Use of Industrial Materials in DOT Projects: A State's Perspective

Industrial Materials Conference

November 1, 2011
Austin, TX

Jim Pappas
DelDOT

“If we knew what we were doing, it wouldn’t be called research.”

Albert Einstein

Topics

- Why Recycle?
- Drivers for Environmental Stewardship
- AASHTO Survey
- Research Activities
- Impediments to Implementation
- Overcoming Obstacles
- DelDOT Experiences
- Challenge

Why Recycle?

- Psychological – "feel good"
- Environmental sustainability – *ward off "help" from external sources*
- Environmental benefits – no land filling *(difficult to find, costly disposal)*
- Save finite natural resources
- Value of in-place materials

Why Recycle? (cont)

- Engineering benefits: *in-place better than new virgin materials?*
- Lower greenhouse gas emissions (less trucking)
- It makes **cents…. (and $$)!**

"Success is measured by your ability to maintain enthusiasm between failures." Winston Churchill

Drivers for Environmental Stewardship

- National and International Focus on energy and climate change and sustainability.
- State and National focus on waste reduction, pollution prevention, and recycling.
- Escalating costs of energy, labor, and materials.
- Traffic congestion and delays.
- Environmental effects of mining, processing, transporting materials.

Center for Environmental Excellence by AASHTO

One Stop Source of Environmental Information for Transportation Professionals

- Developed in cooperation with FHWA
- **Mission** – to promote environmental stewardship and to encourage innovative ways to streamline the transportation delivery process.
- A resource for transportation professionals seeking technical assistance, training, information exchange, partnership-building opportunities, and quick and easy access to environmental tools

http://environment.transportation.org/

Center for Environmental Excellence by AASHTO

One Stop Source of Environmental Information for Transportation Professionals

Assistance Available

- Information Sharing – website, Newsletter, Meetings, Conferences, Conference Calls, Peer Exchange
- Training – webcasts, webinars, seminars
- Technical Assistance – technical experts, handbooks, problem solving sessions

July 2011 Public Works

- Recycling of metal, paper, plastic, glass, textiles, rubber, electronics is up 40% since 2009 according to the Institute of Scrap Recycling Industries, Inc.
- US Bureau of Labor Statistics says scrap recycling added 10,000 jobs between first quarter 2010 and first quarter 2011.
- In 2010, 130 metric tons of scrap worth $77 billion was manufactured into spec grade commodities.

AASHTO Recycled Materials Survey

- Conducted through AASHTO SOM List Serve.
- Sent end of December 2010.
- Various questions related to RAP, RAS, RCA.
- 45 state responses plus West Federal Lands and Ontario.
- Some data used is from 2007/2008 survey due to lack of responses.

AASHTO Survey (cont)

- Main Survey Questions
  - Allowance of recycled materials (RAP, RAS, RCA) per specifications?
  - Contractors actual usage of recycled materials?
  - Special testing/handling procedures?
  - Research needs, major concerns/obstacles for increased usage of recycled materials?

