Back to Basics: Pavement Preservation

2009 Purdue Road School
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grades in energy fell from a D to a D+; wastewater
Americans spend 4.2 billion hours a year stuck in traffic at a cost to the economy of $78.2 billion, or $710 per motorist. Poor conditions cost motorists $67 billion a year in repairs and operating costs. One-third of America’s major roads are in poor or mediocre condition and 45 percent of major urban highways are congested. Current spending of $70.3 billion per year for highway capital improvements is well below the estimated $186 billion needed annually to substantially improve conditions.

Overview

✓ Definitions
✓ Basic Concepts of RSL
✓ Life Cycle Cost Analysis
✓ Agency Programs
✓ Network Tools
✓ NCPP & TSP · 2
"Definition"

Pavement Preservation is Applied Asset Management

✓ Combines Engineering,
✓ Business,
✓ Economic Theory

Pavement Preservation

- Routine Maintenance
- Preventive Maintenance
- Minor Rehabilitation

- Sustainable Financing
- Long-Term Network Planning
- Cost-Effective Decision Making
- Pavement Management System
- Optimization
“Definition”

Pavement preservation is 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.

**Typical Life Extensions**

(UIDs)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Good Condition (PCI=80)</th>
<th>Fair Condition (PCI=60)</th>
<th>Poor Condition (PCI=40)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crack Fill</td>
<td>1 - 3</td>
<td>0 - 2</td>
<td>0</td>
</tr>
<tr>
<td>Crack Seal</td>
<td>1 - 5</td>
<td>0 - 3</td>
<td>0</td>
</tr>
<tr>
<td>Fog Seal</td>
<td>1 - 3</td>
<td>0 - 1</td>
<td>0</td>
</tr>
<tr>
<td>Chip Seal</td>
<td>4 - 10</td>
<td>3 - 5</td>
<td>0 - 3</td>
</tr>
<tr>
<td>Micro-Surfacing</td>
<td>4 - 8</td>
<td>3 - 5</td>
<td>1 - 4</td>
</tr>
<tr>
<td>Thin HMA</td>
<td>4 - 10</td>
<td>3 - 7</td>
<td>2 - 4</td>
</tr>
</tbody>
</table>
Life Extension

![Graph showing life extension](image)

Basic Concepts of RSL
(Remaining Service Life)
**Present Serviceability Index (PSI)**

- **Excellent**
- **Good**
- **Fair**
- **Poor**
- **Very Poor**
- **Failed**

**Remaining Service Life**

Remaining Service Life (RSL) is the estimated number of years, from a specified date, until a pavement section reaches the threshold distress index. RSL is a function of the distress level and rate of deterioration.
Remainin Service Life

- RSL = 12 years
- RSL = 9 years
- RSL = 2 years
- RSL = 4 years

Terminal Threshold

Time (Years)

0 5 10 15 20

Distress Index (DI)

0 20 40 60 80 100

Road A

RSL = 15 yrs
RSL = 30 yrs

Treatment A: 5 year life extension
Treatment B: 10 year life extension

Life Cycle Cost Analysis (LCCA)
### Life Cycle Cost Analysis

#### Traditional Alternative

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>D.I. (Before)</th>
<th>D.I. (After)</th>
<th>AGE</th>
<th>LIFE EXTEND (Years)</th>
<th>R.S.L. (Years)</th>
<th>COST (Lane-Mile)</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Construction</td>
<td>100</td>
<td>0</td>
<td>25</td>
<td></td>
<td>25</td>
<td>$508,000 $21,000</td>
<td>Construct Cost User Cost</td>
</tr>
<tr>
<td>Reconstruct</td>
<td>49</td>
<td>0</td>
<td>25</td>
<td></td>
<td>25</td>
<td>$463,000 $19,000</td>
<td>Construct Cost User Cost</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>25</td>
<td></td>
<td>25</td>
<td>$971,000 $40,000</td>
<td>Construct Cost User Cost</td>
</tr>
</tbody>
</table>

D.I. – is distress index, a measure of pavement condition. Scale values: 100=no distress, 50=when reconstruction is required.

R.S.L. – is remaining service life, the time remaining that a pavement can be preserved.

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### Life Cycle Cost Analysis

#### Traditional Alternative

**Analysis Period - 25 yr.**

- Construction = $508,000 per lane mile
- Preservation = $0 per lane mile
- (Remaining Service Life = 0 years)
- Salvage = $0 per lane mile

**Total Cost = $508,000 per lane mile**
### Life Cycle Cost Analysis

#### Preservation Alternative

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>D.I. (Before)</th>
<th>D.I. (After)</th>
<th>AGE</th>
<th>LIFE EXTEND (Years)</th>
<th>R.S.L. (Years)</th>
<th>COST (Lane-Mile)</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Construction</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>25</td>
<td>$508,000</td>
<td>$12,600</td>
</tr>
<tr>
<td>Crack Sealing</td>
<td>89</td>
<td>94</td>
<td>5</td>
<td>2</td>
<td>22</td>
<td>$5,162</td>
<td>$350</td>
</tr>
<tr>
<td>Thin Overlay</td>
<td>79</td>
<td>0</td>
<td>10</td>
<td>8</td>
<td>25</td>
<td>$40,808</td>
<td>$350</td>
</tr>
<tr>
<td>Crack Sealing</td>
<td>84</td>
<td>92</td>
<td>14</td>
<td>1</td>
<td>22</td>
<td>$5,162</td>
<td>$350</td>
</tr>
<tr>
<td>Slurry Seal</td>
<td>67</td>
<td>0</td>
<td>20</td>
<td>5</td>
<td>21</td>
<td>$16,935</td>
<td>$700</td>
</tr>
<tr>
<td>Chip Seal</td>
<td>86</td>
<td>93</td>
<td>25</td>
<td>2</td>
<td>18</td>
<td>$12,582</td>
<td>$350</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>$588,649</strong></td>
<td><strong>$23,100</strong></td>
</tr>
</tbody>
</table>

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#### Analysis Period - 25 yr.

*Construction = $508,000 per lane mile*

*Preservation = $80,649 per lane mile*

*(Remaining Service Life = 18 years)*

*Salvage = ($333,360) per lane mile*

*Total Cost = $255,289 per lane mile*