PAVEMENT PRESERVATION TREATMENTS & LIFE CYCLE COST EVALUATION

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• Pavement Treatment Scenario

• Review Life Cycle Costs of Various PM Treatments

• Resources

• Questions
I received this drawing in an email from a County Engineer:
Background:
- 25 year old pavement
  - oxidized surface
  - High severity transverse cracking
  - cupped cracks (¾”-1” deep x 12”-18” wide)
- AADT ≈ 300 and serves local grain elevator
- Pavement strength is sufficient
- County is planning a 2” overlay

What to do?
Options:

- Do nothing and overlay
- Tack and fill (level) cupped cracks with fine HMA mix
- Fill (level) with void filler (Mastic)
- Mill and overlay with HMA
- Micromill and place a thin surface treatment
How is the “Best Option” evaluated & selected?

- Past practice/experience
  DWHAD - Do what we have always done
- Try something new and observe
- Ask others
- Life Cycle Cost Analysis - LCCA
Life Cycle Cost Analysis for PM Treatments

• Calculate treatment cost
• Understand the treatment life expectancy
• Assess the treatment’s annualized Life Cycle Cost

(Looking at total cost doesn’t always give true picture)

**Annualized Treatment LCCA**

*Treatment Cost ÷ Life Expectancy (years)*
Let’s evaluate the Life Cycle Cost for the Pavement Preservation Treatments in this situation.
A per mile cost is being used to more easily compare annualized life cycle costs between treatments.

Treatment Life Cycle (expectancy) defined:
*When pavement distresses (cracking, rutting, ride, etc.) have reached a level requiring action. Not necessarily that the treatment itself has failed.*
Do nothing and overlay

- No crack repair cost
- Reflective cracking and cupped cracks will return
- Expect initial fair ride improvement, but this will decline more quickly than the other options.
- Expected treatment life of 8 years
- Overlay cost (2” thick by 24’ wide at $60/ton) = $93,000/mile
- Life cycle cost = $93,000/mile/8 years = $11,625/mile/year
Tack and fill with fine gradation HMA mix and overlay

• Crack repair cost ≈ $6,000/mile (materials & labor)
• Reflective cracking will return
• Expect fair ride improvement
• Expected treatment life of 10 years
• Overlay cost (2” thick by 24’ wide at $60/ton) = $93,000/mile
• Life cycle cost = $99,000/mile/10 years = $9,900/mile/year
Fill with Mastic and overlay

- Crack repair cost ≈ $7,000/mile ($4,000 + labor/mile)
- Reflective cracking will return
- Expect fair ride improvement
- Expected treatment life of 10 years
- Overlay cost (2” by 24’ wide at $60/ton) = $93,000/mile
- Life cycle cost = $100,000/mile/10 years = $10,000/mile/year
Mill and overlay

- Traditional milling cost (2” @ $0.95 SY) ≈ $16,000/mile
- Reflective cracking will return
- Expect excellent ride improvement
- Expected treatment life of 10 years
- Overlay cost (2” by 24’ wide at $60/ton) = $93,000/mile
- Life cycle cost = $109,000/mile/10 years = $10,900/mile/year
Other Options: Thin Surface Treatments

• Chip Seal
• Slurry Seal
• Micro-surfacing
• Thinlay (≤ 1” thick)
• UTBWC (³⁄₈”-¾” thick)
Not all Thin Surface Treatments improve ride quality

Combine with Micromilling

RVD = 3/8” (8mm)

RVD = 1/8” (3-4mm)
What is Pavement Micromilling?

Micromilling vs traditional milling:

• **Ideal for removing ≈ 1” of pavement.**

  ![Traditional Milling Head](image)
  Teeth spaced about 0.625 inches apart

  ![Micromilling Head](image)
  Teeth spaced 0.200 inches apart

• **Micromilling head has 3 times the number of milling teeth or points.**
• **Tighter lacing pattern = smoother finished surface.**
Micromill and chip seal

- Micromilling cost ($1.00/SY = $17,080/mile)
- Expect excellent ride improvement
- Expected treatment life of 8 years
- Chip seal cost = $25,000/mile
- Life cycle cost = $42,080/mile/8 years ≈ $5,250/mile/year
Micromill and micro-surfacing

- Micromilling cost ($1.00 SY) = $17,080/mile
- Expect excellent ride improvement
- Expected treatment life of 8 years
- Micro-surfacing cost (2 lifts @ $5.75 SY) = $40,500/mile
- Life cycle cost = $98,080/mile/8 years = $12,260/mile/year
- LCC based on 10 year life = $9,800/mile/year
**Micromill and thinlay overlay**

- Micromilling cost ($1.00) = $17,080/mile
- Expect excellent ride improvement
- Expected treatment life of 8 years
- Thinlay cost (1” by 24’ wide at $75/ton) = $60,000/mile
- Life cycle cost = $67,080/mile/8 years = $8,400/mile/year
Micromill and UTBWC

- Micromilling cost ($1.00 = $17,080/mile)
- Expect excellent ride improvement
- Expected treatment life of 12 years
- UTBWC cost (½” by 24’ wide at $120/ton) = $63,400/mile
- Life cycle cost = $80,480/mile/12 years = $6,700/mile/year
Let’s Summerize
## Life Cycle Cost Analysis

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Initial Cost/Mile</th>
<th>Expected Treatment Life</th>
<th>Annualized Cost/Mile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do nothing and overlay</td>
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<td>8 Years</td>
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To get the most out of your Pavement Preservation budget you should be looking at Life Cycle costs!
Two questions drive pavement management

• What is the best treatment for this pavement now?
• What combinations of treatments over time will maximize the life of this pavement?

Today’s presentation focused on the first question.
Your challenge is to address the second question.
Costs less to keep a pavement in **GOOD** condition
RESOURCES:

• MnDOT Pavement Preservation Manual
• MnDOT Maintenance Manual – Chapter 3: Smooth Roads
• PPRA – Pavement Preservation & Recycling Alliance

www.roadresource.org
Optimizing Your Network

How to Guide

Calculators

- **Life Cycle Cost**
- **Equivalent Annualized Cost**
- **Remaining Service Life**
- **Cost Benefit Value**
THANK YOU!

Questions?

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