Sealing With Emulsion in New Zealand

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Why use Emulsion?
- Safety
- Environment
- Quality and Engineering

Safety
Positives
- Handled at less than 90°C
- Aqueous environment – not explosive
- Lower chemical content
- Less fumes
- No reported injuries from emulsion in NZ

Negatives
- Changing between emulsion and hot bitumen
- Some reported boil-overs in NZ

Emulsion vs. Cutback Safety Considerations

Environment
Positives
- Less energy required to get binder on the road
- Less diluent released to environment
- Less use of non-renewable resource

Negatives
- Risk of washout into waterways

CO₂ Generated per Tonne of Sealing Bitumen Sprayed

<table>
<thead>
<tr>
<th></th>
<th>Cutback Bitumen (kg/t)</th>
<th>Emulsion (kg/t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Production / Heating</td>
<td>62</td>
<td>16</td>
</tr>
<tr>
<td>Total</td>
<td>62</td>
<td>23</td>
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</tbody>
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VOC Emissions

- Mostly generated by the evaporation of 60% - 75% kerosene within cutback bitumen.
- VOC is known to react with sunlight and other chemicals to form photochemical smog.
- FH calculations indicate that approx. 700,000 litres of kerosene is lost to the atmosphere each year. FH VOC emissions:
  - Cutback 19 kg/t sealing bitumen
  - Emulsion 3 kg/t sealing bitumen
- Increased use of emulsion would significantly decrease the emission of these harmful compounds.

Quality and Engineering

Positives
- Manufactured for purpose (not waste)
- Best delivery system for PMB
- Better wetting and adhesion
- Earlier return to base binder properties
- Binder less oxidised

Negatives
- Susceptible to traffic while curing
- Susceptible to variation in bitumen chemistry
- Susceptible to rain and humidity
- Evaporation of significant quantities of water

Why not 100% Emulsion?

- Emulsions not suitable for some treatments
- Smaller contractors not producing emulsion
- Need strong technical systems
- Climate in some regions increases risk
- Base binder variability causing quality issues
- Emulsions cost more?
  - Per tonne of ordinary binder delivered onto the road
  - Can reduce application rate up to 15% (Downers)?
  - Competitive when used for PMB sealing
**Emulsion Primer**

**Positives**
- For first coat seals on new construction
- Wets through the cement or lime
- Allows second coat seal binder

**Negatives**
- Cost
- Extra operation
- Time to cure

**Contract Environment in NZ**

- NZTA generally leave it to contractor to choose whether emulsion or cutback
  - Some contracts specify emulsion
  - NZTA South Canterbury longest seal lives using emulsion.
- LAs specify it
  - Customer preference

**Performance Based Contracts**

- Clients
  - Specify base binder
  - Penetration grade or PMB
  - Specify flux limits
- Contractors
  - Delivery system emulsion or cutback
  - Choose cutter levels

**No Emulsion or PMB Specification**

- Emulsion just a delivery system
- Cutback and heat just a delivery system
- Contractors have Technical Data Sheets for their products
- Clients specify the end result.

**No Surprises!!!**