Using Hot In-place Recycling to Ensure Success

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Cutler Repaving Inc.
ASPHALT RECYCLING & RECLAIMING ASSOCIATION

ARRA 1976
MEMBERSHIP of ARRA

• CONTRACTORS
• SUPPLIERS
• AFFILIATE MEMBERS
Hot In-Place Recycling
A Rehabilitation Alternative
The 3 Types of HIR

**Surface Recycling:**
Heating, reworking and rejuvenating the top one-two inch of an existing asphalt pavement in preparation of either a seal coat, micro-surfacing or overlay.

**Repaving:**
Heating, reworking and rejuvenating the top one inch of an existing asphalt pavement and simultaneously applying an overlay while the temperature of the recycled layer is 200°F.

**Remixing:**
Heating, reworking and rejuvenating the top 1 to 2 inches of an existing asphalt pavement adding virgin aggregate and/or admix and mixing the newly recycled material in a pug mill mixing plant prior to laying, either as a binder or surface course.
The Bottom Line Question

• How can I maximize the return on my investment in asphalt pavement rehabilitation funding?
Answer

• By repairing your asphalt pavement during the first 40% drop in quality
The Savings of Timely Maintenance

Each $1 spent during the first 40% drop in quality will cost $5-$7 if delayed until pavement loses 80% of its original quality.
Project Considerations

- Uniformity
- Depth of existing HMA
- Presence of Chip Seals
- Asphalt content (bleeding)
- Asphalt properties
- Traffic
- Types of pavement distress
- Environment
Urban Applications

- Curb line milling may be necessary
- Traffic easily controlled in work zone
- Environmental considerations
## Selecting the Appropriate Hot In-place Recycling Process

<table>
<thead>
<tr>
<th>Pavement Distress Mode</th>
<th>Surface Recycling</th>
<th>Remixing</th>
<th>Repaving</th>
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</thead>
<tbody>
<tr>
<td>Raveling</td>
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<td>Potholes</td>
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<td>Bleeding</td>
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<td>Skid Resistance</td>
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<td>Rutting</td>
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<td>Corrugations</td>
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<td>Shoving</td>
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<td>Fatigue Cracking</td>
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<td>Edge Cracking</td>
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<tr>
<td>Slippage Cracking</td>
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<tr>
<td>Block Cracking</td>
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<tr>
<td>Long./Trans./Reflect. Cracking</td>
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<tr>
<td>Swells, Bumps, Sags, Depressions</td>
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<tr>
<td>Marginal Existing Pavement Strength</td>
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### More Appropriate Pavement Strength

#### Non-Distress-Related Considerations

<table>
<thead>
<tr>
<th>Cost Item</th>
<th>Surface Recycling</th>
<th>Remixing</th>
<th>Repaving</th>
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</thead>
<tbody>
<tr>
<td>Initial Cost</td>
<td>$1.00 - $2.00 SY</td>
<td>$3.75 - $4.75 SY</td>
<td>$1.25 - $2.00 SY</td>
</tr>
<tr>
<td>User Costs</td>
<td>See PDM, C.4.3.1</td>
<td>See PDM, C.4.3.1</td>
<td>See PDM, C.4.3.1</td>
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<tr>
<td>Min. turning radius greater than 500'</td>
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<tr>
<td>Min. turning radius less than 500'</td>
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3The initial cost does not include the cost of any succeeding pavement layer that will be required to complete the work. The cost of any additional pavement overlay to be installed after each hot in-place recycling process should be considered in the cost evaluation step.
Remixing 2”
Surface Recycling 1 inch

Dustrol, Inc.
The 1” HIR Process

- Surface heated to approximately 275°F
The HIR Process

• Softened pavement scarified to depth of 1”
Dustrol, Inc.

Mobile Asphalt Recycling System
Deep Heating
The Process

Deep HIR System

- Continuous Process with Self-Contained Train
  - Asphalt Surface Heated
  - Heated Pavement Milled in ½” to ¾” increments
  - Engineered Emulsion Added at Design Content
  - Materials Mixed and Windrowed
  - Recycled Mix Placed by Paver with Vibratory Screed
  - Mat Compacted
  - Surface Applied
    - Such as UBAWS, Micro, Polymer Chip Seal, Thin HMA overlays
The Process
Deep HIR System
Continuous with Self-Contained Train
Asphalt pre-heaters and milling heaters working in front of the asphalt recycling unit. Several pre-heaters and heater millers can be used to achieve the specified heating depth.
Pre-heaters and Milling Heater
Windrow of material from milling heater going under a tunnel heater. Heat is transferred into underlying pavement and into windrow.
Milling, Mixing Heater

