Choosing the Right Pavement Preservation Treatment

PART 2: THE DECISION PROCESS

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Treatment Selection Scenario

- Asphalt surface
- 3,000 vehicles per day
- Arterial
- Mid-Atlantic state
- Cracking, raveling

Can you identify the best treatment based on this information?
Selecting the Right Treatment

- Current conditions
- Treatment capabilities and characteristics
- Project objectives
- Other factors
Considering Current Conditions

- Low severity weathering
- Transverse cracks every 40 feet
- 0.5-inch rutting
- Occasional patching
- Some cracking in wheelpath

Now can you identify the best treatment?
Evaluating Current Conditions—Conduct a Pavement Assessment

- Identify distresses
  - Type
  - Severity
  - Extent
- Determine which distresses will control treatment performance
  - What other factors should be accounted for?
Causes of Distress

- Load
- Environment
- Materials
- Construction
- Design
- Maintenance practices
Load-Related Distresses

- Rutting
- Fatigue cracking
- Edge cracking
- Reflection cracking
- Potholes
Environmental Distresses

- Thermal or transverse cracking
- Block cracking
- Reflection cracking
- Raveling
- Weathering
Materials-Related Distresses

- Patching
- Potholes
- Polishing
- Shoving
Construction/ Design Distresses

- Bleeding
- Longitudinal/construction joint cracking
- Slippage cracking
- Raveling
- Weathering
Other Performance Considerations

- Ride or smoothness
- Friction or skid
- Noise
Where Does This Data Come From?

- Owner’s pavement management system
  - Historical data
  - Most recent survey
- Your own data collection
  - Windshield /shoulder survey
  - Evaluation using distresses identified in ASTM D6433
- Specialized surveys
Treatment Selection Process

- Treatment capabilities and characteristics
- Additional treatment selection considerations
Treatment Capabilities

- How does treatment address distress?
  - Correct
  - Cover
  - Improve
  - Slow down

- What is life of the treatment?
More Treatment Capabilities

- What is effect of treatment on pavement life?
  - No change
  - Extend (how long?)

- What additional work is needed?
  - i.e., multiple treatments
Additional Treatment Selection Considerations

- Resistance to traffic
- Construction duration
- Availability of materials
- Availability of qualified contractors
# Treatment Knowledge

## Crack Sealing and Crack Filling

<table>
<thead>
<tr>
<th>Treatment Description</th>
<th>CRACK SEALING AND CRACK FILLING</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Crack filling</strong></td>
<td>Involves the placement of an adhesive material into and/or over non-working cracks (typically longitudinal cold-joint and reflective cracks, edge cracks, and distantly spaced block cracks) at the pavement surface in order to prevent the infiltration of moisture into the pavement structure and reinforce the adjacent pavement. Crack filling operations generally entail minimal crack preparation and the use of lower quality materials.</td>
</tr>
<tr>
<td><strong>Crack sealing</strong></td>
<td>Involves the placement of an adhesive material into and/or over working cracks (i.e., those that open and close with temperature changes, such as transverse thermal and reflective cracks, diagonal cracks, and certain longitudinal reflective cracks) at the pavement surface in order to prevent the infiltration of moisture into the pavement structure. Crack sealing operations typically require good crack preparation (i.e., routing or sawing a reservoir over the crack and power cleaning the reservoir) and the placement of high-quality flexible materials (i.e., thermosetting or thermoplastic bituminous materials that soften upon heating and harden upon cooling) into and possibly over the reservoir.</td>
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</tbody>
</table>

### Conditions Addressed

- **Functional/Other**
  - Longitudinal cracking.
  - Transverse cracking.
  - Reflection cracking.
  - Minor block cracking.

- **Structural**
  - Crack sealing may be applied to structural (i.e., fatigue or reflection) cracks early in their development. While sealing provides no structural benefit, keeping moisture out of the pavement structure may slow down the progression of load-related cracking.

- **Noise**
  - Overband applications may increase pavement noise. Similarly, wide cracks contribute to a louder riding surface.

### Construction Considerations

- Material selection requirements to consider include adhesion, softening resistance, flexibility, pot life, weather resistance, and cure time.
- In deciding between hot- and cold-applied crack fillers, consider the size and types of cracks. Hot-applied crack fillers are better suited to 0.5 in wide or larger expanding cracks (large longitudinal, transverse, and reflective cracks), while cold crack fillers work better in smaller cracks less than 0.5 in wide.
- Cracks should be clean and dry. Cleaning is essential to good bond and maximum performance.
- A variety of placement configurations are used based on local experience, materials, snow plow use, anticipated subsequent treatments, and aesthetic considerations.
- Sealants and fillers should be allowed to set before being subjected to traffic.
- Sealants and fillers require curing before another treatment is applied to the surface. Emulsions usually require several days to cure, while hot-applied crack fillers take 3 to 4 months.
### Treatment Knowledge, Part 2

