61st Annual New Jersey Asphalt Paving Conference

Pavement Preservation

What to do and When to do it
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What to do and When to do it

Moderator: James J. Purcell, PE – New Jersey Asphalt Pavement Association

Panelists: Susan Gresavage – NJ DOT
Brett Williams – National Asphalt Pavement Association
Helene Roberts – Federal Highway Administration
Paul Pogorzelski, PE, CME – Municipal Engineer
Transportation Performance Management

- Managing pavements (and bridges) on the National Highway System
- Performance measures and targets for pavements
- Targets to be set this May; set by NJ DOT
- Each State DOT reports targets; public-facing website
- Ensures preventive maintenance and other activities are planned and programmed
- Life-cycle Approach
Asset Management

- Transportation Asset Management Plan (TAMP) – April 30
- Pavements and Bridges on National Highway System (regardless of owner)
- Life-Cycle Planning
- Financial Planning
- Risk Component
NHS in Northern New Jersey
Benefits of Programmed Approach

Comparison of lifecycle cost for three alternative maintenance strategies

- **Do-minimum Strategy** - infrequent but major interventions
- **Preventative Strategy** - regular and frequent minor interventions
- **Programmed Strategy** - regular and frequent moderate interventions

We will seek to identify a number of strategies for each asset group and determine which provides best value for money while delivering the required service.

Source: Transport Scotland
Every Day Counts: Pavement Preservation (When and Where)

- Fits with TPM and TAMP
- Moving preservation significantly forward
- Managing pavements through their whole life
- Comprehensive strategy using pavement management system

Effective Pavement Management:
“Right Road, Right Treatment, Right Time”

- Crack Seal
- Single Micro Surfacing
- Double Micro Surfacing
- Chip Seal
- Cape Seal
- Asphalt Overlay
- Mill & Asphalt Overlay
- Cold In-Place Recycling
- Full-Depth Reclamation
Every Day Counts: Pavement Preservation (How)

Improving Construction by:

- Material innovations
- Better construction practices
- Improved specifications
- Better equipment
- More emphasis on construction quality
Good = IRI < 95 and SDI > 3.5
Poor = IRI > 170 or SDI ≤ 2.4
Fair = Everything in between
Multi-Year Status of State Highway System

Source: NJDOT Pavement Management System
States with Noteworthy Preservation Strategies

Project Selection

- Time based (4-8 year window)
- Assess condition and performance
- Select specific preservation treatment based on
  - Road type
  - Condition
  - Traffic volumes
  - Other unique project characteristics
Visual Survey

- Part of a good Pavement Management System.
- Get current project-specific data
- Need to know:
  - Type of distress
  - Extent
  - Severity
- Visit the site and validate data.
Types of Distress

- Raveling
- Longitudinal Cracking (not in wheelpath)
- Longitudinal Cracking (in wheelpath)
- Transverse Cracking
- Alligator Cracking
- Rutting
Longitudinal Cracking
(not in wheelpath)
Longitudinal Cracking (wheelpath)

Temporary Fix for Minor Distress
Transverse Cracking
Alligator (Fatigue) Cracking

Temporary Fix for Minor Distress
Rutting or Shoving

Severe Structural Failure

Surface Failure – Milling Required
Preventive Maintenance: Microsurfacing
Preventive Maintenance: Microsurfacing

Process

- Mineral Filler (Cement and/or Lime) Aggregate and cement drop into pug mill
- Water and field control additive is mixed
- Emulsified asphalt is added
- Materials are mixed and deposited into a spreader box and distributed on road surface with primary and secondary strike-offs
- ALL MATERIALS ADDED AT METERED RATES DETERMINED THROUGH MACHINE CALIBRATION & ACCORDING TO MIX DESIGN
Preventive Maintenance: Chip Seal
Preventive Maintenance: Chip Seal

- Single Chip Seal
- Double Chip Seal
- Cape Seal

The Cape Seal process is when a Micro-surfacing or Slurry seal application is placed over the Chip Seal.
Preventive Maintenance - Thin Asphalt Overlays

- Milling is recommended to:
  - Remove defects
  - Roughen surface
  - Improve smoothness
- Tack
- Pave
  - Cooling can be an issue - warm mix will help
- Compact
  - Static Rollers
Cold In-Place Recycling

1. Inject asphalt emulsion stabilizing agent while milling the existing asphalt.
2. Conveyor recycled material into a modified asphalt paver.
3. Pave the recycled material to the appropriate cross-slope and elevation.
4. Pave over the recycled base course with conventional asphalt (after 7 days).
# Service Life Extension based on preservation techniques

