The Innovations

- Warm Mix Asphalt (WMA)
- Precast Bridge Elements
- Geosynthetic Reinforced Soil
- Safety Edge
- Adaptive Traffic Control Technology
Our Visit Today

Part 1: What is the EDC Technology & Innovation?

Part 2: Current State of the Technology

Part 3: Barriers to Implementation

Part 4: State-based Technology Discussions
Part 1:

Technology and Innovation

Plenary Session
What is EDC Warm Mix Asphalt?
Q. Which project is which?

A: Hot-Mix Asphalt (HMA)?
B: Warm Mix Asphalt (WMA)?
Warm Mix Asphalt

• **Definition:** Warm Mix Asphalt (WMA) is the general term used for technologies that allow producers of asphalt pavement material to lower the temperatures at which the material is mixed and placed on the road.
  – Reductions of 50 to 100 degrees Fahrenheit have been documented.
Warm Mix Asphalt (WMA)

Hot Mix Asphalt at 320°F

Warm Mix Asphalt at 250°F
Warm Mix Asphalt (WMA) Investigation and Implementation Premise

Although there are many factors driving the development and implementation of WMA technologies globally, in order for WMA to succeed in the US, **WMA pavements must have equal or better performance when compared to traditional HMA pavements.**
Brief WMA History...

- 1995 Preliminary Lab Experiments
- 1997 German Bitumen Forum
- 2000 Euroasphalt & Eurobitume Congress
- NAPA 2002 European Scan Tour
  - Germany and Norway
- NAPA 2003 Annual Convention
  - San Diego, CA
- 2004 First public demonstration in US
  - World of Asphalt – Nashville, TN
- 2005 WMA Technical Working Group Established
- 2007 AASHTO FHWA International Scan Tour
- 2008 First US International Conference on WMA
Warm Mix Asphalt: European Practice*
Reported Reductions in Plant Emissions (%) with WMA

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*Reported as NO₂
NA—not available

*Warm Mix Asphalt: European Practice, FHWA-PL-08-007, February 2008
Factors Driving Development of Warm Mix Asphalt

1. Improvement in field compaction... less variable ... better performance!!!

2. Environmental and sustainable development concerns, “Green Highway Construction”
   a. Reduction in energy consumption (fossil fuels)
   b. Reduction in CO$_2$ and other emissions

3. Worker comfort ... reduced fatigue

4. Extension of paving season and potential for longer haul distances
Memorable Message

• I.C. = I.P.
  Improved Compaction = Improved Performance

• F.E.W. key benefits...
  – Fuel
  – Emissions
  – Worker Comfort

**Advantages will only be realized by optimizing production operations and utilizing best practices**
Q. How many WMA technologies are available in the US market today?

A. 9
B. 14
C. 20+
How Many WMA Technologies are Available in the US?

Currently Twenty Two (22) Technologies Marketed and Available in the US.
Currently Twenty Two (22) Technologies Marketed and Available in the US.
More to come ...
Many other technologies are also used Internationally.
Warm Mix Asphalt (WMA)

General Technology Categories:

- Materials Processing
- Organic Additives
- Chemical Additives
- Foaming Processes
- Hybrid Systems (combination of technologies)
Economics of WMA

• Fuel Savings
  – Ex. Reducing production temperatures from 325°F (HMA) to around 265°F (typical WMA) will save ½ to 1 gallons of fuel per ton of mix
  – Cost savings of approximately 45¢ to 90¢ per ton of mix
Economics of WMA

• **Start up costs:**
  - **Foaming Systems...** range in price from ~ $35,000 to $80,000
  - **Additive Systems...** most require the addition of a pneumatic or volumetric pumping system. Range in price from ~ $7,500 to $60,000
Economics of WMA

• WMA Technology (Operating) Cost:
  – Foaming Systems... water is basically free. If a liquid antistrip is needed, this adds ~ $1 to $2 / ton
  – Additive Systems... $1.75 to 2.50 / ton of mix
  – This does NOT include fuel savings
    Net cost ~ Zero to $1.50 / ton
In 2007, Bruce participated in the FHWA WMA International Scan
Innovation takes...

• Leadership
• Partnership
• Sharing Risk

• In 2009, Bruce worked with Industry to make WMA a reality in Maine...
Bruce A Manzer Inc
Asphalt Paving - Phillips, ME

From left: Manzer QC Manager Jeramy Parker, Prof. Mingjiang Tao (WPI), Lab Manager Donald Pellegrino (WPI) and graduate student Karen O'Sullivan (WPI).
Looks like Hot Mix Asphalt, but cooler!
And, so far...

“The pavement weathered well during its first Maine Winter, there are no obvious problems so far.”

– Wade McClay, Maine DOT
Maine: What about today?

- Special Provision for WMA
- Control Strip for HMA
- WMA is contractors option but limited to proven agency & industry accepted practices
- QC plan required
A Brief Overview of VDOT & WMA

• Three WMA trial sections constructed in 2006
  – HMA Control Sections
• Evaluated over 2 year period
• No significant distresses in first 2 years of service
• Major Conclusions:
  – *WMA & HMA expected to perform equally*
  – *Some WMA technologies may contribute to a reduced rate of in-service binder aging*

• Based on previous studies of the trial sections, VDOT has implemented changes to the *Road and Bridge Specifications* to permit the use of approved WMA processes

http://www.irfnet.ch/files-upload/knowledges/10-r17.pdf
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