Hot In-Place Recycling

Robert Lee, P.E. TxDOT
Hot In-Place Recycling - HIR

A single pass process that heats the existing pavement, mills it to a required depth, rejuvenates the asphalt, remixes the material, relays it and compacts it to a required density.
Advantages

• Multi-Step Single Pass Process
• Reuse of Existing Materials
• Reduce Transportation Costs
• Smaller Carbon Footprint
• Thermal Bond at Longitudinal Joint
Challenges

• Varied Pavement Conditions
• Multiple Seal Coats
• Rubber Seal Coats
• Fabric or Grid
• Structural Capacity
Categories of H.I.R.

• Recycling
• Remixing
• Repaving
Recycling

• 100% or close to it
• Can be overlaid
  – in Texas will be overlaid
Remixing

- Mixing new hot-mix with recycled mix
- Helps control gradation and volumetric properties
Remixing

screed

new hot mix

pug mill

heaters
Repaving

- Adds new mix directly on recycled mix
- Creates hot bond between new mix and recycled mix
Repaving

- hopper
- pug mill
- integrated new/recycled overlay
- screeds
Specifications

• Item 358
• Special Specification 3178
  – Sampling
  – Mix Design
  – QC/QA
• New Spec Book
Guidance Document

- Project Selection Guide
- Alternate vs. Mill & Fill
- Alternate vs. Other HIR Processes
Project Selection

• Evaluate the condition of the pavement
  – Cores
  – Pavement distress evaluation

• Pavements with major structural failures will not be good candidates for HIR
  – Load related failures from underlying layers

• Ensure adequate structural capacity
  – enough to handle equipment loads after milling has occurred (2 inches)
Project Selection

• No Rubber Seal or Multiple Seals
  – Recycled pavement becomes over-asphalted
  – Seal coat binders catch fire easily

• No Fabric or Grid
  – Problems with milling heads
Sampling

• Cores
  – enough for mix design ~ 50
• At an interval designed to represent the entire project
• Extra cores and additional designs for varying sight conditions
Mix Design

- Volumetric design similar to hot-mix
  - SGC at 50 gyrations
- Penetration requirement for rejuvenated asphalt binder
  - 40 to 80 pen
- Hamburg requirement
  - 10,000 passes
- Overlay requirement
  - 150 to 200 passes
Design Alternatives

- Aggregates
  - Fine fraction
  - Manufactured
  - Washed

- Hot-Mix
  - Dense Grade
  - Item 340
Quality Control

• Normal hot-mix testing (except gradation)
• In-Place air voids between 4% and 9%
• Watch temperatures
  >200°F behind paver
  >160°F behind milling heads
• Monitor recycling depth and % rejuvenator
Pre-Heating

- Width ~ 10 to 14 ft.
- Uniform Heat
  - Transversely
  - Depth

- Heat below mill depth
- Heat Across Longitudinal Joint
Milling

• Variable Width (8 to 12 feet)
• Mill Across Longitudinal Joint
• Avoid Cold Milling (material degradation)
Milling vs. Scarifying

- Scarifying follows heat
- Milling goes to depth set by equipment
About Heating and Milling

• Heat and Mill in increments to reach required depth, 3/4 inch at a time.
• Slowly Heat and Mill entire depth to be recycled, usually about 2 inches.
Adding Recycling Agent

- Distribute Evenly
- Based on volume of mix recycled
About Recycling Agent

• Emulsion
  – Disperses Easier
  – Wants to Migrate to Surface
  – Temperature Drop

• Oil
  – Maintains Heat
  – Stays in the Mix
  – Harder to Disperse
Placement

- Normal Paving Procedures & Processes
- Above 200°F
Compaction

• Steel wheel rollers
• Can run in vibratory mode
• Pneumatics rollers OK
• Shorter window to obtain compaction
Summary

• Another Tool for the Toolbox
• Do your homework
  – pavement evaluation
  – setting up project
  – during construction
• Use as an alternate to “Mill & Fill”
• Decide what specification fits your project needs
• Please contact CST with any questions
Questions