Integration of Pavement Management and Preservation

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Applied Pavement Technology, Inc. (APTech)

providing engineering solutions to improve pavement performance
So Far This Week....
What’s Coming…
Role of Pavement Management in a Preservation Program

- Assist with project and treatment selection
- Determine best project timing
- Establish program funding needs
- Build program support
- Provide accountability
Project and Treatment Selection

• Analyze pavement performance
  – Assess type of deterioration present
  – Assess extent of deterioration present

• Identify factors that lead to the selection of preventive maintenance treatments
  – Assess what can be differentiated within the pavement management system
Analyzing Pavement Performance

Selection

providing engineering solutions to improve pavement performance
Structural HMA Distress

- Load
- Plastic Deformation

Rutting

Fatigue Cracking
Functional Deterioration

• Most pavement surface distress somehow affects a pavement’s function by increasing roughness or reducing friction

Polishing

Bleeding/Flushing
Safety Enhancements

• Restored Friction Characteristics
Identifying Candidates

What information is needed to identify candidates for PM?

1. ______________________________

2. ______________________________

3. ______________________________
Treatment Selection Approaches

Easiest Approach

1. Group all preventive maintenance treatments into one or two treatments

2. Develop treatment rules, impact models, and costs for the general treatments

3. Have the districts/regions select the final treatment based on actual conditions
Sample Simple Decision Tree

Selection

PCI

Preventive Maintenance
Light to Moderate Rehabilitation
Heavy Rehabilitation
Reconstruction

AGE

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Treatment Selection Approaches

More Sophisticated Approach

1. Develop decision trees for each preventive maintenance treatment

2. Develop performance models, impact rules, and costs for each treatment in the decision tree

3. Provide treatment recommendations to the District/Regions to confirm
Recommendations

- Use existing condition information to identify candidates for preventive maintenance
- Identify the additional factors that trigger preventive maintenance treatments
- Incorporate the additional factors into your pavement management models
- Establish processes for tracking treatments
Project Timing

- Predict pavement deterioration
- Estimate when a more substantial treatment will be needed
Maximum Allowable Distress

HMA Distress Type

- Fatigue Cracking
- Linear & Block Cracking
- “Stable” Rutting
- Raveling
- Flushing/Bleeding
- Roughness
- Friction Loss
- Moisture Damage
- Shoving

Extent of Problem

- Minor
- Major

Timing
# Sample Treatment Guidelines

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<th>HMA Distresses</th>
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**Timing**

*Timing can vary depending on the severity and type of distress.*
# Treatment Guidance - IDOT

## Pavement Conditions

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<th>Crack Sealing</th>
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<th>HRR</th>
<th>Thin HMA Overlay</th>
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- **R** - Recommended treatment for the specified pavement condition. Care must be examined in making sure that all critical distress types are addressed by the selected treatment.
- **R** - Recommended treatment when used with milling prior to treatment.
- **F** - Feasible treatment but depends upon other project constraints including other existing distresses.
- **F** - This is a localized distress and should be treated locally while other distress types present should dictate choice of global treatment.
- **NR** - Treatment is not recommended to correct the specified pavement condition.
- **1** - Preservation treatments do not correct alligator cracking. Of the treatments, chip seals are most appropriate at addressing the alligator cracking.
- **2** - If stable rutting is present without other distresses, microsurfacing or mill and overlay are the recommended treatments.
- **3** - If cracking is joint reflection related, the preservation treatments will not correct the distress.
## Time-Based Schedule Example

New York State Initial Guidelines for Treatment Application Cycles

<table>
<thead>
<tr>
<th>Treatment Type</th>
<th>Appl. Cycle, yrs</th>
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<tr>
<td>PCC pavement joint and crack sealing</td>
<td>8</td>
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<td>HMA pavement crack sealing</td>
<td>4</td>
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<td>Thin HMA overlays (38 mm [1.5 in])</td>
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<td>Surface treatments of HMA pavements</td>
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<td>Surface treatments of shoulders</td>
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<td>Clean drainage</td>
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Recommendations

• Use performance models to determine the “window of opportunity”
• Establish internal guidelines on the amount of deterioration that can be addressed with preventive maintenance treatments
• Establish dedicated funding so scheduled treatments are applied on time
Program Funding

