Strategic Highway Research Program 2 Project R26
Pavement Preservation on High-Traffic Volume Roadways

2009 Midwestern Pavement Preservation Partnership Conference

October 28, 2009
Schaumburg, Illinois
Presentation Overview

- Project overview
- Accomplishments
- Remaining work
- Anticipated products
- Discussion
Project Overview

- Use of pavement preservation is growing
- Use on high-traffic roads is not widely accepted and is poorly documented
- Formal guidelines being developed by many agencies do not include higher ADTs
Project Objectives

- Develop preventive maintenance guidelines for high-traffic volume roads
- Identify promising preventive maintenance strategies for high-traffic volume roads
- Recommend further research opportunities
Project Team

- Principal Investigator: David Peshkin, APTech, Inc.
- Angie Wolters/Kelly Smith/James Krstulovich, APTech, Inc.
- Jim Moulthrop/Cesar Alvarado, Fugro Consultants, Inc.
- Consultants: Gerry Eller, Gary Hicks, and Dean Testa
Research Approach: Tasks

- **Phase I**
  - Task 1: Research, survey state of practice
  - Task 2: Develop criteria to identify best practices
  - Task 3: Submit Interim Report

- **Phase II**
  - Identify factors affecting treatment use
  - Develop draft and final guidelines
  - Prepare draft and final report
Research Approach: Activities

- Literature review
- Comprehensive survey of practice
- Direct contacts with industry, other agencies
Accomplishments

- Completed literature review
- Summarized state of practice through use of survey
- Developed criteria for preservation best practices
- Completed draft guidelines
- Completed draft final report
Literature Review

- Most preservation occurs on low volume roads (with varying definitions of “low”)
- Concerns on high volume roads include durability, performance, negative public perception
- Risk is also likely a concern
Survey Results

- Sought information on
  - Defining “high”
  - Successful and potential successful treatments
  - Challenges and solutions
- Distributed to 50 SHAs, Canadian Provinces, cities, international practitioners, and industry reps
- Responses from 40 SHAs, 7 Provinces, and 3 cities, as well as industry
# HMA Treatments

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Crack Fill</td>
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<tr>
<td>2</td>
<td>Crack Seal</td>
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<tr>
<td>3</td>
<td>Cape Seal</td>
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<td>4</td>
<td>Fog Seal</td>
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<td>5</td>
<td>Scrub Seal</td>
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<td>6</td>
<td>Slurry Seal</td>
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<td>7</td>
<td>Rejuvenators</td>
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<tr>
<td>8</td>
<td>Single Course Microsurfacing</td>
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<td>9</td>
<td>Multi. Course Microsurfacing</td>
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<tr>
<td>10</td>
<td>Single Course Chip Seal</td>
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<td>11</td>
<td>Multi. Course Chip Seal</td>
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<td>12</td>
<td>Chip Seal w/ Modified Binder</td>
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<tr>
<td>13</td>
<td>Thin Bonded Wearing Course</td>
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<tr>
<td>14</td>
<td>Thin HMA Overlay</td>
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<tr>
<td>15</td>
<td>Cold Milling and HMA Overlay</td>
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<td>16</td>
<td>Ultrathin HMA Overlay</td>
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<td>17</td>
<td>Hot In-Place Recycling</td>
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<td>18</td>
<td>Cold In-Place Recycling</td>
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<tr>
<td>19</td>
<td>Profile Milling</td>
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<td>20</td>
<td>Ultrathin Whitetopping</td>
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<td>21</td>
<td>Drainage Preservation</td>
</tr>
<tr>
<td>22</td>
<td>Other</td>
</tr>
</tbody>
</table>

*Applied Pavement Technology: Providing Engineering Solutions to Improve Pavement Performance*
Treatment Use – HMA Rural

- Crack Fill
- Crack Seal
- Single Microsurfacing
- Multiple Microsurfacing

% Agencies Using Treatment

- Low (<10,000)
- Medium (10,000-19,999)
- High (>20,000)
Treatment Use – HMA Rural

% Agencies Using Treatment

Low (<10,000)  Medium (10,000-19,999)  High (>20,000)
Treatment Use – HMA Urban

% Agencies Using Treatment

Low (<10,000)  Medium (10,000-19,999)  High (>20,000)

Treatment 1 2 3 4 5 6 7 8 9 10 11

Low: 100 60 20 40 80 60 40 80 60 40 20
Medium: 80 40 20 10 80 60 40 80 60 40 20
High: 40 20 10 5 40 20 10 40 20 10 5

applied pavement TECHNOLOGY
providing engineering solutions to improve pavement performance
Treatment Use – HMA Urban

% Agencies Using Treatment

Low (<10,000)  Medium (10,000-19,999)  High (>20,000)
“High” Traffic (≥ 20,000 ADT)

Widely used HMA treatments
- Crack Seal
- Crack Fill
- Drainage Preservation

HMA treatments with limited use
- Cape seal, scrub seal, chip seals, CIR, ultra-thin whitetopping
## PCC Treatments

