

Pavement Recycling – The Contractor's Perspective

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Paving Industry Perspective on

- Cold Plant Recycling
 - Production
 - Placement
- Cold in Place Recycling
- Full Depth Reclamation



Cold Plant Recycling

- Two VDOT projects to date:
 - Interstate I-81, Augusta County
 - 2012 NCAT Test Track
- Same plant for both projects
- Same RAP for both projects



Cold Plant Recycling

- Production Lessons Learned:
 - Neat binder for foaming, modifiers can inhibit foaming.
 - Moisture content of material impacts foaming.
 - Crushed RAP is more uniform than screened millings:
 - More consistent particle size
 - More consistent moisture content
 - Can account for oversized material
 - Continuous material production requires careful loader operation to minimize segregation.



Cold Plant Recycling

- **True or False:** Paving Cold Asphalt Base Material (CABM) is like paving conventional asphalt?
 - Both!
 - Same asphalt paver, same or similar rollers
 - But...
- **Placement Lessons Learned:**
 - Delivery of CABM if paving in a “hole”
 - Screed assist on paver to prevent settling
 - Full hopper and head of material
 - No need to heat the screed



Paving in a "Hole"



Screed Settling



Keep the Hopper Full



Full Head of Material



Cold Plant Recycling

- Compaction Lessons Learned:
 - ***This is not AC, so don't treat it that way!***
 - CABM does not break, create a compaction curve.
 - With “dry” mix, difficult to compact longitudinal joints if not constrained.
 - Must keep roller drums moist, not to prevent pickup but to seal the surface.
 - Rubber tire rollers can aid compaction and seal surface.



Initial Passes of the Roller



Vibratory Roller at NCAT



Cold Plant Recycling

- Final thoughts on CPR CABM:
 - Final mat thickness controlled by paver and compaction, not in-place material.
 - Material can be designed and controlled at plant.
 - Crushed and blended RAP may make better base mix.
 - Can be used as patching material or backfill.
 - Can be used with new construction in addition to rehabilitation.



Cold In-Place Recycling

- Four projects in Virginia since 2011
- Continuous paving operation
- Final material a function of in-place materials
- Lessons learned:
 - Prior to project, take plenty of samples.
 - Identify oversized aggregates.
 - Not for areas with cross traffic during construction.



Oversized Aggregate



Oversized Aggregate



Cold In-Place Recycling

- Other Lessons Learned:
 - Contract must account for increase in grade from CIR (typically a 10% volume increase).
 - Contract must consider depth of CIR required or final CIR thickness— not the same (see above).
 - Difficult to meet $\frac{1}{4}$ " surface tolerance.
 - Edges ravel as traffic passes over.



Cold In-Place Recycling

- More Lessons Learned:
 - Fogging emulsion CIR retards setting time.
 - Fogging emulsion CIR without dusting promotes raveling, sticks to tires.
 - Fogging foamed CIR reduces raveling.
 - Consistent CIR speed produces more consistent material.
 - At times, difficult to regulate amount of material in paver – flood hopper.



Removing Excess CIR Material



Fluff of CIR Material



Fluff of CIR Material



Pre-Mill to Address Grade



Cold In-Place Recycling

- Compaction Lessons Learned:
 - Like CPR material, CIR acts like an aggregate or soil – not like asphalt concrete.
 - Need compaction curve that considers moisture content.
 - More uniform the material, less variability and effort to meet targets.



CIR is Function of In-Place Material



Breakdown with Vibratory Roller



Intermediate with Rubber Tire Roller



Full-Depth Reclamation

- Numerous projects around Virginia and US
- Continuous reclamation process
- No asphalt paver involved, uses a huge tiller, motor graders and various rollers



Full-Depth Reclamation

- Lessons Learned:
 - FDR equipment will not crush oversized aggregate.
 - FDR material will fluff similar to CIR, must be accounted for in project through widening pavement or grade increase.
 - With cement, lime or other dry binding agents, uniform application across width crucial.
 - Water must be applied uniformly, water truck not allowed to leak on FDR.



Base Variability Along Project



Widening the Road with Excess



Full-Depth Reclamation

- More Lessons Learned
 - Experienced grader operator required.
 - Avoid bridging with steel wheel rollers.
 - AC will not bond to cement FDR.
 - FDR should be surface treated to seal in moisture and minimize raveling.
 - Leveling course needed prior to final surface.
 - Incentive only rideability unless multiple AC lifts are placed.



Checking the Depth



Scuffed Final Surface



Other Areas to Investigate

- Cover material for CIR and CPR Base Mixtures
 - Foamed mixes – fogging to minimize raveling
 - Emulsion mixes – fogging and dusting to minimize raveling
 - Require scratch AC layer for higher traffic levels prior to opening to traffic
- Density acceptance
 - Use nuclear gauge in backscatter for monitoring
 - Use nuclear gauge in direct transmission for acceptance



Industry Recommendations

- CPR, CIR and FDR should have minimum two full AC lifts for rideability.
- First AC lift should be considered as leveling course unless scratch course is placed.
- Leveling course quantity should account for variations.
- SM-12.5 at 2" should be the leveling course.
- Allow for longer times lane closures.



Finally, Start Right – Stay Right

- Consider pre-bid meeting to review project for potential construction issues.
- Project Kick-off and Pre-Production Meetings
- Communication and Training of all staff
 - Review inspection points
 - Review quality management plan – contractor and VDOT
- Understanding roles and responsibilities



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Questions?

