Cold In Place Recycling Project Selection

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Why Select Cold In Place Recycling?

Improve serviceability of aged, deteriorated pavements
Reduce raw material costs
Level deformations & re-establish crown
Retain overhead clearances and geometric design criteria.

Montana
Why Select Cold In Place Recycling?

Minimize lane closure time and user delays
Public acceptance of recycling
Recycled pavement can be recycled itself
Reduce Life Cycle Costs
Where?

- **Rural Roads**

  - Iowa

- **Interstate Highways**

  - California

  - Colorado

- **City Streets**
<table>
<thead>
<tr>
<th>Pavement conditions</th>
<th>CIR</th>
<th>Pavement conditions</th>
<th>CIR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic</td>
<td>✓</td>
<td>Stripping</td>
<td>?</td>
</tr>
<tr>
<td>Ruts</td>
<td>✓</td>
<td>Texture - Rough</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>?</td>
<td>Ride - Poor</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>?</td>
<td>Poor Drainage</td>
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<tr>
<td>Crack</td>
<td>?</td>
<td>Snow Plow Use</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>✓</td>
<td>Low Skid Resistance</td>
<td>✓</td>
</tr>
<tr>
<td>Surface</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>✓</td>
<td>Other Criteria</td>
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</tr>
<tr>
<td></td>
<td>✓</td>
<td>Rural</td>
<td>✓</td>
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<tr>
<td></td>
<td>✓</td>
<td>Urban</td>
<td>?</td>
</tr>
<tr>
<td>Raveling</td>
<td>✓</td>
<td>Low Life Cycle Cost</td>
<td>✓</td>
</tr>
<tr>
<td>Potholes</td>
<td>✓</td>
<td>High User-Delay $</td>
<td>✓</td>
</tr>
</tbody>
</table>

=? = depends on the cause of the distress

For distress identification, consult SHRP P338
When to Recycle?

Pavement at end of design life
- Fatigue (alligator) cracking

Oxidized

Raveling of thermal cracks - potholes

Low clearances under bridges and geometric issues.
Pavement Distresses

- Thermal Cracking
- Fatigue Cracking
- Dry, Raveled
- Poor Rideability

Solution – CIR
Distressed Pavements Not for ReFlex Emulsion CIR

Avoid base problems!

- Poor Drainage
- Poor Base
- Stripping
Engineered System

Defined sampling procedure

• Millings sampled from Job Site
  • Mill to the depth of proposed recycle
  • Ensure that millings are of expected gradation.

• Coring
  • Select a sample pattern that will generate representative materials.

Goal is to collect enough materials for design, to determine the thickness and recycling depth and to test subgrade as needed.
Coring Considerations

Highways or Airports
D - 1 mile maximum
L – 0.5 mile maximum
At least 15% of the cores should be in the shoulder if the shoulder is getting recycled.
At least 25% of the cores should be on or within 3 feet of centerline.

Arterial and Industrial Streets
D - 2,000 feet maximum
L – 1,000 feet maximum
At least 25% of the cores should be in the shoulder if it is getting recycled or within 3-feet of gutter.
At least 25% of the cores should be on or within 3-feet of centerline.

Residential Sites
Streets less than 250 feet long one core
Streets 250 to 500 feet long two cores. One within 3-feet of gutter the other within 3-feet of centerline.
Streets over 500 feet long three cores. One within 3-feet of gutter, one within 3-feet of centerline the other between the two.
Initial Construction & Life Cycle Costs

<table>
<thead>
<tr>
<th>Method</th>
<th>Initial Cost ($0)</th>
<th>15-yr LCC ($0)</th>
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</thead>
<tbody>
<tr>
<td>ReFlex System</td>
<td>SN=1.07</td>
<td></td>
</tr>
<tr>
<td>Mill &amp; Fill</td>
<td>SN=0.40</td>
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<tr>
<td>Thin HMA Overlay</td>
<td>SN=1.06</td>
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<tr>
<td>Mill &amp; Overlay</td>
<td>SN=1.08</td>
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</tbody>
</table>

SN = increase in structural number

5.5 mi project, 15 year LCC analysis, 7% interest rate, 3% inflation, 4% discount rate Data from Tazewell County
MEPDG Curves for Reflex (Kansas Projects)
How do I select my project appropriately?

- Take into consideration **Location** and **Geometric Constraints**
- Take into consideration **Design Life** and **Traffic Data**
- Perform **Distress Analysis**.
- Look at **Funding** availability
- Consider **Environmental** and green paving aspects
- Study the impact of **user delays** and traffic control on the project
- Do you homework on **Site Assessment**
- Perform **Life Cycle Cost Analysis** using the findings from above

**Cash In On the Savings!**
Thank you.

Questions?