Cold Recycling: A National Perspective on Research and Implementation

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Outline

• Introduction – Cold Recycling Techniques
• Research Studies
• Implementation
• Where are we nationally?
• The future...

Cold Recycling: What is it?

• A method of reconstructing the pavement base using 100% recycled material
• Construct in-place, or...
• Use stockpiled RAP
• Combination of:
  • RAP
  • Water
  • ~2-2.5% Asphalt binder (foam/emulsion)
  • ~1% Active filler (cement, lime, etc.)
• This is a hybrid material

Cold in-place recycling (CIR)
- Within the bound layers only
- Usually 2-5 inches thick

Cold central plant recycling (CCPR)
- Mobile plant
- New or existing RAP
- Layers usually 4-6 inches, but multiple layers can be placed

Full depth reclamation (FDR)
- Creates a stabilized base
- Bound + unbound layers
- Usually 4 to 12 inches thick
Research

Interstate 81, Virginia
• Constructed in 2011
• Project
  • 3.66 mile section (2 lanes)
  • AADT = 23,000, 28% trucks
• Before condition
  • Repeated mill and overlay + patching
  • Service life of 12-18 months
  • Fatigue cracking, pumping of fines

Interstate 81 – The Solution
• Right lane:
  • 12 in FDR
  • 6 or 6 in CCPR
  • 4 or 6 in new AC
• Left lane:
  • 5 in CIR
  • 4 in AC

Interstate 81
• Reconstruction with recycling versus overlay
• Two segments treated at the same time
• 7+ years of performance
  • IRI “excellent”
  • Very little rutting

NCAT Test Track
• 2012 – Shipped the same material to the NCAT test track
• 3 test sections
  • 2 CCPR over aggregate base
  • 1 CIR over FDR
• 20+ million ESALs applied to date, still loading

NCAT Test Sections
NCAT Test Sections

- CCPR-100% RAP with 2% Foamed 67-22 and 1% Type II Cement
- FDR = 6" Crushed granite aggregate base and 2" subgrade stabilized in-place with 4% Type II cement

Performance...

- Excellent
- Rutting
- IRI
- Perpetual Pavement?
- Trending that direction!

Now let's talk about...

Implementation

I wonder if there's a good place to implement all of this awesome research...

Where bright ideas come from...

I-64 Widening and Reconstruction (Virginia)
I-64 Widening and Reconstruction

- 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

#10s + RAP = CCPR
I-64, Considering Segments 2 + 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

Now let's talk about...

where we are nationally...

Where are we nationally?
- Extensive specification review as a part of NCHRP 9-62 - Rapid Tests and Specifications for Construction of Asphalt-Treated Cold Recycled Pavements
- 63 specifications
  - 38 CIR
  - 19 FDR
  - 6 CCPR
- Very diverse in thoughts/approach
  - Mix design, acceptance, etc.
  - Low vs high volume routes

9-62 Survey: Challenges
- 84 responses
  - 74% agency, 10% academic, 16% industry
1. Lack of experience
2. Lack of quality tests with quick results
3. Excessive time before opening/resurfacing
4. Lack of specification uniformity
5. Previous unsuccessful experiences
So what’s next?

- Documenting successful projects
- Working to formalize/unify the mix-design process
- NCHRP 9-62 is developing specifications for field acceptance
- Like anything, lots of research opportunities!
- Rebuild our infrastructure using sustainable, cost effective tools

Thank you!
Questions?

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