IN-PLACE COLD RECYCLING
30 + YEARS
PENNDOT DISTRICT 1-0

Jeff Oswalt, P.E., PennDot District 1-0 Pavement Mgt Engineer
DISTRICT 1-0 COLD RECYLING

445 Miles In-Place Cold Recycling

YEAR


MILES

0.0 5.0 10.0 15.0 20.0 25.0 30.0 35.0 40.0
SECTION 341 – COLD RECYCLED BITUMINOUS BASE COURSE, COLD-IN-PLACE, 3” DEPTH

- Utilizes On-Grade Processing of Material.
- Structural Strength increases as mix cures.
- Application of Traffic provides additional compaction to CRBC.
- High Void Content
  - CRBC must be Seal Coated or Overlayed.
BENEFITS

- In-Place Cold Recycling Very Effective in Reducing/Eliminating Reflective Cracking.
- High Production (Approximately 2 lane miles per day).
- Economical. (Eliminates Hauling of RAP Material).
- Reduced Emissions (Environmentally Friendly).
## Reflective Cracking
### In-Place Cold Recycling vs. Control Section

<table>
<thead>
<tr>
<th>COUNTY</th>
<th>PROJECT</th>
<th>Control/CIR #Cracks/Mile Ratio</th>
<th>Control/CIR Linear Ft/Mile Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRAWFORD</td>
<td>SR 77-07M</td>
<td>1.8</td>
<td>1.9</td>
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<tr>
<td>ERIE</td>
<td>SR 20-04M</td>
<td>1.6</td>
<td>1.1</td>
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<tr>
<td>ERIE</td>
<td>SR 3006-02M</td>
<td>2.7</td>
<td>3.1</td>
</tr>
<tr>
<td>MERCER</td>
<td>SR 62-05M</td>
<td>3.7</td>
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<td>MERCER</td>
<td>SR 18-04M</td>
<td>1.3</td>
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<tr>
<td><strong>AVERAGE</strong></td>
<td></td>
<td>2.2</td>
<td>2.9</td>
</tr>
</tbody>
</table>

Dennis A. Morian, P.E. Quality Engineering Solutions, Inc.
DISTRICT 1 PRACTICES

- 3” vs. 4” depth
  - Compaction and Curing issues experienced with 4” depth.

- Virgin Aggregate Not Utilized
  - Raveling Issues/Increased Project Cost
  - No. 57s Increase Final Grade of Pavement
  - Increased Emulsion Quantities
  - Additional Scratch/Leveling Quantities on Shoulders
  - Drive Adjustments Require More Material
BEST PRACTICES

- District 1 - Seasonal Restrictions September 1 through May 15. Warmer Temperatures Aid in Compaction and Curing.

- “Boxing In” Cold Recycled Mat with Existing/New Shoulders.

- Polymer Modified Emulsion
  - Use Polymer Modification - High Truck Traffic.
PROJECT SELECTION

- Project selection is an important factor in assuring the success of cold recycling.
  - Requires evaluation of existing pavement conditions.
    - Candidate projects should be structurally sound with good drainage.
  - Pavement Coring and Analysis
    - Existing pavement should have adequate depth for cold recycling.
Traffic Analysis
- Truck Percentage and ADT

Utilities
- Manholes, valves, drainage inlets

Good candidates include Composite Pavement and Full-Depth Bituminous Pavements exhibiting Thermal Cracking, Reflective Cracking, Block Cracking and Miscellaneous Cracking.
Composite Pavement Sections
Traffic – Pub 242 ADT Criteria

- 1,000 and less. Provide a surface treatment (double application) as a minimum for wearing surface.
- 1,001 to 3,000. Provide a hot mix or cold mix wearing course.
- 3,001 to 10,000. Provide a hot mix wearing course.
- More than 15,000. Do not Recycle.
- Projects carrying significant heavy truck traffic (i.e. 200 or more daily ESALs) should not be selected for cold recycling.
SR 62-05M CONTROL SECTION
(9 YR OLD at Time of Photo)
SR 62-05M RECYCLED PAVEMENT
(9 YR OLD at Time of Photo)
Recycled Roadway
(Uncompacted Mat)
Recycled Roadway
(Compacted Mat)
FINISHED PRODUCT
Summary

- Study of Control Sections (Conventional Mill and Overlay or Level and Overlay) vs. Cold Recycling.
  - Cold Recycled Sections exhibited almost 3 times less Reflective Cracking (LF) than adjacent control sections.
  - Increase in roughness higher in Control Sections than Cold Recycled Section.
- Backcalculated Cold Recycled Pavement Modulus comparable to Typical Plant Mixed HMA (250,000 – 450,000 psi.)
- On average, Cold Recycling extends Project Service Life an approximately 4 years compared to Conventional Overlay Treatments.
QUESTIONS?