NCAT+MnROAD: National Long-Term Pavement Preservation Benefit Experiment
NCAT Pavement Test Track

Private Sector Sponsors
Cargill Deicing Technology
Kraton Polymers
Oldcastle Materials
Polycon Manufacturing
Seneca Petroleum
Shell Sulfur Solutions
Trinidad Lake Asphalt

Pre-2015, 2015
NCAT Pavement Test Track

• Help state DOTs implement positive change
• Promote real innovation for the industry

• Mix and materials
• Structural pavement design
• Pavement preservation.
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Standalone Research

- Optimization of reclaimed/recycled materials
- Increasing RAP in polymer surfaces
- Benefit of rejuvenator in RAP+RAS mix
- Innovative porous surface mix design
- Asphalt based high friction alternatives
- Lower cost thinlay rutting and cracking
- Mix improvements on longitudinal joint.
Thickness Design Optimization

- Stiff Track subgrade and aggregate base
  - Original 24” Track via ‘93 AASHTO Design Guide
  - 9” conventional HMA found to be perpetual
  - 5¾” high polymer HMA found to be perpetual
- Soft subgrade imported to Track for Oklahoma
  - 10” failed (salvaged with high polymer inlay)
  - 14” found to be perpetual (micro milled/inlaid).
Thickness Design Optimization

- Mechanistic-Empirical (M-E) implementation
- Incorporation of “unconventional materials”
- Ongoing support for empirical (E) designs
- Layer coefficients for modern DGA, OGFC, CR...
  - ≈0.54 for dense (DGA) & gap (SMA) graded asphalt
  - ≈0.15 for open graded friction course (OGFC)
  - ≈0.36 for foamed cold central plant recycle (CCPR).
Benefits of Preservation

- Life extending benefit
- Condition improving benefit
- $f$ (pretreatment condition)
Benefits of Preservation

- Preservation
- Rehabilitation
- Reconstruction

Life Extending Benefit
Condition Improving Benefit

Pavement Condition

Time / Traffic
Benefits of Preservation
Pavement Preservation

- Preservation
- Rehabilitation
- Reconstruction

- Crack/fog seal
- Chip/slurry seal
- Thin overlay
- Thick overlay
- Shallow mill/inlay, hot recycle
- Deep mill/inlay, cold recycle
- Reclamation

Time / Traffic

MnROAD

National Center for Asphalt Technology (NCAT) at Auburn University
Track Thinlay

>8½ million ESALs...
Lee Road 159 Low Traffic Preservation

630k ESALs

53k ESALs
Benefits of Preservation
Benefits of Preservation

The graph illustrates the percentage of projected untreated cracking for various preservation methods. "Chip Seal + Crack Seal" has the highest percentage, followed by "Double Chip Seal" and "Triple Chip Seal". "FiberMat Chip Seal" and "Scrub Seal" have the lowest percentages.
Benefits of Preservation

<table>
<thead>
<tr>
<th>Treatment</th>
<th>% of projected untreated cracking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cape Seal</td>
<td>10%</td>
</tr>
<tr>
<td>Micro Surfacing</td>
<td>100%</td>
</tr>
<tr>
<td>Micro Surfacing + Crack Sealing</td>
<td>80%</td>
</tr>
<tr>
<td>Double Micro Surfacing</td>
<td>15%</td>
</tr>
<tr>
<td>FiberMat Cape Seal</td>
<td>10%</td>
</tr>
<tr>
<td>Scrub Cape Seal</td>
<td>10%</td>
</tr>
</tbody>
</table>
Benefits of Preservation

% of projected untreated cracking

- Thinlay Cape Seal
- PG 67-22 Thinlay
- Thinlay on foamed recycle inlay
- PG 76-22 Thinlay
- UTBWC
- RAP Thinlay
- RAS Thinlay
- HiMA Thinlay
Ultra Thin Bonded Wearing Course
DGA Polymer Thinlay
Balanced HMA Mix Designs
US-280 High Traffic Preservation

3M Vehicles, 840k ESALS
High Traffic Thinlays on US-280

- 4.75 mm NMAS dense graded asphalt
  - Standalone test sections at ¾” thickness (virgin vs ABR)
  - Thinlay Cape seals (¾” in combination with chip seals)
  - 1” overlays on cold recycle mixes (CCPR & CIR, F & E)
- Open graded friction course (OGFC) 1” thinlays
  - Spray paver, UltraTack, PG67-22, UltraFuse, eTac
- ¾” ultra thin bonded wearing course (UTBWC).
Balanced Mix Designs
Balanced Mix Designs
Cantabro Loss (e.g., TEX-245-F)
Split Tensile Strengths

Peak Load

Balanced Mix Design

Fracture Energy
RAP+RAS Thinlays on Cold Recycle

Central Plant

In-Place
Cold Climate Sections
MnROAD Low Traffic Sections
MnROAD High Traffic Sections
Chip Seal

CELL 8-010
Micro Surface

169-008
Micro Surface with Crack Sealing
Thinlays

CELL 169-024
End-of-Cycle Track Conference

- High RAP/RAS balanced mix designs
- Nationwide pavement preservation
- Preventing reflective distresses
- Optimized structural design
- Implementation

Pavement Test Track Conference
March 27-29, 2018
The Hotel at Auburn University and Dixon Conference Center
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