“Sustainable solutions using asphalt emulsions”

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Sustainable:

The word sustainable refers to something that can be sustained by itself and with own reasons. When we speak of sustainable we mean something that can be maintained by itself because economic, social or environmental conditions allow, can be sustained without affecting resources.

This concept could be applied to the economic field, ecology, social development and social responsibility.
How to know if a system or proposal is or not sustainable?

• Renewable resources should not be used faster than their generation.

• Contaminants can not be produced at a higher rate than the process required to recycle, neutralize or biodegrade.

• Non-renewable resources should not be used more quickly and then be replaced by sustainable renewable resources
ENVIRONMENTAL CHALLENGES.

Meeting the criteria for sustainable development

• Respect for the safety of people.
• Respect for the natural environment.
• Renewal and efficient management of resources

Saving fossil fuels
Sustainable Pavement

• **Key Concepts**

• Consider environmental, social, and economic factors.

• Think about sustainability holistically, over the entire life of the pavement.

• Sustainability is context sensitive. Tailor the approach to the specific pavement application.

• Six key pavement life cycle phases are considered for sustainability best practices. (Courtesy of FHWA)
Pavement life cycle phases

- Materials Production
- Design
- Construction
- Use
- Preservation, Maintenance and Rehabilitation
- End of life
Impact of Preservation

- Preservation
- Rehabilitation
- Reconstruction

Pavement condition:
- Excellent
- Rehabilitation
- Reconstruction

Pavement life time:
- Failure
Best Practices

• **Materials Production:** Reduce use of virgin material by using recycled or reclaimed pavement. Use Cold mix and warm-mix asphalt technologies or reduce cement content to reduce greenhouse gas emissions.

• **Design:** Incorporate life cycle assessment or sustainability ratings into the design process.

• **Construction:** Minimize negative impacts and improve construction quality.
Best Practices

• **Use:** Employ porous pavements for storm water management.

• **Preservation, Maintenance, and Rehabilitation:** Incorporate sustainability metrics into asset management systems. Use pavement maintenance/preservation methods to extend pavement life while maintaining pavement smoothness.

• **End-of-Life:** Consider the highest and best use of the pavement, and avoid landfilling.
• The European Road Federation (ERF) defines **sustainable roads** as those that are **efficient and efficiently planned, designed, built, modernized and preserved**, through integrated policies with respect to the environment and retaining the benefit Socio-economic in terms of mobility and security.

• On the other hand the University of Washington developed a system called **Green roads**, used to distinguish the sustainable roads through a certification. In this context, a sustainable road **is one that has less impact on the environment, low costs in its useful life and more positive benefits for society.**
CO₂ emissions per country from fossil-fuel use and cement production

CO₂ emissions per capita from fossil-fuel use and cement production
2014 Global CO₂ Emissions from Fossil Fuel Combustion and Some Industrial Processes

Source: IPCC (2014); based on global emissions from 2010. Details about the sources included in these estimates can be found in the Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.
Options and Expected Life

<table>
<thead>
<tr>
<th>Treatment Type</th>
<th>Life Extension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thin HMA Overlay</td>
<td>5-10 Years</td>
</tr>
<tr>
<td>Hot In-Place Recycling</td>
<td>5-10 Years</td>
</tr>
<tr>
<td>Chip Seal</td>
<td>3-6 Years</td>
</tr>
<tr>
<td>Slurry/Micro</td>
<td>3-5 Years</td>
</tr>
<tr>
<td>Crack Sealing</td>
<td>1-3 Years</td>
</tr>
<tr>
<td>Crack Filling</td>
<td>1-2 Years</td>
</tr>
<tr>
<td>Fog Sealing</td>
<td>1 Year</td>
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</tbody>
</table>
## Total Energy Use and GHG Emission for Pavement Preservation Treatments

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Details</th>
<th>Energy use</th>
<th>GHG emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>BTU/yd²</td>
<td>MJ/m²</td>
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<tr>
<td>Hot Mix Asphalt</td>
<td>Thickness 1.5&quot; (3.8cm)</td>
<td>46300</td>
<td>59</td>
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<td>Thickness 2.0&quot; (5.0cm)</td>
<td>61500</td>
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<tr>
<td>Hot In-Place Recycling HIR (50/50) Recycle/New</td>
<td>Thickness 1.5&quot; (3.8cm)</td>
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<td>49</td>
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<td></td>
<td>Thickness 2.0&quot; (5.0cm)</td>
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<td>Chip Seal</td>
<td>Emulsion 0.44 g/yd² (1.6 L/m²) Aggregate 38 lb/yd² (21 kg/m²)</td>
<td>7030</td>
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<tr>
<td></td>
<td>Emulsion 0.35 g/yd² (2.0 L/m²) Aggregate 28 lb/yd² (15 kg/m²)</td>
<td>5130</td>
<td>6.5</td>
</tr>
<tr>
<td>Treatment</td>
<td>Details</td>
<td>Energy use</td>
<td>GHG emissions</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>BTU/yd²</td>
<td>MJ/m²</td>
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<tr>
<td>Slurry Seal/ Microsurfacing</td>
<td>Type III 12% Emulsion 24 lb/yd² (13 kg/m²)</td>
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<td>6.5</td>
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<td>Type II 14% Emulsion 16 lb/yd² (8.7 kg/m²)</td>
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<td>Crack Seal</td>
<td>1 lin. ft/yd² (0.37 m²/m²) 0.25 lb/ft (0.37 kg/m)</td>
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<td>Crack Fill</td>
<td>Emulsion 0.35 g/yd² (2.0 L/m²) Aggregate 28 lb/yd² (15 kg/m²)</td>
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<td>2.0</td>
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<td>Fog Seal</td>
<td>0.05 gal/yd² (0.23 L/m²) 50/50 Diluted Emulsion</td>
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<td>0.10 gal/yd² (0.46 L/m²) 50/50 Diluted Emulsion</td>
<td>500</td>
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<td></td>
<td>0.15 gal/yd² (0.69 L/m²) 50/50 Diluted Emulsion</td>
<td>750</td>
<td>1.2</td>
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</tbody>
</table>
Asphalt Emulsions

• Made of:
  Asphalt Binder *(pitch of oil distillation)*
  Water *(universal solvent)*
  Emulsifier *(biodegradable, natural base, animal/vegetal)*
  Alkali/Acid ---- For a specific pH value
  Additives *(Polymer, fibers, fillers... etc.)*
Asphalt Emulsion
Using Asphalt Emulsions...

Emissions are reduced by;
- Less heating employed to process, store and apply materials
- Less or no use of volatile hydrocarbons in binders and
- Less transportation of raw materials and products.
Typical Applications:

- Tack Coat
- Prime Coat
- Chip Seal
- Slurry / Microsurfacing
- Fog Seal
- Cold Mix
- Cold-in-Place Recycling (CIR)
- Full Depth Reclamation (FDR)
- Base Stabilization
Spread or Mixed
Chip seal, natural or premixed
Application
Final appearance
Microsurfacing

Chemical reaction between Aggregate and Asphalt Emulsion
Use of fiber
It is a Surface Treatment not MAGIC!
Thank you!

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