround

Turn around is quicker with only one product to load.

Product Degradation

Less degradation of polymer with heating.

Cost

No cutters / Better Plant utilisation
## Lower Energy Use

<table>
<thead>
<tr>
<th></th>
<th>Hot bitumen</th>
<th>HBCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 L / m² without cutter</td>
<td>827 KJ</td>
<td>1,192 KJ</td>
</tr>
<tr>
<td>1 L / m² with 5% cutter in bitumen – none in HBCE</td>
<td>2,827 KJ</td>
<td>1,192 KJ</td>
</tr>
</tbody>
</table>

While HBCE require more energy to produce this is offset by less heating and no cutter being added.

(excludes energy for transport)
Disadvantages
Rain

Rain events prior to breaking of the emulsion cause damage to the seal.

Weather radars on the internet are useful.

Damage from as little as 1mm.
In an Urban area this results in stained gutters and binder in stormwater system.
Spreading of Aggregate

- Spreading of aggregate slows the break.
- More aggregate required to cover binder when opening to traffic.

- Greater stone loss in winter with frosts.
- Multi Stage sweeping program to remove loose stones.
Opening the Road to Traffic

Traffic must be kept moving (avoid braking / acceleration)

**Precoat**

- Ideally none
- Petroleum based precoats act like cutters.
- Emulsion based are preferred.
Same Specification – Different Product

Product development is outstripping Spec’s

Viscosity and break times vary
Stability of the Product

Less viscous product will run into gutters.
Humidity

High humidity significantly slows the emulsion break.
High Humidity in 2011

Extended wet periods required a switch to hot products
Storage of Product

No storage tanks / Unstable product
Extremely Low Temperatures

Frosts can lead to failure of the seal.

Product Supply

- Limited suppliers / Long Haulage distances
- Balance the stability in transport and the speed of the break on the road.
New Works

Reduced penetration into pavement on seals requires 2 coats
The Contractor’s View
Greater Contact Area

Emulsions offer better aggregate embedment
Greater Contact Area

After the emulsion has cured, there is improved aggregate wetting and binder contact area.
Bitumen Vs Emulsion

Differential in binder rise over 24hr
Why Bitumen Emulsion Seals?

• Improved OH&S
• More environmentally sustainable product
• Enhanced Spray Season
• Increased Aggregate embedment & interlocking
• Potentially extended seal life - ???
• Flexibility in sealing solutions
But … They aren’t Bullet Proof Solutions

• Not immune to early rain, frosts, changing humidity or poor base conditions – Increased contractor risk

• Reduced Productivities – Traffic Management Issues

• Only as good as the seal design – GIGO

• Sensitive to emulsion viscosity & consistency

• There is no one magic standard solution to fit all needs
Emulsion Seals – The Future

• Sealing Techniques and Emulsion knowledge are critical

• Hence contractor experience, know-how and technical capability and capacity will provide added value to the client in the future
We have come a long way?

1930s - Somewhere between 5 & 14 workers died on this project
Summary
Spraying HBCE is not the same as spraying hot bitumen.

All parties have learned a great deal in the past 4 years.

It is intended that HBCE will be continued to be used in the ACT.
Advantages

- Improved Safety
- Environmental
- Extended sealing season
Disadvantages

Greater loose stone issues

Rain

Humidity

Product stability / viscosity
Areas to Improve

Information about break times in differing temperatures and humidity

Updating our specifications

Precoating
Thank You