

Hot In-Place Recycling



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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

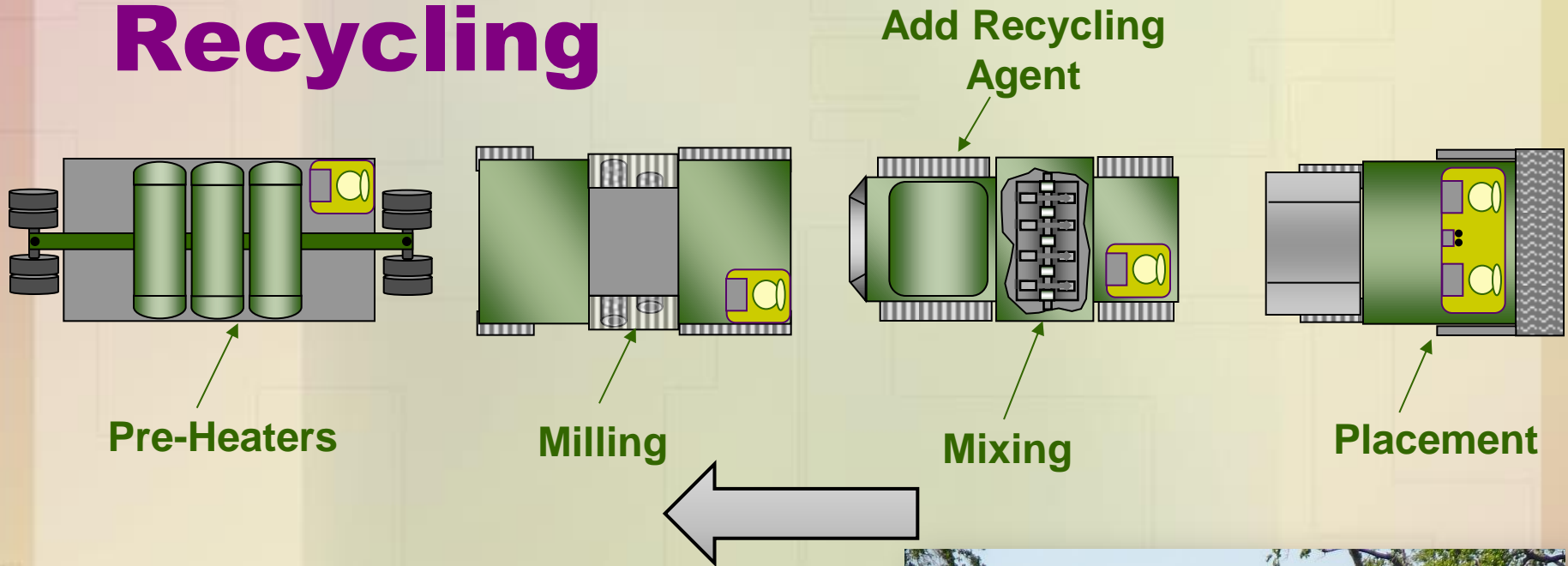


Categories of H.I.R.

