Selecting the Right Pavement Preservation Treatment

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Pavement Preservation

“A program employing a network level, long-term strategy that enhances pavement performance by using an integrated, cost-effective set of practices that extend pavement life, improve safety and meet motorist expectations.”

- FHWA Pavement Preservation Expert Task Group

Preservation and Rehabilitation Techniques

- Crack sealing
- Patching
- Fog seal
- Chip seal
- Slurry seal
- Micro-surfacing
- Cape seal
- Scrub seal
- Thin Lift Asphalt Concrete
- Ultra Thin Bonded Wearing Course
- Hot In-place Recycling
- Cold Recycling (In-place or Plant)
- Full Depth Reclamation
- Asphalt Overlay

Project/Treatment Selection Strategies (NCHRP Synthesis 222)

- Current condition rating
- Prediction models (“What if” scenario)
- Network Optimization models
- Find treatment that addresses deficiencies (may be affected by local policies/mandates)

Factors that affect selection

- Roadway location
- Roadway type & traffic
- Pavement condition
- Expected performance

Existing pavement performance; (“Do-Nothing”)
Factors to consider

- Roadway location
  - Rural
  - Urban

Factors to consider

- Roadway location
  - Rural / Urban
- Roadway type & Traffic volume
  - Residential – low volume
  - Arterial – high volume

Factors to consider

- Roadway location
  - Rural / Urban
- Roadway type & Traffic volume
  - Residential – low volume / Arterial – high volume
- Pavement condition
  - Age
  - Smoothness
  - Rutting
  - Cracking

Factors to consider

- Roadway location
  - Rural / Urban
- Roadway type & Traffic volume
  - Residential – low volume / Arterial – high volume
- Pavement condition
  - Age / Smoothness / Rutting / Cracking
- Expected performance
  - Years of Service
  - Smoothness
  - Noise / Friction

Factors to consider

- Roadway location
  - Rural / Urban
- Roadway type & Traffic volume
  - Residential – low volume / Arterial – high volume
- Pavement condition
  - Age / Smoothness / Rutting / Cracking
- Expected performance
  - Years of Service / Smoothness / Noise / Friction

Existing pavement performance; ("Do-Nothing")

Performance of Pavement Preservation Treatment

Target Service Condition

Target Reconstruction Condition

(A) Overall Life Extension

(C) Service Life Extension
**Other selection factors**

- Roadway location
- Roadway type & traffic
- Pavement condition
- Expected performance
- Cost
  - Availability of materials
  - Availability of contractor
- Time duration of closures
  - Access to homes
  - Access to businesses
- Climate
  - Time of year of placement

**Tools**

- Decision Trees
  - Set of criteria for identifying a treatment
  - Each branch = set of conditions (pavement type, distress type, traffic volume, functional classification, etc.)
- Decision Matrices
  - Similar to decision trees – both rely on set of criteria or rules to determine appropriate treatment
  - Different in the layout – tabular vs. graphical

**Example – Decision Tree**

**Selecting Treatments**

- Decision Tree
  - Example from MNDOT:
    
    http://www.dot.state.mn.us/materials/pvmtmgmtdocs/Bituminous_Deci

**Ohio Decision Tree – General**

**Ohio Decision Tree – Low Volume**
### Example Decision Matrix

<table>
<thead>
<tr>
<th>Category</th>
<th>Type</th>
<th>Possible Treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cracking</td>
<td>Fatigue Cracking</td>
<td>Not a candidate</td>
</tr>
<tr>
<td></td>
<td>Block Cracking (low – moderate)</td>
<td>Chip seal, thin overlay</td>
</tr>
<tr>
<td></td>
<td>Edge Cracking</td>
<td>Crack seal</td>
</tr>
<tr>
<td></td>
<td>Longitudinal Cracking</td>
<td>Crack seal, chip seal, scrub seal, thin overlay</td>
</tr>
<tr>
<td></td>
<td>Reflection Cracking at Joints</td>
<td>Crack seal</td>
</tr>
<tr>
<td></td>
<td>Transverse Cracking</td>
<td>Crack seal, chip seal, scrub seal, thin overlay</td>
</tr>
<tr>
<td>Surface Defects</td>
<td>Rutting (Structural)</td>
<td>Not a candidate</td>
</tr>
<tr>
<td></td>
<td>Rutting (in AC layers)</td>
<td>Micro Surfacing</td>
</tr>
<tr>
<td></td>
<td>Shoving</td>
<td>Unstable pavement – not a candidate</td>
</tr>
<tr>
<td></td>
<td>Bleeding</td>
<td>Chip seal, Micro Surfacing</td>
</tr>
<tr>
<td></td>
<td>Roughness</td>
<td>Fill seal, chip seal, thin overlay</td>
</tr>
<tr>
<td></td>
<td>(R (good – fair))</td>
<td>Micro Surfacing, thin overlay</td>
</tr>
</tbody>
</table>