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>Joint Seal</td>
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<tr>
<td>2</td>
<td>Crack Seal</td>
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<tr>
<td>3</td>
<td>Diamond Grinding</td>
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<tr>
<td>4</td>
<td>Diamond Grooving</td>
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<tr>
<td>5</td>
<td>Partial-Depth Patching</td>
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<td>6</td>
<td>Full-Depth Patching</td>
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<tr>
<td>7</td>
<td>Dowel Bar Retrofit</td>
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<tr>
<td>8</td>
<td>Thin PCC Overlay</td>
</tr>
<tr>
<td>9</td>
<td>Thin Bonded Wearing Course</td>
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<td>10</td>
<td>Thin HMA Overlay</td>
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<tr>
<td>11</td>
<td>Drainage Preservation</td>
</tr>
<tr>
<td>12</td>
<td>Other</td>
</tr>
</tbody>
</table>
Treatment Use – PCC Rural

% Agencies Using Treatment

1. Joint Seal
2. Crack Seal
3. Diamond Grinding
4. Full-Depth Patching
5. Partial-Depth Patching
6. Dowel Bar
7. Retrofit
8. Drainage Preservation

Low (<10,000) | Medium (10,000-19,999) | High (>20,000)
Treatment Use – PCC Urban

% Agencies Using Treatment

Treatment

Low (<10,000) Medium (10,000-19,999) High (>20,000)
“High” Traffic ($\geq 20,000$ ADT)

Widely used PCC treatments

- Joint Seal
- Diamond Grinding
- Full-Depth Patching

PCC treatments with limited use

- Diamond grooving, thin bonded wearing course, thin HMA or PCC overlay
Decision Criteria

- Traffic levels
- Pavement condition
- Climate/environment
- Available work hours
- Expected performance
- Costs
Guidelines

- Discussion of decision criteria
- Detailed information on treatments
- Flow of decision process
- Treatment feasibility matrices
Flow of Decision Process, part 1

Evaluate Current and Historical Pavement Performance Data
(from field surveys and testing and/or agency PMS database)

- Overall Condition Indicator (PCI, PSR, etc.)
- Individual Distress Types, Severities, and Extents
- Smoothness (IRI, PI, etc.)
- Surface and Subsurface Drainage Characteristics
- Safety Characteristics
  - friction/texture (FN, MPD/MTD, IFI, etc.)
  - crashes
- Pavement–Tire Noise

Review Historical Design, Construction, and Maintenance and Rehabilitation (M&R) Data

- Pavement Type and Cross-Sectional Design
- Materials and As-Built Construction
- M&R Treatments (materials, thicknesses, etc.)

Develop Preliminary Set of Feasible Preservation Treatments
Flow of Decision Process, part 2

Develop Preliminary Set of Feasible Preservation Treatments

Assess Specific Needs and Constraints of Project

Performance Needs
- Treatment Life
- Traffic effects (functional class and/or traffic level)
- Climate/environment effects
- Risk
  - Availability of qualified contractors
  - Availability of quality materials

Construction Constraints
- Funding
- Time (of year) of construction
- Geometrics
- Work duration (facility downtime)
- Traffic accommodation

Develop Final Set of Feasible Preservation Treatments

Select the Preferred Preservation Treatment

- Conduct Cost-Effectiveness Analysis
- Benefit-Cost Analysis
- Life-Cycle Cost Analysis (LCCA)
- Evaluate Economic and Non-Economic Factors
# Example Treatment Matrix

<table>
<thead>
<tr>
<th>Preservation Treatment</th>
<th>Window of Opportunity</th>
<th>Distress Types and Severities</th>
<th>Surface Characteristics Issues</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>PCI</td>
<td>Age, yrs</td>
<td>Surface Distress</td>
</tr>
<tr>
<td>Concrete Joint Resealing</td>
<td>75-90</td>
<td>5-10</td>
<td>—</td>
</tr>
<tr>
<td>Concrete Crack Sealing</td>
<td>70-90</td>
<td>5-12</td>
<td>—</td>
</tr>
<tr>
<td>Diamond Grinding</td>
<td>70-90</td>
<td>5-12</td>
<td>•</td>
</tr>
<tr>
<td>Diamond Grooving</td>
<td>70-90</td>
<td>5-12</td>
<td>•</td>
</tr>
<tr>
<td>Partial-depth Concrete Patching</td>
<td>65-85</td>
<td>6-15</td>
<td>x</td>
</tr>
<tr>
<td>Full-depth Concrete Patching</td>
<td>65-85</td>
<td>6-15</td>
<td>x</td>
</tr>
<tr>
<td>Load Transfer Restoration</td>
<td>65-85</td>
<td>6-15</td>
<td>x</td>
</tr>
<tr>
<td>Thin Bonded Wearing Course</td>
<td>70-90</td>
<td>5-12</td>
<td>•</td>
</tr>
<tr>
<td>Thin HMA Overlay</td>
<td>70-90</td>
<td>5-12</td>
<td>•</td>
</tr>
</tbody>
</table>

- **Highly Recommended**
- **Generally Recommended**
- **Provisionally Recommended**
- **Not Recommended**

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* May be appropriate in conjunction with partial- and/or full-depth repairs to ensure smooth profile.

* Likely needed in conjunction with diamond grinding.
Current Status and Remaining Work

- Submitted Draft Guidelines and Draft Report to SHRP 2
- Awaiting feedback on Drafts
- Complete Final Report and Guidelines
Questions?
Thank You!

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