RAP Survey

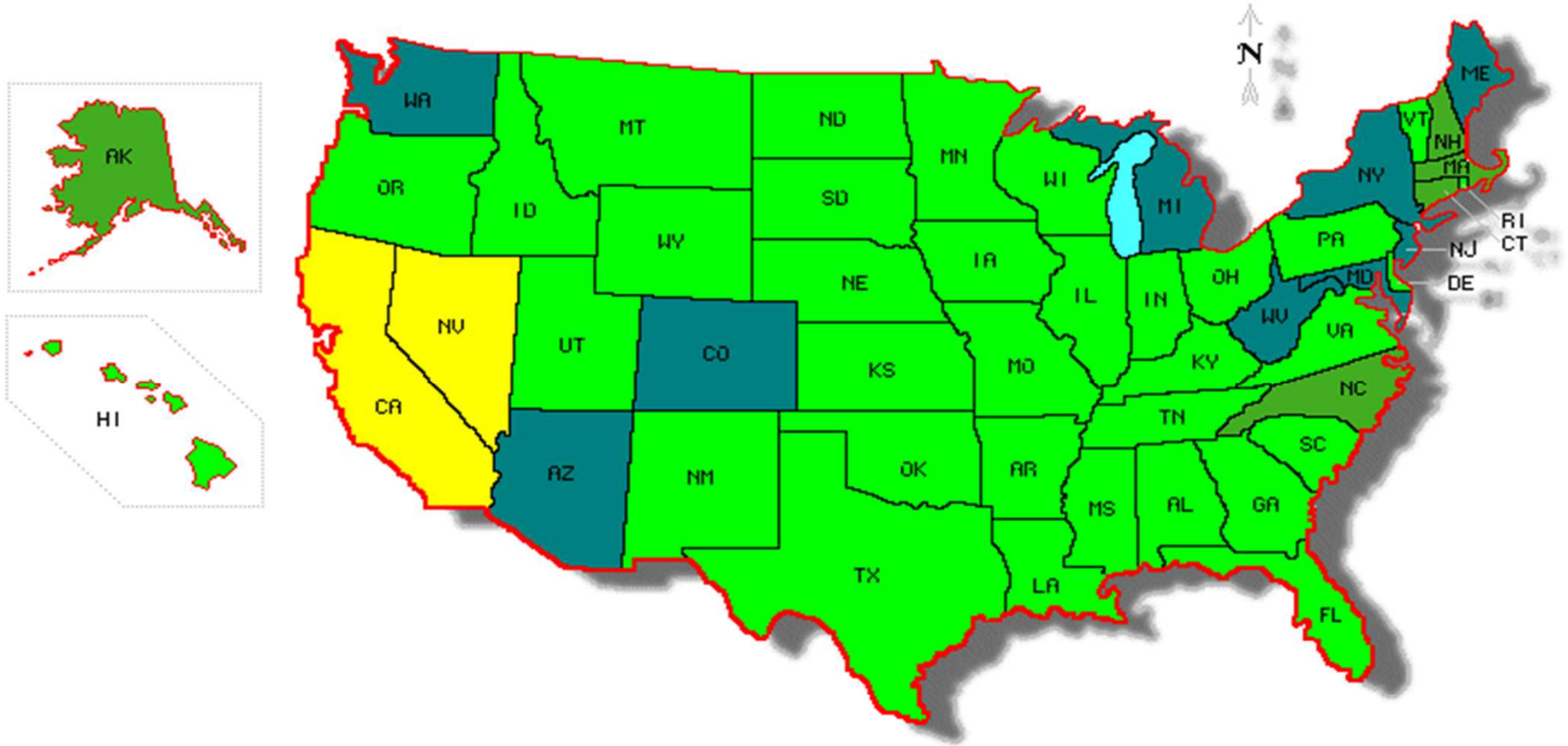
- Items of note from survey…
  - **RAP Availability** – contractor/DOT ownership?
  - **WMA** - Increased usage during DOT implementation?
  - **Stockpiles** - Fractionation, captive stockpiles becoming more prevalent?

RAP Survey (cont)

- Research Needs:
  - Needed dwell time for mixing?
  - Mix performance tests (long-term durability, thermal cracking, f/t resistance).
  - Binders - bumping, blending, stiffness/cracking, interaction with polymers.
  - Determining RAP binder properties.
  - Skid resistance.

