Reconophalt

Recycling Soft Plastics and Toner into Roads
Social, Environmental & Economic Value

- Quality infrastructure is fundamental to community development & well-being. The quality of the asphalt and road building products is the highest of priority.

- Waste soft plastics and glass are a major issue globally

- Waste soft plastics are landfilled in Australia

- Loss of valuable resource that sits in the ground for years and years

- Reduction in Ghg by using recycled asphalt, polymers and glass
Portfolio of Recycled Materials

Diverse and Innovative Blend of Materials:

- Reclaimed Asphalt Pavement
- Recycled Toner Cartridges
- Recycled Glass
- Recycled Waste Oil
- Recycled Tyre Rubber
- Soft Plastic
Partnerships Making A Difference
Red Group

PLANET ARK

CELEBRATING 15 YEARS OF CARTRIDGES 4 PLANET ARK

...OVER 38 MILLION CARTRIDGES AND COUNTING!
Partnerships Deliver Better Outcomes

CARTRIDGES 4 PLANETARK + Plastic Police® redcycle = TonerPlas™

Close the Loop
Success Through Collaboration

- Successful trials in most States
- High media and government interest
- Significant community engagement and feedback
- Part of a broader solution to challenging issues
Every 1km road (2 lanes) paved with plastic and glass modified asphalt will see approximately:
- 530,000 plastic bag equivalents
- 168,000 glass bottle equivalents
- 12,500 waste toner from printer cartridges

Compared to standard RMS, VicRoads and AUS SPEC asphalt:
- 65% Improvement in fatigue tests for longer life pavements
- Superior deformation resistance for withstanding heavy vehicular traffic
- Still flexible and durable for light traffic installations.

First trial in Melbourne – 29th May 2018
What does this mean for the environment?

For every 1km of road (2 lanes) surfacing course (50mm), this equates to;

~ 30% reduction of CO₂e
~ 481 tonne of CO₂e saved
Equivalent to;
  ~ 1,104 trees for a 12 month period
  ~ Travel 3.2 times around the world in a small car
~ 357.5 tonnes of recycled material used
Equivalent to;
  ~ 800,000 plastic bags (Usage for ~4,706 people in a year)
  ~ 250,000 glass bottles (Usage for ~ 1,214 people in a year)
  ~ 18,000 toner cartridge (toner only)
  ~10.5 tonne of bitumen recycled
  ~ 289.5 tonne of aggregate, dust, natural sand recycled

and this is just for the surface of 1km of road, imagine what can be done if used in all asphalt!
Estimation of Environmental Benefits

As not all savings can be added directly to the bottom line, Downer also provides a certificate of estimated CO2 reduction by accepting our Low CO2ₑ Mixes in lieu of standard hot mix asphalt.

This savings estimated on the certificate are calculated from an in house Carbon Calculator which was created based on the Life Cycle Assessment completed in 2008. This is to provide a guide on CO2ₑ savings for a specific project.
Performance of Reconophalt Asphalt

COMMON QUESTIONS

• Can I recycle it again?
• Are there any microplastics issue?
• Will asphalt with recycled products perform as well or better than normal asphalts?
• How much does it Cost $?
• Does it come in any other colours?
Can I recycle it again?

• Reconophalt contains Polymers from the recycled plastic and from the toner
• The plastic and toner in the form of Tonerplas melts into the mix and becomes part of the binder
• In the same way as PMB Asphalt can be recycled, Plastiphalt can be milled and used as RAP
• Research in the future around quarantining Polymer Modified Asphalt as a higher grade RAP
Are there any microplastics issue?

- The Plastic and Toner are melted and combined to become Tonerplas
- The Tonerplas is melted into the binder and becomes a part of the binder
- Downer has undertaken extensive testing here and overseas to ensure that microplastics are not an issue in Reconophalt
- Testing at $250k and continuing
- More stringent testing than any other product to satisfy the NSW EPA requirements
Will asphalt with recycled products perform as well or better than normal asphalts?

