



U.S. Department
of Transportation
Federal Highway
Administration



EDC Summit

Barriers to Implementation



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 3:

Barriers Challenges to Implementation





Q. We know everything we need to know to fully and effectively use HMA?

- A. True
- B. False
- C. Depends





Overarching Challenges for WMA Implementation

1. Temperature...

2. Performance...





Challenge: Reduced Production Temperatures

- Concerns:
 - Incomplete drying of aggregate
 - Reduced production aging of binder
- Performance issues
 - Moisture susceptibility
 - Early rutting





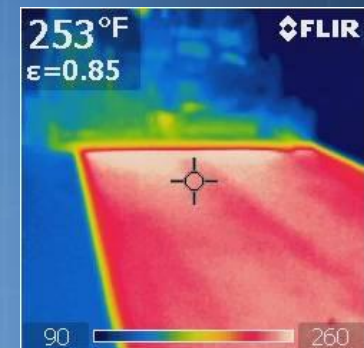
Challenge: Reduced Production Temperatures

- Ways to meet Challenge...
 1. Proper materials & mix type selection
 - Implement materials handling & production best practices
 2. Similar to HMA, treat WMA to resist stripping
 - Moisture damage and rutting have not commonly been witnessed in the field



Challenge: Lack of Information on Long-Term Performance

- Concerns:
 - WMA use began in the US in 2006, thus there is no long-term pavement performance information for WMA
 - WMA may behave differently than HMA over the long term





Challenge: Lack of Information on Long-Term Performance

- Ways to meet Challenge:
 - Europe has demonstrated success with WMA since the 1990s
 - Recent evaluations of in-place WMA pavements show they reach a similar aged condition as HMA pavements after 2 or 3 years in service
 - No early pavement distresses indicates good long-term performance



I.C. = I.P.

- The BAD mix with GOOD density outperformed the GOOD mix with POOR density



Nevada Automotive Test Center



What is WMA?

- ✓ WMA encompasses a wide range of enabling technologies that enhance asphalt production and/or lay-down properties...





What is WMA?

Relative Production Temperature (°F)	Zone	Driver	WMA Technology
<p>HMA - 40° - 60° - 80° - 100°</p>	Total Project	Extend Paving Season	Yes
		Production	Improve Aggregate Compaction
	Reduce Fuel Usage (F)		
	Reduce Emissions (E)		
	Transport	Enhance Worker (W) Comfort	A little
		Extend Effective Haul Distance	
	Lay-Down	Improve Compaction (I.C.=I.C.)	
		Reduce Emissions (E)	Unlikely
		Enhance Worker (W) Comfort	n/a



Questions for Discussion

*Exploring the Challenges
of
Implementation...*





Q. Could WMA lead to early rutting?

- A. True
- B. False
- C. Depends





Q. Will reduced mixing temperatures or adding water to mix lead to moisture damage?

- A. True
- B. False
- C. It Depends





Q. Let's say a Contractor has implemented a WMA process, however the Contractor still produces the mixture at HMA temperatures...is this WMA?

- A. Yes
- B. No
- C. It Depends





Ex. At Typical HMA Temperatures...



Relative Production Temperature (°F)	Zone	Driver	WMA Technology Category...
<div style="border: 1px solid black; padding: 5px; display: inline-block; background-color: #f08080;">HMA</div> <div style="text-align: center; margin-top: 10px;"> - 40° - 60° - 80° - 100° </div>	Total Project	Extend Paving Season	Yes
		Production	Improve Aggregate Coating
	Reduce Fuel Usage (F)		No
	Reduce Emissions (E)		No
	Enhance Worker (W) Comfort		No
	Transport	Extend Effective Haul Distance	Yes
	Lay-Down	Improve Compaction (I.C.=I.P.)	Yes
		Reduce Emissions (E)	No
		Enhance Worker (W) Comfort	No



Q. How do we decide which WMA technologies to allow?

- A. Have an approved supplier list and let the Contractor decide
- B. DOT designation
- C. Performance Criteria





Allowing WMA



- There are several approaches being employed to allow WMA by State DOTs...
 - Florida/Texas/Washington – Approved/Qualified Products List
 - Texas/Illinois – Performance Approach
 - WMA with Hamburg LWT for rutting & moisture damage
 - Illinois/New York – Experimental Features Program
 - www.fhwa.dot.gov/programadmin/contracts/expermnt.cfm
- Challenging: Working to find the best approach for you!