Allowable RAP Usage

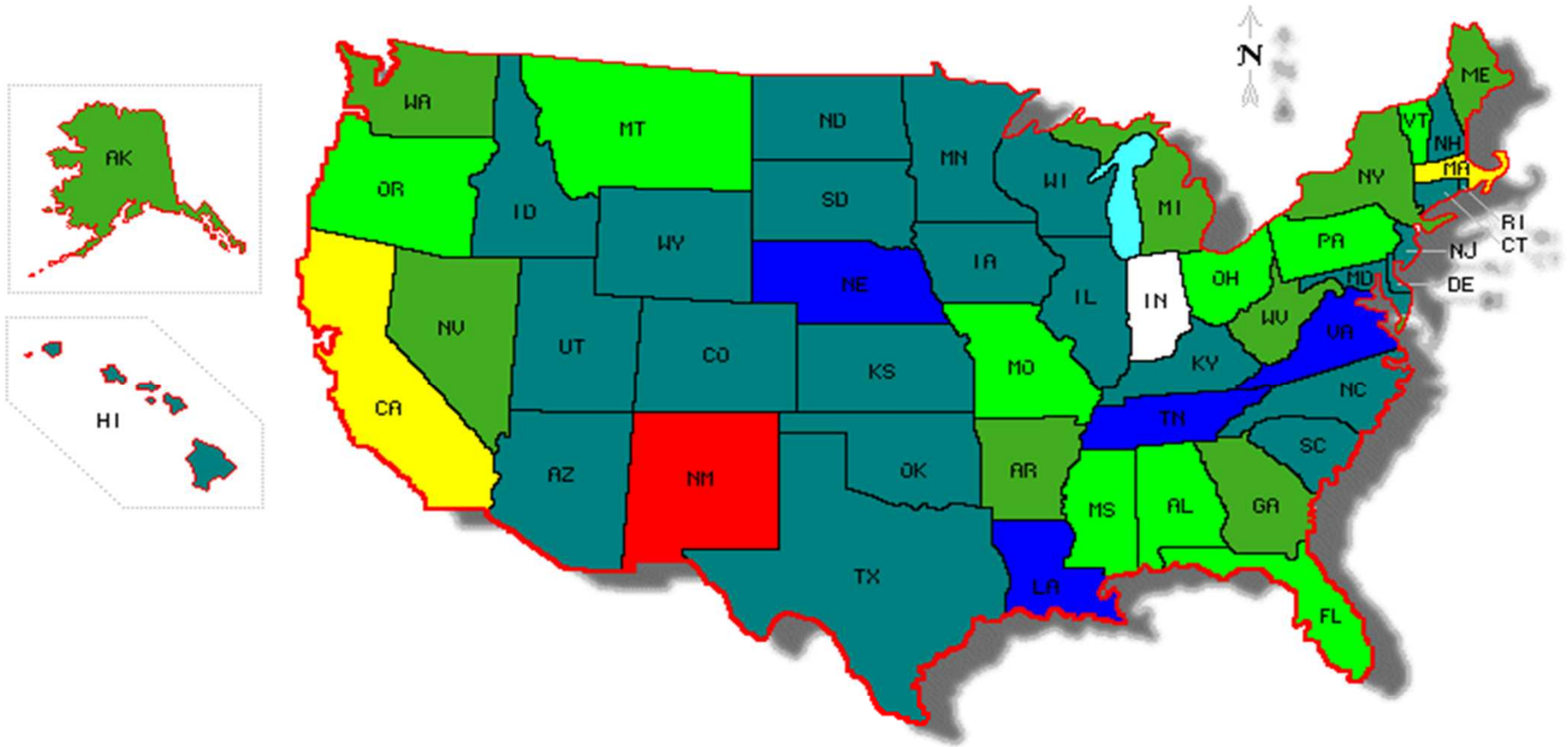
- <15%
- <20%
- <25%
- >30%



5-8-11

RAP Usage (Contractors)

- 0%
- <10%
- <15%
- <20%
- <25%
- >30%



5-8-11

Since 2007/2008 Survey…

- RAP % ***allowed*** by percentage has stayed pretty consistent for DOT's.
- For RAP ***utilization*** by contractors, it appears the 20-30% usage has increased the most with all other percentages staying pretty much the same.