- Recycling
- Remixing
- Repaving



Recycling



- 100% or close to it
- Can be overlaid
 - in Texas will be overlaid

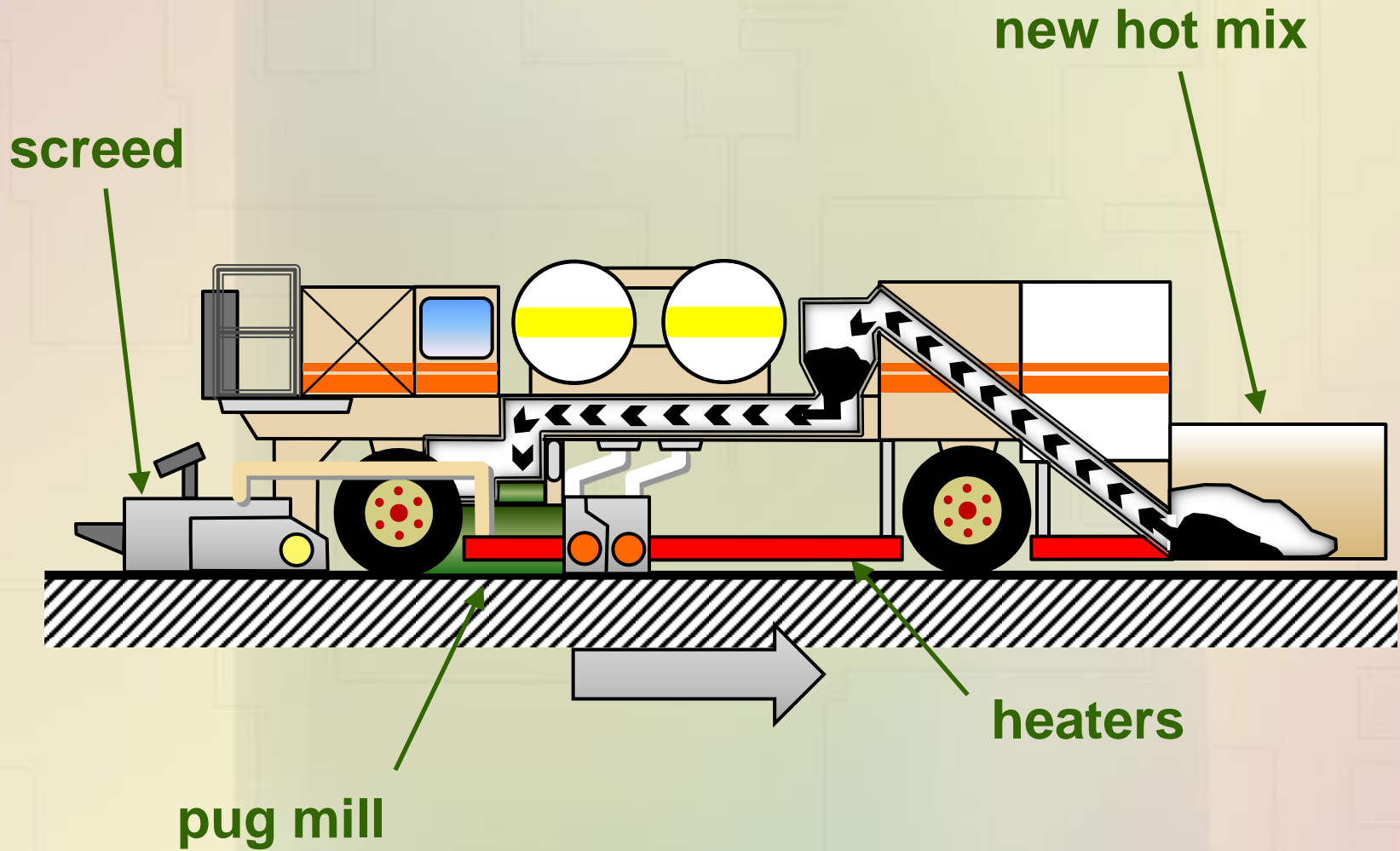


Remixing

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



Remixing

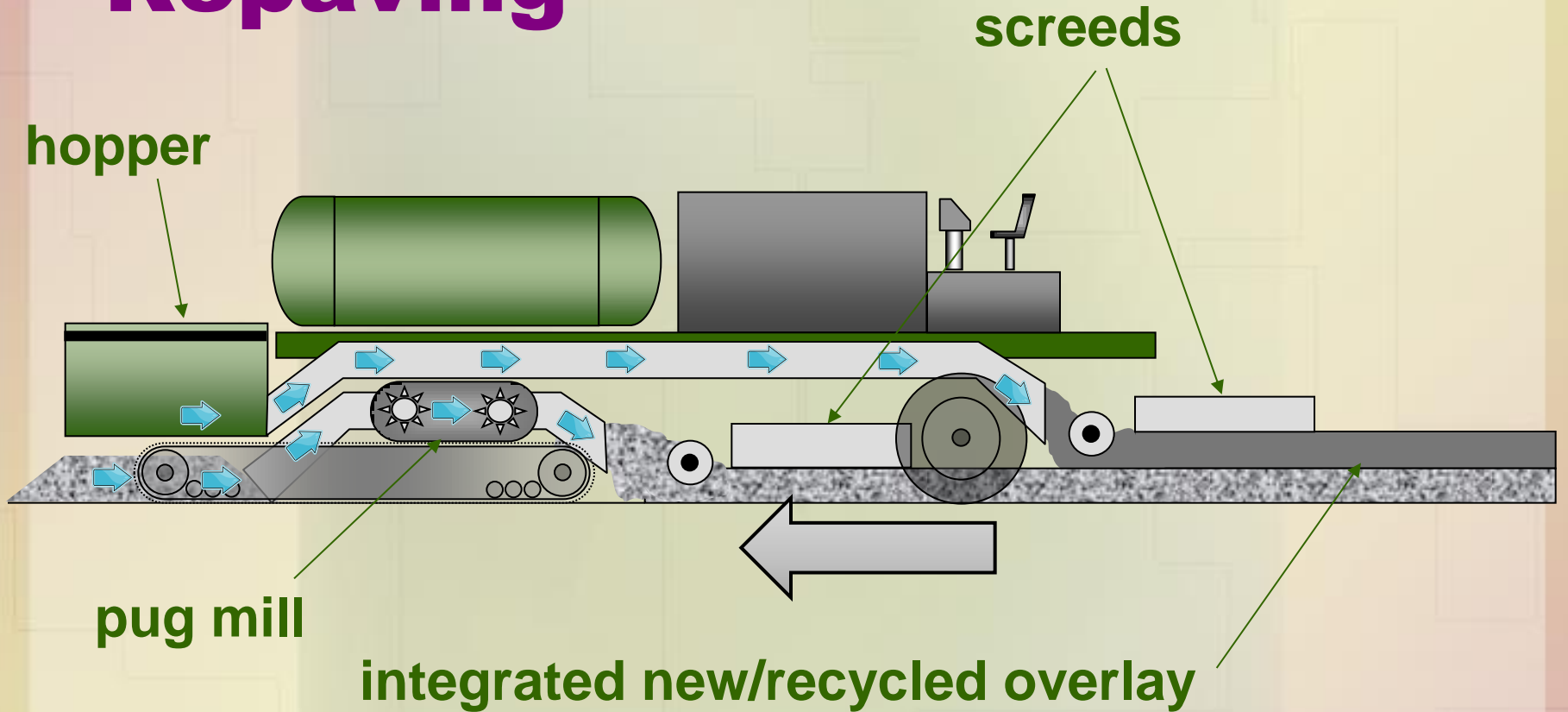


Repaving

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



Repaving



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



- Heat below mill depth
- Heat Across Longitudinal Joint

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



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

