Cold In-Place Recycling

DAN SCHELLHAMMER, P.E.
Founded in 1984 by our CEO, Tom Johnson
In 1991, Midstate brought the first reclaimer into the state of Minnesota
Emphasis on asphalt recycling techniques (milling, reclaiming, SFDR, CIR, CCPR), soil stabilization, and heavy haul trucking
Focus on technologies that do more, with less, and extend the life of pavement systems
ARRA member since 1994.
Offices in Lakeville, MN and Spearfish, SD with a satellite office in Tioga, ND.
Perform work throughout the Midwest.
Overview

- Cold Mix (It is NOT Hot Mix)
- CIR Process
- Additives
- Economics
- Right Tool, Right Time, Right Place
- Best Practices: Project Selection and Construction
- Success and Failure
Cold Mix
-It’s NOT hot mix!

Looks black and smooth.

Coarse graded and sensitive.
Multi-Unit Cold In-Place Recycling Train
Water Tanker
Full Lane Width Mill
Crusher – Pug Mill
Pup (Oil Tanker)
Pick-Up Machine with Paver
Double Steel Drum Roller
Rubber Tire Roller
Single Unit Train

Photo Credit: Dunn Company
Single Unit Train

Photo Credit: Dunn Company
Cold Central Plant Recycling (CCPR)
Photo Credit: Coughlin Companies
Additives

- Emulsion, 3% by Weight
  - Types: CSS-1H (IA/MN), HFMS-2S (IA/MN), Engineered (MN/IL)

- PG Graded Binder (Foam), 2% by Weight
  - Types: PG 49-34 (MN), PG 52-34 (IA/NE), PG 58-28 (NE), PG 64-22 (NE)

- Modify Cold Mix Performance by Adding Other Materials
  - Portland Cement
  - Quicklime/Hydrated Lime
  - Lime Slurry
  - Add Rock
Costs

- Many Scenarios, Many Options to Consider
- Attempt to Level the Playing Field

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<thead>
<tr>
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<th>Base HMA</th>
<th>CIR</th>
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<tbody>
<tr>
<td>MnDOT GE Factor</td>
<td>2.25</td>
<td>1.50</td>
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<tr>
<td>NCAT Structural Coefficients</td>
<td>0.44</td>
<td>0.40</td>
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Costs – Base Course HMA vs. CIR Cold Mix

- Price of Installed Base Course HMA (Aggregate, Oil, Trucking, Placement, Traffic Control, QC, Temp Striping) by the TN

- Price of CIR (Aggregate, Oil, Trucking, Placement, Traffic Control, QC, Temp Striping) by the TN

- To the Spreadsheet We Go
Right Tool, Right Place, Right Time

- Save Money
- Save Time
- Extend the Life of Pavement
- Reduce Maintenance Costs
- Improve Ride
- Reduce Carbon Emissions
- Recycle and Re-Use
Best Practices: Project Selection and Construction
Project Selection

- Structurally Sound
- Stable Subgrade
- Well Drained (No Cattails in the Ditch)
Project Selection
Project Selection
Accurate Pavement Assessment

- Cores
- GPR
- Construction Records (chip seals, fabric, old asphalt mix design)
- Mix Design (medium/coarse gradation, 75 degree and 110 degree RAP)
Mix Design Tools
Photo Credit: American Engineering and Testing (AET)

- Gyratory Compactor
- IDT
- Wirtgen Foaming Machine
- Proctor
- Gradation
- Lab Crusher
- Experienced Lab
Depth of CIR

- 3 to 4 inches is the Sweet Spot, 5 inch max
- Less than 3 inches, Resistance to Reflective Cracking is Reduced
- 4 to 5 inches Increases the Size of the Windrow
- SFDR should be considered when going over 5 inches (Economy and Compaction)
Roadway Widening

- Safer Roadway
- Small Expense of Additional Oil
- Need clean shoulder and have adequate clear space for widenings
Profile and Cross Slope Corrections

- Condition of Existing Roadway
- Percent Improvement (Profile)
- 0.5% Cross Slope Corrections
- Alternatives
  - Wedge/Level with HMA
  - Profile Mill (3D Milling)
  - Consider use of other pavement rehab technique
Traffic Control

- Roads that are Closed and Only Open to Local Traffic are Safest
- Manage Time Lapse of Traffic on Fresh Mat
- Work Zone 2 Miles or Less
- Train Moves Against Traffic to Prevent Vehicles from Being Parked on New CIR Mat
- Pilot Car and Flaggers Needed if the Road Remains Open to Traffic
- Keep your Head on a Swivel
Dimensional Restrictions

Height and Width

- Overhead Power, Trees, Bridges, etc.
- Mailboxes
- Guardrail (horizontal and vertical)
- Ditch Slopes
- Level Up Shoulders
Load Restrictions

Weight of Mill

Posted Weight Limits
Patches

- A Great Way to Repair Isolated Subgrade Issues
- Hot Mix patches are preferred

Concrete Patches

Recycling Concrete Patches
Quality Control

- Establish a Roll Pattern
- Perform Gradations and Compare Field RAP Size to Mix Design RAP Size
- Nuke Gauge
- Timely Reporting of Test Results
- Foaming Characteristics
- Monitor Moisture of the CIR Layer to Ensure Cure Prior to Surface Treatment
- Enforce Specifications
- Allow Input from Experienced Contractors
Ambient Temperature and Sunlight

Temperature and Sunlight Effect:

- Oil Incorporation Rate
- Cure
- Mid Day Changes
- Break of the Windrow
- Cold Mix Work Time
Curing of the Cold Mix

- Rolling Traffic is our Friend
- Self Healing
- Stop Signs
- Frequent Turning can Tear the Mat
- Limit Haul Routes
- Hot, Sunny Days will Accelerate Cure
- When the Water is Out, Cover It Up
- Do NOT Apply a Surface Treatment on a Mat that has not Cured Out
CIR Safety

- Traffic
- Extremely Hot Oil (Foam)
- Respect the Equipment
- Have a Spill Plan
Unique Applications

- Interstate
  - I-680 in Iowa outside of Council Bluffs, IA
- Airports
  - Bemidji, Fairmont
- CIR over Concrete
  - Throughout Iowa
- Suburban/Urban Areas
- Shoulders
  - Interstate
Dana, Iowa
The Reason Iowa has a Robust CIR Program
Rest of the Story

- Cost Savings
  - Roadway Maintenance
  - Smoother Ride
- Shorter Construction Durations than a Reconstruct
  - Safer for Traveling Public and Construction Workers
- Green
  - Recycle 100% of the Roadway
  - Reduced Environmental Impact (Mining of Virgin Aggregate and Lower CO2 Footprint)
Questions?

Dan Schellhammer, P.E.
Midstate Reclamation and Trucking
21955 Grenada Avenue
Lakeville, MN 55044
Email: dans@midstatecompanies.com
Office: 952-985-5555
Mobile: 612-490-3835