RAS Survey

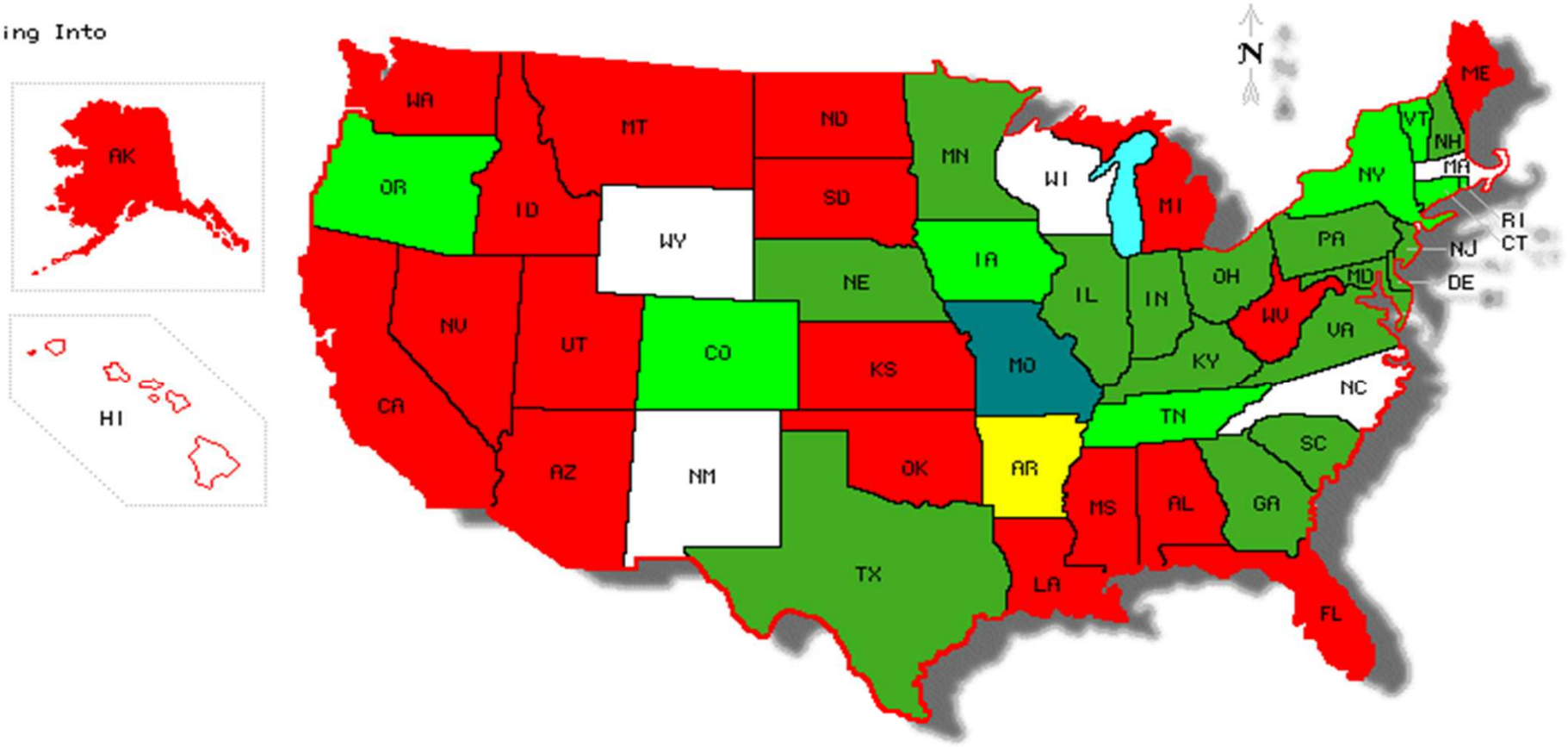
- Items of note from survey….
  - **Sources –** pre/post consumer supply (about 50/50).
  - **Special Requirements** – gradations, asbestos testing.

RAS Survey (cont)

- Research Needs
  - % binder contribution
  - Mix performance testing
  - Binder bumping, blending
  - Fatigue and low temperature cracking
  - Use in WMA?
  - Use of rejuvenators
  - Binder impacts

