Hot-In-Place-Recycling
A Valuable Tool For Denver Pavement Preservation

Pat Kennedy, PE
Denver Street Maintenance

2014 International & Western States
In-Place-Recycling Conference
Denver, CO.
Denver

- 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%

August 6, 2014
Agenda

- Pavement Management in 30 seconds
- Hot-In-Place-Recycling Process
- Unique Considerations
- Life Cycle
- Sustainability
- Economics
Mid-Range Treatment
Urban Pavement Management

Deterioration Curve

Age in Years

PCI

August 6, 2014

2014 International & Western States In-Place-Recycling Conference
HIPR/M&O Compared

Trigger Point

**HIPR**
- Fair to slightly Poor
- Few structural defects
- PCI 60 to 70

**M&O**
- Poor to Very Poor
- Structural defects
- PCI > 65
HIPC/M&O Compared

Milling/Prep

HIPR
- Edge mill only
- Minor patching

M&O
- Full width milling
- Possible extensive patch
**Paving Train**

**HIPR**
- Pre heater
- Recycler/Laydown
- Three rollers
  - Breakdown
  - Rubber Tire
  - Finish

**M&O**
- Tack
- Laydown
- Three rollers
  - Breakdown
  - Rubber Tire
  - Finish
HIPR Preheater
HIPR Paver
Unique Considerations

- Traffic Control- No special needs
- Street selection- No cul-de-sacs or tight curves, uniform width, x-slope
Typical Neighborhood
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
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

2006 SMA- Major Arterial- 20,000+ AADT each direction

Current PCI ~75
Specialized Mixes

2007 AR- Major Arterial- 10,000 AADT each direction

Current PCI ~70
Specialized Mixes

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

Current PCI ~85
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 HIPIR, 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
## Economics

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<th>Year</th>
<th>Ln-Mi</th>
<th>Cost/sy</th>
<th>15yr cost</th>
<th>M&amp;O</th>
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HIPR History

HIPR 2002 thru 2014
Questions?

Pat Kennedy, PE
Engineering Supervisor
Denver Street Maintenance
william.kennedy@denvergov.org
303-446-3535