Back to Basics: Pavement Preservation

2009 Purdue Road School
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1940's 1960's

1980's Today

ROUGH ROADS AHEAD
grades injected declined, and energy fell from a D+ to a D; wastewater treatment fell from a C+ to a C.

In 2005, a report was released that found the nation's infrastructure—critical to the economy—was in poor condition. The report, "Infrastructure Report Card," assigned grades of D+ to D+ for roads, bridges, airports, transit systems, and water systems, among other categories.

In 2009, a new report was released that found that the nation's infrastructure was in even worse condition. The report, "ASCE's Infrastructure Report Card," assigned grades of D to D for roads, bridges, airports, transit systems, and water systems, among other categories.

ASCE's Infrastructure Report Card Gives Nation a D, Estimates Cost at $2.2 Trillion

(as published in the February 2009 issue of ASCE News)

In 2010, a new report was released that found that the nation's infrastructure was in even worse condition. The report, "ASCE's Infrastructure Report Card," assigned grades of D to D for roads, bridges, airports, transit systems, and water systems, among other categories.

ASCE Offers Suggestions For Economic Stimulus Plan

(as published in the March 2010 issue of ASCE News)
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

(Year)

<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

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

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.
**Remaining Service Life**

Distress Index (DI) vs. Time (Years)

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

Terminal Threshold:
- **Treatment A**: 5 year life extension
- **Treatment B**: 10 year life extension

**Road A**

Time (Years):
- 15 yrs
- 30 yrs

**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></td>
<td>25</td>
<td>25</td>
<td>$508,000</td>
<td>Construct Cost</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$21,000</td>
<td>User Cost</td>
</tr>
<tr>
<td>Reconstruct</td>
<td>49</td>
<td>0</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>$463,000</td>
<td>Construct Cost</td>
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<td></td>
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<td></td>
<td></td>
<td>$19,000</td>
<td>User Cost</td>
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<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td>25</td>
<td>25</td>
<td>$971,000</td>
<td>Construct Cost</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>$40,000</td>
<td>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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### Analysis Period - 25 yr.

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

**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>20</td>
<td>25</td>
<td>$508,000 12,600</td>
<td>Construct Cost</td>
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<tr>
<td>Crack Sealing</td>
<td>89</td>
<td>94</td>
<td>5</td>
<td>2</td>
<td>22</td>
<td>$5,162 350</td>
<td>User Cost</td>
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<tr>
<td>Thin Overlay</td>
<td>79</td>
<td>0</td>
<td>10</td>
<td>8</td>
<td>25</td>
<td>$40,808 350</td>
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<td>Crack Sealing</td>
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<td>92</td>
<td>14</td>
<td>1</td>
<td>22</td>
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<td>Slurry Seal</td>
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<td>20</td>
<td>5</td>
<td>21</td>
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<td>Chip Seal</td>
<td>86</td>
<td>93</td>
<td>25</td>
<td>2</td>
<td>18</td>
<td>$12,582 350</td>
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<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$588,649 23,100</td>
<td>Construct Cost</td>
</tr>
</tbody>
</table>

Life Cycle Cost Analysis

Preservation Alternative

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