Allowable RAS Usage

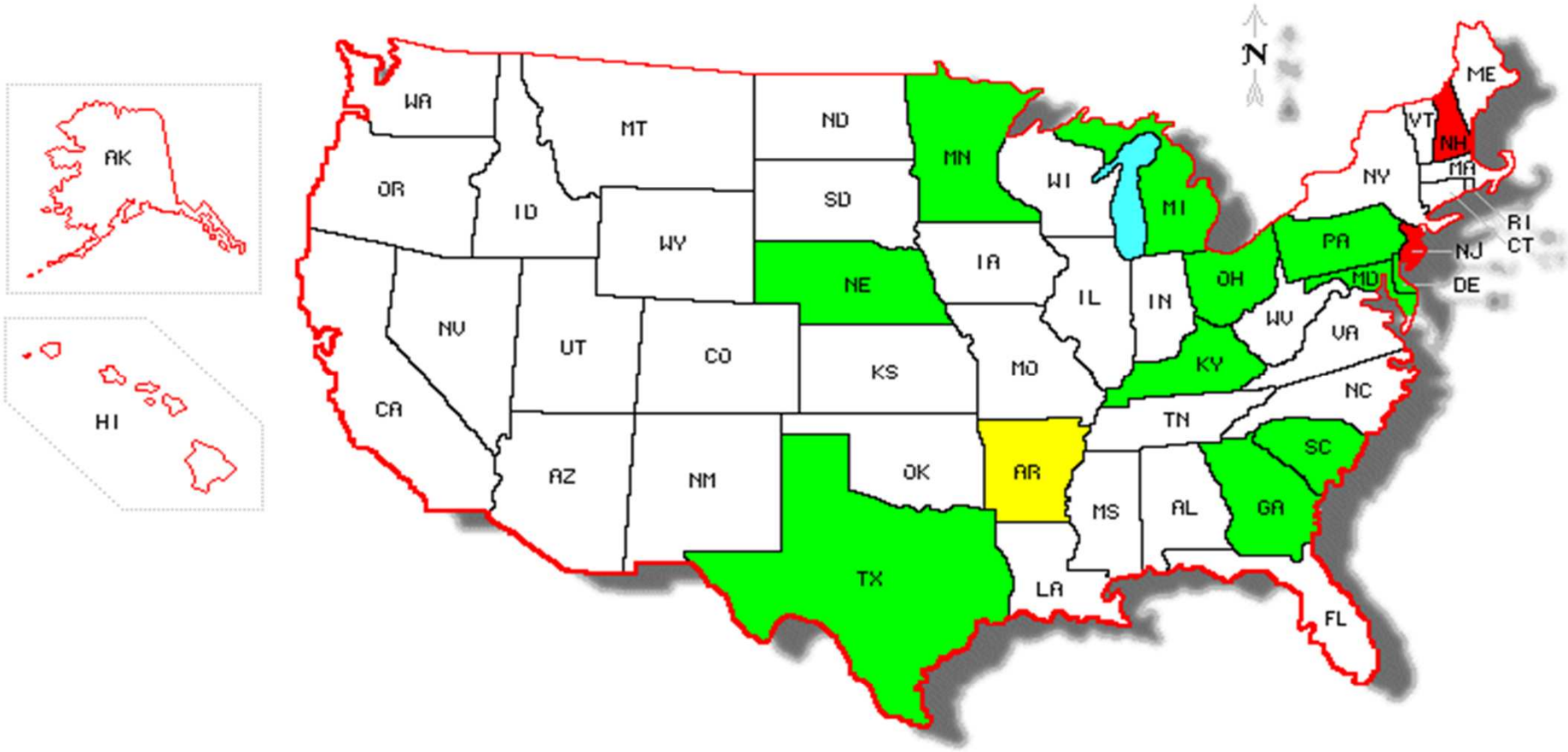
- 0%
- 3%
- 5%
- 7%
- Looking Into



5-8-11

RAS Usage (Contractors)

- 0%
- 3%
- 5%



5-8-11

RCA Survey

- 80% of states responding allow use of RCA in some form.
- Uses – mostly as recycled aggregate base or fill; some use in new PCC, LCB, HMA.
- Concerns/Obstacles – stockpile contamination/management, durability, unknown sources of aggregates, ASR, leaching, pH levels.

RCA Survey (cont)

- Research Needs
  - Durability of PCC w/RCA
  - Use of unknown RCA w/r/t ASR & D-cracking
  - Clogging of underdrains from RCA fines
  - Sample specifications
  - Leaching, pH

Research Activities

- RMRC
- FHWA RAP ETG
- EPA Green Highway Partnership (GHP) Mid-Atlantic Specification Harmonization
- AASHTO, NCHRP, TRB
- Industry sponsored research

"The greatest gap in life is the one between knowing and doing." Dick Biggs

Impediments to Implementation

- Misconceptions
- Bad (past) experiences
- Lack of knowledge
- Regulatory challenges
- Department (Agency)/Contractor willingness
- Lack of national standards (AASHTO)

Overcoming Obstacles

- Outreach/marketing
- Educate
  - Research work (FHWA, AASHTO, NCHRP, RMRC, Industry, University, etc).
- Highlight state's/contractor's successes
- Perception
  - Recycled material ≠ inferior material
- Fear of failure