#### CRACK SEALING AND CRACK FILLING (continued)

<table>
<thead>
<tr>
<th>Miscellaneous Considerations</th>
<th>Cost (Relative Cost, $ to $$$$):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety: Extensive crack sealing may require blotting to maintain the pavement’s skid resistance.</td>
<td>Crack filling: $0.10 to $1.20/ft ($)</td>
</tr>
<tr>
<td>Risk: Improper installation can cause sealant or filler material to fail. Overband applications should be avoided on heavily trafficked roadways due to high tensile stresses directly above crack edges, resulting in edge separations. Overband applications are susceptible to snowplow damage.</td>
<td>Crack sealing: $0.75 to 1.50/ft ($)</td>
</tr>
<tr>
<td>Climate: Placement should take place during moderate temperatures when the pavement is dry. The manufacturer’s guidelines should be followed, but a good range of ambient temperatures is 45 to 65 °F.</td>
<td></td>
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<tr>
<td>Tracking of seal or fill material by tire action may obscure lane markings and adversely affect skid resistance. Applying a blotter coat of sand can reduce such “tracking.” There are other products and means available to reduce surface tackiness.</td>
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</tr>
<tr>
<td>There is point at which excessive cracking is better addressed by a “blanket” solution, such as a surface treatment or milling. Aesthetic considerations may limit the acceptable amount of crack sealed surface.</td>
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<tr>
<td>Rough riding surface may occur during warm months when sealant or filler material is compressed and bulges out of the crack.</td>
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<thead>
<tr>
<th>Treatment Life (years):</th>
<th>Pavement Life Extension (years):</th>
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<tbody>
<tr>
<td>Crack filling: 2 to 4</td>
<td>Crack filling: NA</td>
</tr>
<tr>
<td>Crack sealing: 3 to 8</td>
<td>Crack sealing: 2 to 5</td>
</tr>
</tbody>
</table>

**Other Remarks**

Tools to Assist Treatment Selection Process

- Decision trees
- Decision matrices
# Example Decision Matrix

## Distress Types and Severity Levels

- **L** = Low Severity
- **M** = Medium Severity
- **H** = High Severity

### Surface Distress
- Cracking
- Deformation
- Deformation
- Ravel/Wear
- Bleed/Purge
- Polish
- Segregation
- Water Bleed/Pump

### Cracking Distress
- Block
- Trans Therm
- Joint Reflect
- Long/Edge
- Wear/Stable

### Deformation Distress
- Corrug/Shove
- Bump/Sag
- Patches
- Ride Quality
- Friction
- Noise

## Preservation Treatment

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Window of Opportunity</th>
<th>Surface Distress</th>
<th>Cracking Distress</th>
<th>Deformation Distress</th>
<th>Surface Characteristics Issues</th>
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<tbody>
<tr>
<td>Crack Fill</td>
<td>75-90</td>
<td>—</td>
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<tr>
<td>Crack Seal</td>
<td>80-95</td>
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<tr>
<td>Sherry Seal (Type III)</td>
<td>70-85</td>
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<tr>
<td>Microsurfacing-Single</td>
<td>70-85</td>
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<tr>
<td>Microsurfacing-Double</td>
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<tr>
<td>Chip Seal-Single-Conventional</td>
<td>70-85</td>
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<tr>
<td>Chip Seal-Conventional Polymodified</td>
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<tr>
<td>Chip Seal-Double-Conventional</td>
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<td>Chip Seal-Polymodified</td>
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<tr>
<td>Ultra-Thin Bonded Wearing Course</td>
<td>65-85</td>
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<tr>
<td>Ultra-Thin HMAOL</td>
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<tr>
<td>Thin HMAOL</td>
<td>60-80</td>
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<tr>
<td>Cold Milling and Thin HMAOL</td>
<td>60-75</td>
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<tr>
<td>Hot In-place Recycling</td>
<td>70-85</td>
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<tr>
<td>Surf Recycled/HMAOL</td>
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<tr>
<td>Repaving</td>
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<tr>
<td>Cold In-place Recycling and HMAOL</td>
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<td>Profile Milling</td>
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<tr>
<td>Ultra-Thin Whitetopping</td>
<td>60-80</td>
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### Additional Notes
- Age, yrs
- PCI/PCR
- Remarks
- Distress Types and Severity Levels
- Wear/ Stable Rating
- Corrug/Shove
- Bump/Sag
- Patches
- Ride Quality
- Friction
- Noise

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Project Objectives

- Specific performance period
- Improve overall condition
- Address specific functional deficiency
  - Ride
  - Skid
Other Factors

- Politics
- Local preferences
- Costs
  - But which costs?

Tools are available to assess both technical inputs and other factors in the decision process.
Scenario Revisited

- Low severity weathering
- Transverse cracks every 40 feet
- 0.5-inch rutting
- 4 patches/lane mile
- < 2 percent cracking in wheelpath
- Skid Number < 35
- Need \( \geq \) 8 years of performance
- Must consider cost effectiveness

You may not know what the best treatment is yet, but you now begin to have much of the information needed to identify appropriate solutions.
Summary: Preservation Treatment
Selection as an Organized Process

1. Know your treatments
2. Know your pavements
3. Match up pavement conditions with treatment capabilities
4. Consider project objectives and other factors
5. Select “best” treatment
Questions?
Comments?

Thank you!

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Some Resources

Some More Resources

- [http://docs.lib.purdue.edu/cgi/viewcontent.cgi?article=2618&context=jtrp](http://docs.lib.purdue.edu/cgi/viewcontent.cgi?article=2618&context=jtrp)
Thanks for your Participation

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March 7-11, 2017
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