Pavement Preservation and Thin Lift Asphalt

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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
## Current Life Extension Based on Ranges

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Reported Extended Service Life Range (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thin Overlay</td>
<td>3-23</td>
</tr>
<tr>
<td>Chip Seal</td>
<td>3-8</td>
</tr>
<tr>
<td>Microsurfacing</td>
<td>3-8</td>
</tr>
<tr>
<td>Crack Sealing</td>
<td>0-4</td>
</tr>
<tr>
<td>Mill and Resurfacing</td>
<td>4-20</td>
</tr>
<tr>
<td>Hot In-place Recycling</td>
<td>3-8</td>
</tr>
<tr>
<td>Slurry Seal</td>
<td>4-7</td>
</tr>
<tr>
<td>Fog Seal</td>
<td>4-5</td>
</tr>
<tr>
<td>Cold In-place Recycling</td>
<td>4-17</td>
</tr>
<tr>
<td>Full Depth Reclamation</td>
<td>10-20</td>
</tr>
<tr>
<td>Structural Overlay (Mill and Fill)</td>
<td>6-17</td>
</tr>
<tr>
<td>Whitetopping</td>
<td>3-17</td>
</tr>
</tbody>
</table>

FHWA-HIF-10-020, January 2010
Pavement Preservation
2012 Preservation Group Study

- Quantify life extending benefit of study treatments
  - \textit{Time/traffic to return to pretreatment condition(s)}
  - Test sections on the Track and Lee Road 159
Preservation Group Experiment

- 25 sections on local county road (Lee Road 159)
  - ≈5½” thick paved access road to quarry/asphalt plant
  - 2 control, 22 sections with treatments/combinations, 1 demonstration section
  - Pretreatment condition varied by WP and direction
- 14 sections on the NCAT Pavement Test Track
  - 7” pavements placed in the summer of 2009
  - PFC sections, DGA sections (virgin, high RAP)
  - >10 million ESALs
• Low ADT roadway
• **Very** high % trucks
• Load data provided by quarry and asphalt plant
• No traffic control needed for data collection
Lee Road 159

- Preventive maintenance
- Routine maintenance
- Minor rehabilitation
1. Rejuvenating Fog Seal
2. Fibermat Chip Seal
3. Control
4. Control
5. Crack Seal (CS)
6. Single Layer Chip Seal
7. CS + Single Layer Chip Seal
8. Triple Layer Chip Seal
9. Double Layer Chip Seal
10. Single Chip + Microsurfacing (Cape)
11. Microsurfacing
12. CS + Microsurfacing
13. Double Layer Microsurfacing
14. Fibermat Chip + Microsurfacing (Cape)
15. Scrub Seal + Microsurfacing (Cape)
16. Scrub Seal
17. Distress Demo Section
18. Fibermat Chip + HMA thinlay (Cape)
19. HMA Thinlay (PG 67-22)
20. 100% Foamed Recycle Inlay + thinlay
21. HMA Thinlay (PG 76-22)
22. Ultra Thin Bonded Wearing Course
23. HMA Thinlay (50% RAP)
24. HMA Thinlay (5% PCRAS)
25. HMA Thinlay (High Polymer)
LR 159 Testing Overview

- **Weekly**
  - Inertial Profiler (roughness, texture)
  - Visual inspections with notes/pictures

- **Monthly**
  - Video for crack mapping
  - Rut depth
  - Falling weight deflectometer (FWD)
  - Subgrade moisture readings

- **Other**
  - Locked wheel skid trailer friction
  - Ground penetrating radar (GPR)
Thin Lift Asphalt (Thinlays)

- Surface preservation
- Smaller NMAS, thinner lift thickness – lower cost
- Good rut resistance
- Impermeable surface

Selection conditions:
- Smooth pavement
- Good friction fine aggregate in mix (for high speed routes)
- Cool weather paving (thin lift)
- Modified mix design / construction criteria
Advantages of Thin Overlays

- Pavement preservation tool (no cure, no loose stone)
- Provides long service life (when placed over structurally sound pavements)
- Provides good riding surface (site dependent)
- Reduces noise (fine-graded mixes)
- Maintains grade and slope geometry
- Is recyclable
- Uses a surplus aggregate (if required quality)
2003 NCAT Test Track Cycle

- Mississippi DOT 4.75 mm mix
- ¾ in thick
- 92.2% Theoretical Density
- PG 76-22
- Aggregate
  - 69% Limestone
  - 19% Gravel
  - 12% Natural Sand
- After 30 million ESALs, 7 mm rut
2003 NCAT Test Track Cycle

- 9.5 mm mix
- 1 in thick
- 93.7% Theoretical Density
- PG 76-22
- Aggregate
  - 19% Natural Sand
- After 30 million ESALs, 5 mm rut
NCHRP Synthesis of Thin Overlays

- 9.5 and 12.5mm dense graded
- 9.5 and 12.5mm SMA
- 4.75mm dense graded and SMA
- UTBWC (ultra-thin bituminous wearing coarse)
- OGFC/PFC
PennDOT Use of Thin Overlays
Where Not To Use Thin Overlays
## Performance Measures
(Purdue Study)

<table>
<thead>
<tr>
<th>Performance Indicator</th>
<th>Roughness (IRI)</th>
<th>Condition (PCR)</th>
<th>Rut Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threshold Used</td>
<td>110 in/mi (1.74 m/km)</td>
<td>85</td>
<td>0.25 in (6 mm)</td>
</tr>
<tr>
<td>Expected Life (Yrs.)</td>
<td>7 - 10</td>
<td>7 - 11</td>
<td>8 - 11</td>
</tr>
</tbody>
</table>
Service Life

- LTPP Data (Liu, 2013)
  - 341 Thin Overlay Sections
  - 40 States, 8 Canadian Provinces
- Median life expectancy – 7 to 9.5 years
Explanations for Range in Service Life

Environmental Differences
Explanations for Range in Service Life

Construction Quality Standards - Interstate versus Secondary
Explanations for Range in Service Life

Variation in material quality
Explanations for Range in Service Life

Temporary Fix
# NCAT Pavement Preservation Study

<table>
<thead>
<tr>
<th>Section</th>
<th>18</th>
<th>19</th>
<th>20</th>
<th>21</th>
<th>22</th>
<th>23</th>
<th>24</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface</td>
<td>4.75/PG 67-22</td>
<td>4.75/PG 67-22</td>
<td>4.75/PG 76-22</td>
<td>4.75/PG 76-22</td>
<td>UTBWC</td>
<td>4.75 50% RAP</td>
<td>4.75 5% Shingles</td>
<td>4.75 PG 88-22</td>
</tr>
<tr>
<td>Subsurface</td>
<td>Fibermat</td>
<td>Existing</td>
<td>Full-Depth Reclamation</td>
<td>Existing</td>
<td>Existing</td>
<td>Existing</td>
<td>Existing</td>
<td>Existing</td>
</tr>
</tbody>
</table>
Conclusions

- Agencies need to define performance for pavement preservation
- Thin overlays routinely used as preservation tool
- Thin overlays extend life of pavements
  - Success depends on existing distresses
  - Service life generally in 7 – 11 year range
2015 Pavement Test Track Conference
March 3-5, 2015
The Hotel at Auburn University
and Dixon Conference Center
Auburn, Alabama

- WMA & High RAP/RAS/GTR Mixes
- Pavement Preservation
- Open-Graded Friction Courses
- Optimized Structural Design

Official registration information available at www.ncat.us

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Lee Road 159
Pavement Preservation Experiment to Reduce the Cost to Maintain Your Roads

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