Overcoming Obstacles (cont)

- Partnerships
  - Recycled Materials Resource Center (RMRC)
  - Industry (NAPA, ACI, PCA, ARRA, etc)
  - Federal Agencies – FHWA, EPA
  - AASHTO
  - Planners, Designers
  - Materials/Construction groups
  - University Researchers
  - Elected Officials/Public

Overcoming Obstacles (cont)

- Communication
- Partners have the same goals
  - Quality product
  - Specification conformance
  - Environmentally sensitive
- Be proactive
- Seek innovation

DelDOT Mission Statement

The Mission of the State of Delaware's Department of Transportation is to provide a safe, efficient, and *environmentally sensitive* transportation network that offers a variety of convenient, and cost-effective choices for the movement of people and goods.

Sustainability and DelDOT

- What does sustainability mean to DelDOT?
  - Depends on who you ask – Planning or Operations.
  - Implementing pavement preservation practices and specifying materials that meet the **3E's benefits** – engineering, economic, and environmentally sensitive.
  - "Easily" implemented due to known benefits of 3E's.

Roadway Construction Options

- New Construction
- Rebuild existing
- Rehabilitate existing
- Maintain existing

Each has positive and negative aspects.

Which Option to Choose?

- Factors to Consider:
  1. Cost of project
  2. Time for completion (time of year)
  3. Traffic disruptions
  4. Right-of-Way implications
  5. Environmental implications
  6. Utility involvement
  7. Contracting capacity
  8. *Sustainability*

Which Option to Choose? (cont)

- No "one option fits all projects"
- Balance all options
- Finding best fit…

We have found recycling, either in-place or through recycled material incorporation has been a very good fit.

Recycle Material Checklist

- Factors:
  1. Cost of project – **minimized***
  2. Time for completion (time of year) - **coordination**
  3. Traffic disruptions - **minimized**
  4. Right-of-Way implications - **none**
  5. Environmental implications – **beneficial***
  6. Utility involvement - **none**
  7. Contracting capacity – **available**
  8. Sustainability – **absolutely***

DelDOT Experiences (cont)

- Pavement Systems
  - Cold-in-Place Recycling (CIPR)
  - Full-Depth Reclamation (FDR)
  - Benefits
    - Saves natural resources
    - Reuse good materials
    - Within ROW, limited utility conflicts
    - Less trucking (GHG savings)
    - Cost savings

Pavement Preservation Costs

Treatment Type	Cost per Centerline Mile
Surface Treatment*	$10,000
Microsurfacing	$50,000
Surface Treatment to Hot-Mix Conversion	$225,000
Overlay	$300,000
Mill + Overlay	$500,000
FDR/CIR + Overlay	$370,000

DelDOT Experiences

- Materials
  - Recycled Asphalt Pavement (RAP)
  - Recycled Asphalt Shingles (RAS)
  - Ground Granulated Blast Furnace Slag (GGBFS)
  - Warm-Mix Asphalt (WMA)
  - Recycled Concrete Aggregate (RCA)
  - Fly Ash (embankment, concrete)
  - Tires (embankment, HMA)

GHP Harmonization Materials

- FHWA and Mid-Atlantic States
  - Foundry Sand
  - Recycled Asphalt Pavement
  - Fly Ash/Bottom Ash
  - Scrap Tires
  - Steel Slag
  - Scrap Shingles

Next Steps …

- Market/showcase success
- Admit “challenges”
- Champion the cause
- Reach out
- Challenge…

“Failure is the opportunity to begin again, more intelligently.”

Henry Ford

Challenge……

- Take something you've heard today, and try to implement it in your state.
- Don't research something to death trying to find a reason for something not to work.

"It is hard to fail, but it is worse never to have tried to succeed …. he who makes no mistake makes no progress." Theodore Roosevelt

“If we’re here to make a difference – and why else are we here – we have to do things that have never been done before. To many people that’s a risk. To me it’s an adventure.”

Gwen Edwards

Thank you for your time and attention

Jim Pappas
302.760.2379
james.pappas@state.de.us

DelDOT

AASHTO
THE VOICE OF TRANSPORTATION