### Simple Decision Matrix – Example:

<table>
<thead>
<tr>
<th>Structural Condition</th>
<th>Ride Quality</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Good</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Simple Decision Matrix – Example:

<table>
<thead>
<tr>
<th>Preservation Treatment</th>
<th>Criteria</th>
<th>Chip Seal</th>
<th>Slurry Seal</th>
<th>Micro-surf.</th>
<th>Combo-seal</th>
<th>Overlay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td></td>
<td>Rural</td>
<td>Rural</td>
<td>Urban</td>
<td>Urban</td>
<td>Urban</td>
</tr>
<tr>
<td>Traffic</td>
<td>Low volume</td>
<td>High speed</td>
<td>High volume</td>
<td>High volume</td>
<td>No curing time</td>
<td></td>
</tr>
<tr>
<td>Condition</td>
<td>Raveling</td>
<td>Rutting</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance</td>
<td>Friction</td>
<td>Fill ruts</td>
<td>Friction</td>
<td>Smoothness</td>
<td>Noise</td>
<td></td>
</tr>
</tbody>
</table>
Selecting between preservation treatments

- Roadway location
- Roadway type & traffic
- Pavement condition
- Expected performance
- Duration of closure
- Cost (availability)

Benefit-Cost Analysis
- Cost of treatment
- Duration of benefits
- Level of service

Comparing Treatments

<table>
<thead>
<tr>
<th>Structural Condition</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ride Quality</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>Surface Treatment</td>
<td>$$/yr</td>
<td>Overlay</td>
</tr>
<tr>
<td>Fair</td>
<td>Mill and Overlay</td>
<td>$$/yr</td>
<td>Mill and Overlay</td>
</tr>
<tr>
<td>Poor</td>
<td>Overlay</td>
<td>$$/yr</td>
<td>Structural Overlay</td>
</tr>
</tbody>
</table>

Existing pavement performance; ('Do-Nothing')

Performance of Pavement Preservation Treatment

Target Service Condition

Target Reconstruction Condition

(A) Overall Life Extension

(B) Overall Benefit

(C) Service Life Benefit

(D) Service Life Extension

(C) Service Life Extension

2009 FHWA Survey

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Initial Cost ($/SY)</th>
<th>Expected Life (yrs)</th>
<th>Annualized Cost ($/SY)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crack Seal</td>
<td>0.32</td>
<td>2</td>
<td>0.16</td>
</tr>
<tr>
<td>Fog Seal</td>
<td>0.99</td>
<td>4</td>
<td>0.25</td>
</tr>
<tr>
<td>Chip Seal</td>
<td>1.85</td>
<td>6</td>
<td>0.31</td>
</tr>
<tr>
<td>Microsurface</td>
<td>3.79</td>
<td>6</td>
<td>0.63</td>
</tr>
<tr>
<td>Slurry Seal</td>
<td>4.11</td>
<td>5</td>
<td>0.82</td>
</tr>
<tr>
<td>Thin Overlay</td>
<td>5.37</td>
<td>13</td>
<td>0.41</td>
</tr>
</tbody>
</table>
**Annual Cost of Preservation Treatment**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Initial Cost ($/SY)</th>
<th>Expected Life (yrs)</th>
<th>Annualized Cost ($/SY/YR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chip Seal</td>
<td>1.50-2.00</td>
<td>3-7</td>
<td>0.35 NAPA</td>
</tr>
<tr>
<td>Microsurface</td>
<td>1.50-2.00</td>
<td>3-6</td>
<td>0.50 0.71</td>
</tr>
<tr>
<td>Slurry Seal</td>
<td>0.75-1.00</td>
<td>3-5</td>
<td>0.22 0.55</td>
</tr>
<tr>
<td>Thin Overlay</td>
<td>3.00-6.00</td>
<td>5-12</td>
<td>0.53 0.42</td>
</tr>
</tbody>
</table>

**References**