From Indiana DOT for its Interstates

Rehabilitation/ Preventive Maintenance
- $100 million/ $15 million
- $125 million/ $12.5 million
- $125 million/ $25 million

Year of analysis
Recommendations

• Use your pavement management analysis to determine the appropriate funding level for your pavement preservation program

• Link funding levels to performance targets
Program Support

- Promote concepts
- Demonstrate cost effectiveness
- Illustrate impacts with and without preventive maintenance
- Justify expenditures
Promoting Concepts

• Educating decision makers

Condition Deterioration & Treatment Triggers / Resets

Remaining Service Life (RSL) = 0

Original Pavement

Seal Coat

Thin Overlay

Structural Overlay

Reconstruction

Years / AADT (ESALs)

Condition Index

100

50

$ 1

$ 2

$ 6

$ 15

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Good Roads Cost Less (1977)

Thickness Required for 1M Additional Load Applications

**Pavement Condition**

- **Good**
- **Fair**
- **Poor**
- **Very Poor**

**Thickness (in)**

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8

Support
Program Support

The dynamic life cycle requirements of an aging infrastructure…Hamilton, Canada

providing engineering solutions to improve pavement performance
Challenge

• Does distress data allow you to measure the effectiveness of a preventive maintenance treatment?
  – Example: crack sealing
Recommendations

- Incorporate preventive maintenance treatments into the analysis
- Demonstrate benefits using strategies that resonate with decision makers
- Improve your measures of effectiveness as data become available
Accountability

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Setting Performance Targets

Percent Pavement in Good Condition

- Do Nothing
- $5M/year
- $25M/year

Plot end points versus annual budget

Time (Years)

0 1 2 3 4 5 6 7 8 9 10

Accountability

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Setting Performance Targets

Percent Pavement in Good Condition in 10 Years

- Do nothing
- $5M/year
- $25M/year

Relative Budget, $Millions/Year

Accountability

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Enhance Accountability

• Pavement Management Plans

  Background → Description of Services Provided → Description of Pavement Conditions → Description of Targeted Service Level → Program Descriptions

  Commitment to the Users → Performance Metrics → Financial Requirements and Funding Strategies
Asset Plans

Oklahoma Department of Transportation

TRANSPORTATION INVESTMENTS FOR THE FUTURE
2006 Statewide Pavement Management Report

City of Portland
Office of Transportation

Pavement Asset Management Plan

April 2006
Recommendations

• Establish the processes necessary to track preventive maintenance applications
• Prepare Pavement Asset Plans showing what funding is needed and how it will be used.
Making Improvements

• Address the core questions
• Identify factors impacting the degree to which pavement preservation is integrated in your pavement management system
• Consider creating a Pavement Preservation Engineer position
• Keep moving forward!
5 Core Questions

• What is the current state of my pavements?
• What is the required level of service?
• Which pavements are most critical to achieving our performance objectives?
• What are the best strategies for Maintenance & Operations and Capital Improvement investments?
• What is the best long-term funding strategy?
Moving Forward

Identify Your Needs

Develop A Plan For Addressing Gaps

Identify Any Gaps

Determine What’s Available

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Addressing Data Issues

- Accessibility
- Integration
Addressing Institutional Issues

- Resistance to change
- Disconnected decisions
Resources Available

• NHI 131116: Pavement Management: Characteristics of an Effective Program
  – Free to state highway agencies
  – 1 day
  – Conducted by FHWA
  – [www.nhi.fhwa.dot.gov](http://www.nhi.fhwa.dot.gov) (In the training catalog)

• Final Report from the First Pavement Management Peer Exchange
  • [http://www.fhwa.dot.gov/pavement/pub_details.cfm?id=600](http://www.fhwa.dot.gov/pavement/pub_details.cfm?id=600)
Useful Resources - Websites

• FHWA Pavement Preservation website: www.fhwa.dot.gov/preservation

• FHWA Office of Asset Management: www.fhwa.dot.gov/infrastructure/asstmgmt
It’s Time

• Pavement management should be designed to support an agency’s decision processes
• Today, that means more than ever before with the increased demands associated with:
  – Pavement preservation
  – MEPDG calibration
  – HPMS changes
  – Accountability requirements
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