Cold-In-Place Recycling (CIR) in Nevada

National Pavement Preservation Conference
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Nashville, TN

Anita Bush, PE, CPM
Chief Maintenance and Asset Management Engineer
Outline

• Overview of the Pavement Preservation Program at NDOT
• What is the definition of CIR (NV Specs)?
• Why should an agency use CIR?
• How do you select a project for CIR?
• How do you construct a successful project?
• What is the short-term & long-term performance of CIR?
• What are the costs?
• Conclusions and Recommendations
Centerline miles of rural highway = 4,782
Centerline miles of urban highway = 618

Source: U. S. Census Bureau
Census 2000 Summary File 1
population by census tract.
Overview of the Pavement Preservation Program at NDOT

• Nevada was the fastest growing state in the country for the past two decades. As such there is a high demand for capacity improvements!
• Nevada is the hardest hit state by the recession.
• Despite a significant cost increase in highway construction, the level of funding for pavement preservation has not increased since 1990.
Overview of the Pavement Preservation Program at NDOT

- NDOT has some of the smoothest roads in the country based on the FHWA’s Highway Performance Monitoring System (HPMS).
- 19th Annual Highway Report

<table>
<thead>
<tr>
<th>Performance by Category in 2008</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural Interstate Condition</td>
<td>1</td>
</tr>
<tr>
<td>Rural Other Princ. Art. Condition</td>
<td>20</td>
</tr>
<tr>
<td>Urban Interstate Condition</td>
<td>20</td>
</tr>
</tbody>
</table>
# Roadway Categories

<table>
<thead>
<tr>
<th>Category</th>
<th>ADT &amp; Truck Traffic</th>
<th>% of System</th>
<th>Projected Deterioration Rate (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Controlled Access</td>
<td>19</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>ESAL &gt; 540 OR ADT &gt; 10,000</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>540&gt;=ESAL&gt;405 OR 1,600&lt;ADT&lt;=10,000 &amp; NHS</td>
<td>21</td>
<td>12</td>
</tr>
<tr>
<td>4</td>
<td>405&gt;=ESAL&gt;270 OR 400&lt;ADT&lt;=1,600</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>5</td>
<td>ADT&lt;=400</td>
<td>25</td>
<td>20</td>
</tr>
</tbody>
</table>
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Definition of CIR
(Nevada Specifications)

• Utilizing a CIR train to:
  – Mill the existing plantmix to a depth of to 3"
  – Crush the millings to < 1.5
  – Mix the millings with and emulsion (CMS-2S or Engineered Emulsion)
  – Lime slurry mandatory w/ CMS-2S
  – Use the paver to place the millings
Definition of CIR (Nevada Specifications)

- Compact the material after the emulsion breaks (1 to 2 hours)
- Seal and sand blotter the mat and open to traffic (prefer traffic to help compaction on low volume roads)
- AADT<5000, No overlay, Double chip seal wearing surface
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The Message

- We must utilize the existing pavement structural section to meet the engineering and economical challenges of pavement rehabilitation:
  - Limited funding for pavement preservation
  - In the past decade the cost of plantmix has tripled (-)
  - Lack of quality aggregates
  - Stringent environmental regulations
The Message

CIR is a cost effective preservation treatment that Nevada had been using for 30 years.
Facts About CIR
Cold-In-Place Recycling Projects 1982-2012

• Total Cold-in-Place Recycling with PBS 950.197 cl. miles
• Total Cold-in-Place Recycling Seals Only 344.854 cl. miles
• Total Cold-in-Place 1295.051 cl. miles (24% of total system)
Facts About CIR

• NDOT successfully CIR over 3421 lane miles of roadway ranging from
  – IR080 – 3700 daily ESALs
  – SR892 – 4 daily ESALs
CIR Train US095A
CIR Train SR659 (McCarran Blvd.)
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How Do You Select a CIR?

Condition Survey

Core or Depth Check

FWD on Project with Questionable Structural Section

Determine Cause of Pavement Distress

Functional Distress

Structural Distress

Preservation

CIR and Wearing Surface

FDR and Overlay

2012 NATIONAL PAVEMENT PRESERVATION CONFERENCE

ROAD TRIP: DRIVING THE MESSAGE FOR CHANGE
Project Selection Criteria

• CIR
  –> 3” of plantmix on 80% of the cores
  –< 15% of the pavement is experiencing load related distress
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How do you Construct a Successful Project?

• Develop a check list of critical items

• The CIR Contractor is responsible for correcting any damage, raveling, or areas of non-uniform mixture at their own expense

• Use experienced individuals
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Short-Term Performance of CIR

- Short term performance (less than 10 years)
  - With lime slurry we’ve had excellent performance
  - With using engineered emulsion we’ve had mixed performance
CIR Cores

PBS

CIR
Long-Term Performance of CIR

• Long term performance (10-20 years)

  – With lime slurry we’ve had excellent performance

  – Minor stripping in harsh climates when lime slurry is **NOT** used
Long-Term Performance of CIR

- Long term performance (10-20 years)
  - Have re-recycled 73 cl. miles
  - Average age at time of 2\textsuperscript{nd} treatment is 16 years
  - Minor stripping in harsh climates when lime slurry is NOT used
Long-Term Performance of CIR (SR208 – 2nd CIR -4yr. old)
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Cost Comparison Among Various Treatment Alternatives (per centerline mile)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Cost (K)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2” Mill</td>
<td>$90</td>
</tr>
<tr>
<td>3&quot; CIR</td>
<td>$100</td>
</tr>
<tr>
<td>2&quot; Overlay</td>
<td>$136</td>
</tr>
<tr>
<td>2” Overlay w/ 3/4” O.G</td>
<td>$200</td>
</tr>
<tr>
<td>2” Overlay w/ single (3/8”) Chip</td>
<td>$160</td>
</tr>
<tr>
<td>3” CIR w/ double Chip</td>
<td>$150</td>
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Recommendations

• All agencies should consider utilizing CIR in their Pavement Preservation Program

• Start slowly and keep pushing the envelope
Recommendations

• Get the contractors involved at an early stage

• Require the contractors to accept responsibility for their work

• Continue improving the process
CIR Allows You to Do More With Less
QUESTIONS?

Anita Bush
775.888.7856
abush@dot.state.nv.us