Getting the Most Out of an Asphalt Overlay
VDOT Experiences with Pavement Recycling

Brian Diefendorfer, PhD, PE

Illinois Bituminous Paving Conference
December 12, 2018
Overview

• Background
• Examples
  – I-81
  – NCAT
  – I-64
• Summary
Background

• VDOT maintains nearly all roads in the state
  – About 128,000 lane miles
  – More than 97% has an asphalt surface

• CY 2018 planned paving
  – $515 million
  – 8500+ miles
Background

• Main causes of pavement deterioration
  – Environment and traffic loading

• Choice of pavement rehab methods
  – Costs
  – Traffic volumes
  – Allowable work hours
  – Type and causes of deterioration
Background

• Typical rehab methods = overlay or mill and overlay
  – Addresses most needs
  – Efficiently?
  – Suitable when distresses are in upper 3 to 4 inches

• Challenges
  – Increasing costs
  – Same treatments do not last as long as they used to
  – Greater reluctance to inconvenience public
  – Consumption of natural resources
More than 10 million tons of stockpiled RAP
Could pave a 12-foot wide lane, 12 inches deep for more than 2,300 miles
Background

- Pavement recycling can address some challenges
  - Reduced costs, environmental impact, and construction time
  - Expect similar service life to non-recycling
  - Can be easier to fix deeper issues

- Cold in-place recycling
- Cold central plant recycling
- Full depth reclamation
I-81 (2011)

- 3.7 miles
- FDR+CCPR right lane
- CIR left lane

- 29,000 AADT
- 29% trucks
- 14+ million ESALs (right lane)
I-81 (2011)

- 3.7 miles
- FDR+CCPR right lane
- CIR left lane
- 29,000 AADT
- 29% trucks
- 14+ million ESALs (right lane)
I-81 (2011)

- Performance comparison
  - Reconstruction with recycling (circles) versus single course overlay (triangles)

![Graph 1](attachment:load_distress_rating.png)

\[ y = -0.6452x^2 + 1.2057x + 99.578 \]
\[ R^2 = 0.9785 \]

![Graph 2](attachment:iri_inches_per_mile.png)

\[ y = 0.3798x^2 + 1.4722x + 52.455 \]
\[ R^2 = 0.9382 \]
NCAT (2012)

- 3 test sections
- 2 with CCPR over aggregate base
- 1 with CCPR over FDR
- 20 million ESALs to date
NCAT (2012)

- 3 test sections
- 2 with CCPR over aggregate base
- 1 with CCPR over FDR
- 20 million ESALs to date
NCAT (2012)

- 3 test sections
- 2 with CCPR over aggregate base
- 1 with CCPR over FDR
- 20 million ESALs to date
NCAT (2012)

- Section S12
- 85% recycled content
- Very low strain performance
  - Perpetual?
I-64

- Segment 2
  - 7.1 miles (2017-2019)
- Segment 3
  - 8.3 miles (2018-2021)
- 35,500 AADT
- 9% trucks

- New lanes
  - Imported material stabilized using an FDR process
- Existing lanes
  - Existing material under old concrete reclaimed using FDR
- All lanes include CCPR
CCPR = 85% RAP, 15% #10s
100% passing 12.5mm
SN = 7.08, $83/SY

12-in AC
2-in OGDL
8-in Cement Treated Agg
Subgrade

SN = 7.06, $40-61*/SY

4-in AC
6-in CCPR
2-in OGDL
12-in FDR/RC*
Subgrade
I-64, Considering Segments 2 and 3

- About 154 lane miles of new pavement constructed primarily with recycled materials
  - Includes mainline and shoulders
- More than one million tons of material will be recycled
- Compared to a non-recycling design, cost savings exceed $15 million
I-64

- Annual performance monitoring
  - Ride quality, rut depth, and cracking measurements

- Instrumented test section
Summary

• Recycling can address some pavement rehab challenges and increase the life of an asphalt overlay – Including on high volume pavements

• Further study needed to identify:
  – Expected service life
  – Failure mechanisms
  – Practical methods of QA
Thank you!

brian.diefenderfer@vdot.virginia.gov