Cold In-Place Recycling

DAN SCHELLHAMMER, P.E.

MIDSTATE RECLAMATION & TRUCKING
WHERE CUTTING EDGE IS COMMONPLACE

- 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


Pick-Up Machine with Paver
Oil Tanker "Pup"
Crusher/Pug Mill
Full Lane Width Mill
Water Tanker

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

	Base HMA	CIR
MnDOT GE Factor	2.25	1.50
NCAT Structural Coefficients	0.44	0.40

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

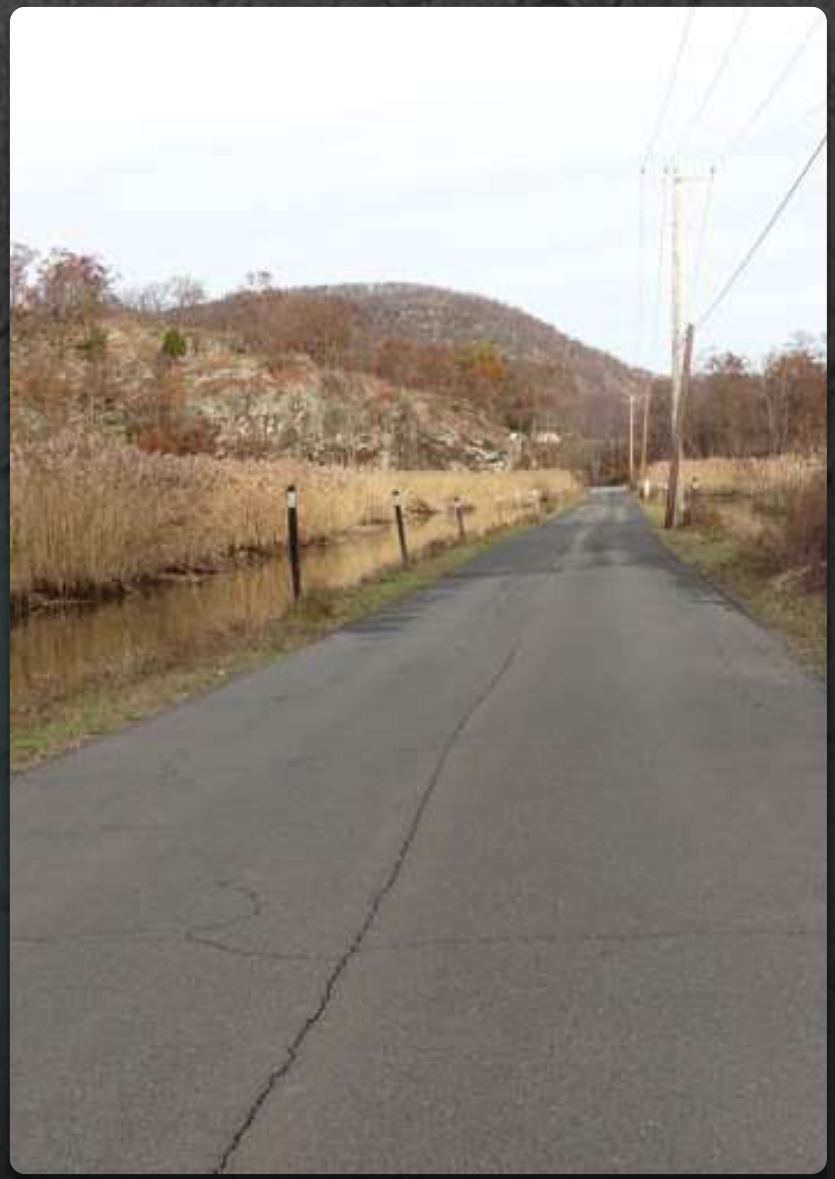
Reduce Maintenance Costs

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

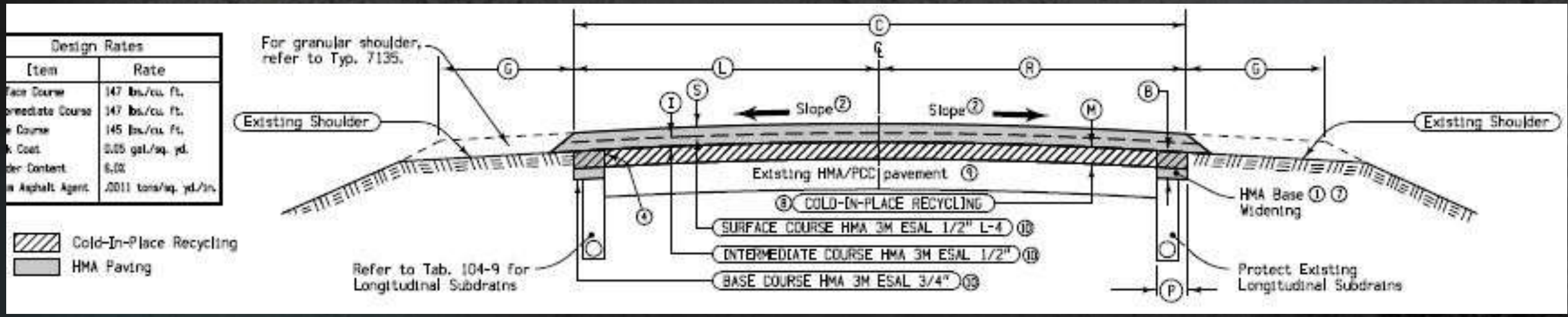
-Lab Crusher

-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

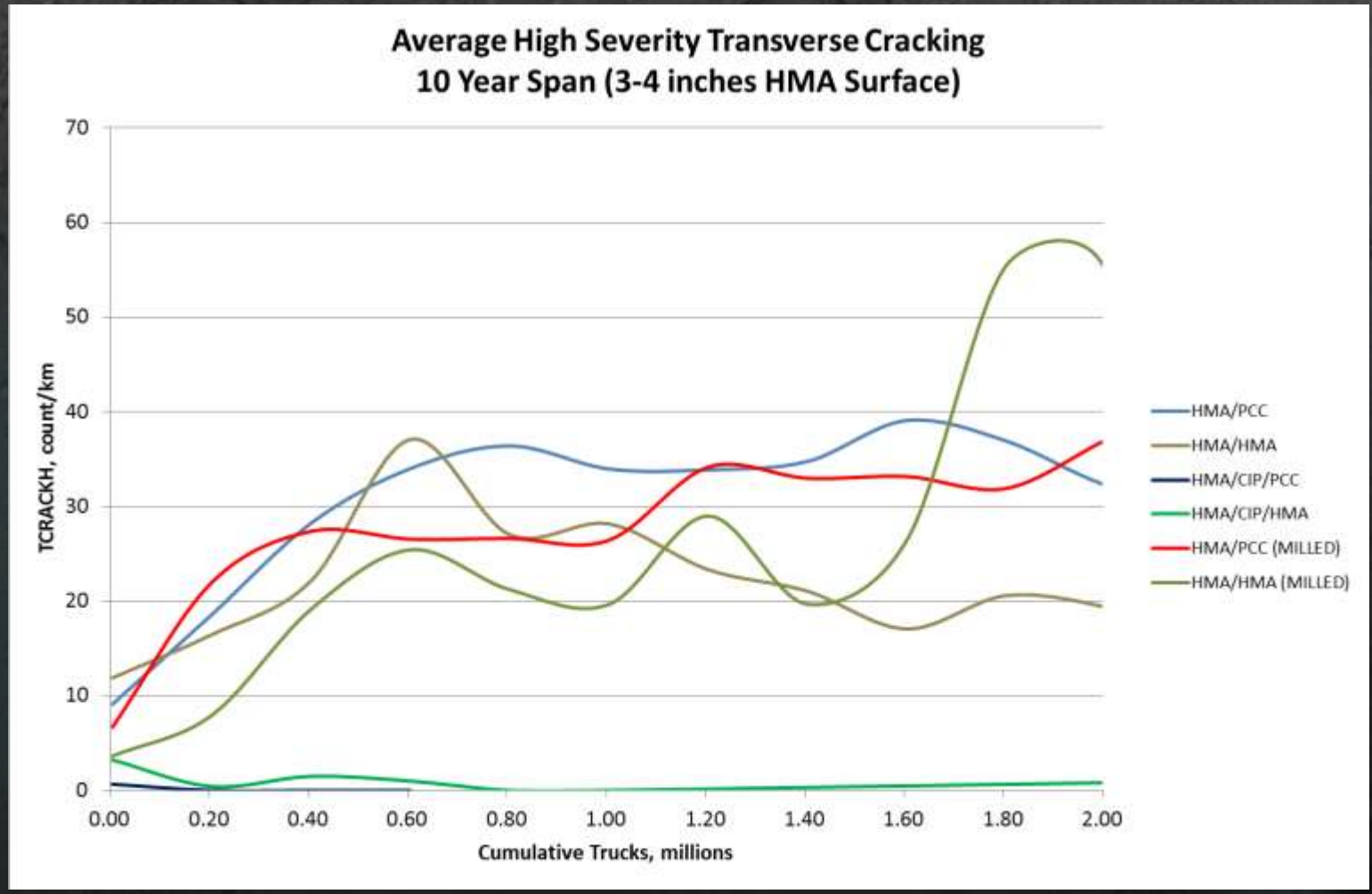
- Traffic
- Extremely Hot Oil (Foam)
- Respect the Equipment
- Have a Spill Plan

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?

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