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Service Life Extension</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Routine</strong></td>
<td></td>
</tr>
<tr>
<td>Crack Sealing</td>
<td>1 - 3 years</td>
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<tr>
<td>Micropave Joints</td>
<td>5 - 8 years</td>
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<tr>
<td><strong>Preventive</strong></td>
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<tr>
<td>Slurry Seal</td>
<td>3 - 5 years</td>
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<tr>
<td>Chip Seal</td>
<td>3 - 6 years</td>
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<tr>
<td>Micro Surfacing - Single Application</td>
<td>5 - 8 years</td>
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<tr>
<td>Micro Surfacing - Double Application</td>
<td>6 - 10 years</td>
</tr>
<tr>
<td>Cape Seal</td>
<td>6 - 10 years</td>
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<tr>
<td>Thin Overlays</td>
<td>8 - 10 years</td>
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<tr>
<td><strong>Major Rehabilitation</strong></td>
<td></td>
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<td>Cold In-Place Recycling</td>
<td>10 - 15 years</td>
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<td>Full Depth Reclamation</td>
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## Service Life Extension - Thin Asphalt Overlays

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Economics

Chou et al. (2008):
- Thin overlays on asphalt – almost always most cost effective
- Thin overlays on PCC – not as cost effective, but greater deterioration prior to overlay

2008 NAPA Survey of State Asphalt Associations

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<thead>
<tr>
<th>Treatment</th>
<th>Expected Life, yrs</th>
<th>Range</th>
<th>Cost, $/SY</th>
<th>Range</th>
<th>Annual Cost, $/lane-mile</th>
</tr>
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<tr>
<td>Chip Seal</td>
<td>4.08</td>
<td>2.5 - 5</td>
<td>2.06</td>
<td>0.50 - 4.25</td>
<td>3,554.51</td>
</tr>
<tr>
<td>Slurry Seal</td>
<td>3.25</td>
<td>2 - 4</td>
<td>1.78</td>
<td>1.00 - 2.20</td>
<td>3,855.75</td>
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<tr>
<td>Micro-surfacings</td>
<td>4.67</td>
<td>4 - 6</td>
<td>3.31</td>
<td>2.30 - 6.75</td>
<td>4,989.81</td>
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<tr>
<td>Thin Surfacing</td>
<td>10.69</td>
<td>7 - 14</td>
<td>4.52</td>
<td>2.40 - 6.75</td>
<td>2,976.69</td>
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Economics

Annual Cost of Preservation Treatment

- Chip Seal
- Slurry Seal
- Microsurfacing
- Thin Overlay

Annual Cost, $/lane-mile

Costs range from approximately $3,000 to $5,000 per lane-mile.
NJ State Highway System
Annual Preventive Maintenance Pavement Investment

Millions

Fiscal Year


$3.10 $4.00 $0.00 $2.40 $5.69 $9.24 $17.07 $53.93 $36.50 $87.16

$0 $10 $20 $30 $40 $50 $60 $70 $80 $90 $100

$100

$100

$100
Performance of Thin Asphalt Overlays

- Pavement Condition (Labi et al. (2005))
  - reduced roughness
  - decreased rut depth
  - improved condition rating

- Noise
  - Between 5 and 6.7 dB reduction on overlaid PCC
  - 3 dB reduction = $\frac{1}{2}$ traffic volume
Lessons Learned - HPTO

- Most frequently used preservation treatment.
- Performance - Rutgers preliminary performance study shows that treatment timing is critical
  - SDI < 2.4 = 5 years service life
  - SDI > 2.4 = 13 years service life
Lessons Learned - UTFC

- Aggregate shape and gradation is critical to success
- Aggregate crushing operation is critical
- Refined specification to better control gradation
Lessons Learned – Micro/Slurry

- Minimal ride quality improvement
- Most temperature sensitive
- Customer expectations
Resources

- New Jersey Asphalt Pavement Association – http://www.njapa.com
- Foundation for Pavement Preservation – http://www.fp2.org/
- National Center for Pavement Preservation – https://www.pavementpreservation.org/
- National Center for Asphalt Technology – http://eng.auburn.edu/research/centers/ncat/
Acknowledgements

- Robert Blight - NJ DOT Pavement Design
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- Dr. Nick Vitillo - Rutgers University
- The staff of Asphalt Paving Systems
- The engineering staff at NAPA
- AND
  - Your panelists
    - Helene Roberts
    - Paul Pogorzelski
    - Sue Gresavage
    - Brett Williams

Any Questions?

Thank You!