- Downer has tested Reconophalt mixes in Victoria, NSW, ACT, Tasmania and South Australia
- All mixes exhibit superior fatigue and rut resistance when compared to standard asphalt
- The mix is suitable for highly trafficked areas in base courses and wearing courses
- Results in detail for the initial trial in Melbourne as follows:
## Reconophalt Performance Tests (Victoria)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Reconophalt (20% RAP, 5% Glass, 5.6% Binder, 0.75% Additive)</th>
<th>Reconophalt Production Trial 29/05/2018</th>
<th>Reconophalt Testing by ARRB 24/05/2018</th>
<th>Standard Baseline AC10H</th>
<th>VicRoads AC10H Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stiffness Modulus @ 25°C (Mpa)</td>
<td>4200</td>
<td>3820</td>
<td>5200</td>
<td>4100</td>
<td>2500 – 5500</td>
</tr>
<tr>
<td>Wheel Tracking Depth @ 60°C (mm)</td>
<td>1.6</td>
<td>1.8</td>
<td>2.0</td>
<td>9.0</td>
<td>&lt;11</td>
</tr>
<tr>
<td>Fatigue Life @ 20°C (kcycles)</td>
<td>477</td>
<td>926</td>
<td>505</td>
<td>156</td>
<td>&gt;140</td>
</tr>
<tr>
<td>Moisture Sensitivity – Tensile Strength Ratio (%)</td>
<td>84</td>
<td>81</td>
<td>Not tested</td>
<td>91</td>
<td>&gt;80</td>
</tr>
<tr>
<td>Moisture Sensitivity – Wet Tensile Strength (kPa)</td>
<td>998</td>
<td>1068</td>
<td>Not tested</td>
<td>1251</td>
<td>&gt;850</td>
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<tr>
<td>Particle Loss, Unconditioned (%)</td>
<td>8</td>
<td>12</td>
<td>Not tested</td>
<td>14</td>
<td>N/A</td>
</tr>
<tr>
<td>Particle Loss, Moisture Conditioned (%)</td>
<td>11</td>
<td>13</td>
<td>Not tested</td>
<td>15</td>
<td>N/A</td>
</tr>
<tr>
<td>Air Voids @ 50 Marshall Blows (%)</td>
<td>4.9</td>
<td>5.1</td>
<td>Not Applicable</td>
<td>5.0</td>
<td>4.9% to 5.3%</td>
</tr>
</tbody>
</table>
### Asset Life and Performance

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Reconophalt Improvements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased Pavement Life in Years</td>
<td>+15% or 3 Years</td>
</tr>
<tr>
<td>Increased Traffic Count Volume</td>
<td>+20%</td>
</tr>
<tr>
<td>Pavement Thickness Reduction</td>
<td>-10%</td>
</tr>
</tbody>
</table>

Reconophalt Meets VicRoads Performance Specifications
How much does it Cost $?

• Reconophalt performance is equivalent to a mild PMB asphalt
• Reconophalt will last longer than standard asphalt
• Reconophalt is less likely to rut under heavy traffic when compared to Standard Asphalt
• Reconophalt will save plastics, glass and toner from going to landfill with savings in transportation and tipping fees ($250/t)
• Reconophalt is similar in price to standard asphalt depending on mix design
• Reconophalt will cost around 25% less than PMB Modified Asphalt
• Whilst initially a little bit more expensive, if Whole of Life Costs are considered, then Reconophalt costs less than standard asphalt and far less than Polymer Modified Asphalt
Does it come in any other colours?

NO

JUST BLACK
Hi RAP Recycling (HRT) Plants

• Downer was involved in the development in the High Recycling Technology incorporated into the plants at:

• Bayswater in Melbourne
• Wingfield in Adelaide
The Ultimate Circular Economy – 100% Recycled Road

- On Tuesday 26th February 2019, Downer along with the City of Adelaide achieved the first 100% recycled road on Chatham Street in Adelaide
- The mix comprised RAP (Recycled Asphalt Pavement) and used fish and chip oil.
Outside the Box?

• We look to recover those things that are currently not being recycled, or are discarded from an existing process.
Questions?