- Milling drum on main unit mills additional depth and adds emulsion. The milling drums extend to process width up to 15 feet.
The Process

- Combination – Heater Unit and Milling Section
- Engineered Emulsion Metered at Design Content
This safe, water-based emulsion replaces the chemical constituents of the asphalt that have oxidized. ARA-1P emulsion also contains polymer modified asphalt, which further improves elasticity and coating. Moisture, rutting, and crack resistance are also improved.
Recycled Asphalt Laydown

- Windrowed 100% recycled material is picked up and paved in a conventional paver to the specified width.
Recycled Asphalt Mix Placed with Paver and Vibratory Screed. Minimum temp at screed 190° F.
The blended recycled material is compacted using conventional rollers.
Surface Repaving

Heating, reworking and rejuvenating the top 1 to 2 inches of an existing asphalt pavement and simultaneously applying an overlay while the temperature of the recycled layer is 200°F
Surface Repaving

Heating, reworking and rejuvenating the top 1 to 2 inches of an existing asphalt pavement and simultaneously applying an overlay while the temperature of the recycled layer is 200°F
• Population 634,000 – Metro area 2.5M
• Street network 6,100 lane miles
• Capital Maintenance Budget $23M annually
• 2014 paving program;
  – Self performed Mill and Overlay; 210 ln-mi 53%
  – Contracted Mill and Overlay; 28 ln-mi 7%
  – Hot-In-Place-Recycle; 109 ln-mi 27%
  – Chip Seal; 50 ln-mi 13%
HIPR/M&O Compared

Trigger Point

HIPR
- Fair to slightly Poor
- Few structural defects
- PCI 50 to 70

M&O
- Poor to Very Poor
- Structural defects
- PCI > 60
HIPR/M&O Compared

Milling/Prep

**HIPR**
- Edge mill only
- Minor patching

**M&O**
- Full width milling
- Possible extensive patch
## HIPR/M&O Compared

### Paving Train

<table>
<thead>
<tr>
<th>HIPR</th>
<th>M&amp;O</th>
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</thead>
<tbody>
<tr>
<td>Pre heater</td>
<td>Tack</td>
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<tr>
<td>Recycler/Laydown</td>
<td>Laydown</td>
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<tr>
<td>Three rollers</td>
<td>Three rollers</td>
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<tr>
<td>- Breakdown</td>
<td>- Breakdown</td>
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<tr>
<td>- Rubber Tire</td>
<td>- Rubber Tire</td>
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<tr>
<td>- Finish</td>
<td>- Finish</td>
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</table>
HIPR Preheater
HIPR Paving Train
Unique Considerations

• Traffic Control- No special needs
• Street selection- No cul-de-sacs or tight curves, uniform width, x-slope
Unique Considerations

- **Traffic Control**: No special needs
- **Street selection**: No cul-de-sacs or tight curves, uniform width, x-slope
- **Vegetation**: Minor protection of street side plants
- **Specialized mixes**
  - SMA
  - AR
  - RAS
Specialized Mixes

2010 RAS- Minor Arterial- 5,000 AADT one way

Current PCI ~85

Nov 18, 2014 PPRA Fall Meeting
Denver Asphalt Plant

- City owned Astec asphalt plant
- Standard HMA and specialty mixes
- Less expensive
  - Production costs
  - Wait times
  - Hauling costs
Life Cycle

Arterials - Track record of 10 years on

2005 Process
10,000 AADT
PCI ~75

2003 Process
10,000 AADT
PCI ~70
Collectors - Track record of 10 years on collectors

2003 Process
3,000 AADT
PCI ~70
Locals - ??? Haven’t seen full life, some sites covered with chip seal at 7 years

Local streets, 2003 HIPR, average PCI 75
Sustainability

• **Less disruption**

• **Smooth surface**
  - 40% IRI improvement, 265 in/mi to 165 in/mi

• **Less use of raw materials**
  - One half existing pavement reuse
  - One half added pavement at 25% RAP

**Final product 60%+ recycled material**
Economics

- Reduced Mill/Prep
- Reduced raw materials
- Reduced hauling
- Unit cost $1 to $2 per sy less than m&o

Life cycle cost savings of 6%-10%

Compared to mill and overlay
Cutler Hot Air heating system
Cutler Hot Air heating system
Cutler Hot Air heating system
Cutler Hot Air heating system
Recycling & Paving screed
Cutler Hot Air heating system
Cutler Hot Air heating system
Cutler Hot Air heating system
Cutler Hot liquid application
HMAC Placement
Final Compaction
Thank You!

Questions?