FHWA Division Offices' *Role in Innovation*

- ***Patented/Proprietary Products***
 - 23 U.S.C. 112 & 23 CFR 635.411
 - HQ memorandums
 - Product Selection, 11.25.1987
 - [Guidance on Patented and Proprietary Product Approvals 1.11. 2006](#)
 - Guidance on Sign Sheeting Proprietary Products, 1.13.2006
- FHWA will not participate...unless:
 - ...competitive bidding with equally suitable unpatented items
 - STA (or LPA) certifies item is essential or no equally suitable alternative exists
 - the item is used for research or for a special type of construction on relatively short sections of road for experimental purposes. States should follow FHWA's procedures for "*Construction Projects Incorporating Experimental Features*"

<http://www.fhwa.dot.gov/programadmin/contracts/expermnt.cfm>



Q. Should we be concerned about proprietary issues with WMA technologies?

- A. Yes
- B. No
- C. Maybe





Q. Do all the WMA technologies do the “same” thing?

- A. Yes
- B. No
- C. It Depends





Potential Challenge

- WMA technologies can not be simply “dropped in” to an existing HMA mix design or HMA production facility
- Challenge: WMA technologies require mix design changes, production operational changes, and greater QC and best practices for the contractor to achieve all WMA benefits, including fuel savings and lower emissions





Q. Is there a minimum temperature that WMA can be produced?

- A. 212° F
- B. No
- C. The temperature at which you're no longer able to compact on roadway





Ex. At Typical WMA Temperatures...



Relative Production Temperature (°F)	Zone	Driver	WMA Technology Category...	
<div style="background-color: #ff0000; color: white; padding: 5px; text-align: center;">HMA</div> <div style="background-color: #ff4500; color: white; padding: 5px; text-align: center;">- 40°</div> <div style="border: 1px solid black; background-color: #ff8c00; color: white; padding: 5px; text-align: center;">- 60°</div> <div style="background-color: #ffff00; color: black; padding: 5px; text-align: center;">- 80°</div> <div style="background-color: #00ff00; color: black; padding: 5px; text-align: center;">- 100°</div>	Total Project	Extend Paving Season	Maybe	
		Production	Improve Aggregate Coating	Yes
			Reduce Fuel Usage (F)	Yes
			Reduce Emissions (E)	Yes
	Transport	Enhance Worker (W) Comfort	Yes	
		Extend Effective Haul Distance	Maybe	
	Lay-Down	Improve Compaction (I.C.=I.P.)	Yes	
		Reduce Emissions (E)	Yes	
		Enhance Worker (W) Comfort	Yes	



Q. Are performance test required to use WMA technologies?

- A. Yes
- B. No
- C. It depends





Q. There is a major difference in the placement and compaction of WMA compared to HMA.

- A. True
- B. False
- C. Depends





Q. Do I accept WMA the same way I do HMA?

- A. Yes
- B. No
- C. It Depends





Q. Do we need to adjust sampling procedures?

- A. Yes
- B. No
- C. It Depends





Q. WMA technologies reduce the cost of the plant mixes by reducing fossil fuel use?

- A. True
- B. False
- C. Depends





Q. Can we guarantee that WMA use will result in less fuel use and reduced emissions?

- A. Yes
- B. No
- C. It depends





Q. Can I use higher amounts of RAP with WMA?

- A. Yes
- B. No
- C. It depends





Memorable Message

- **I.C. = I.P.**

Improved Compaction = Improved Performance

- **F.E.W. key benefits**

- Fuel
- Emissions
- Worker Comfort





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<p>HMA - 40° - 60° - 80° - 100°</p>	Total Project	Extend Paving Season	Yes	
		Production	Improve Aggregate Compaction	A lot
	Reduce Fuel Usage (F)			
	Reduce Emissions (E)			
	Transport	Enhance Worker (W) Comfort	A little	No
		Extend Effective Hauling Distance		
	Lay-Down	Improve Compaction (I.C.=100%)		n/a
		Reduce Emissions (E)		Unlikely
		Enhance Worker (W) Comfort		



Ex. At Typical HMA Temperatures...



Relative Production Temperature (°F)	Zone	Driver	WMA Technology Category...
<div style="border: 1px solid black; padding: 5px; display: inline-block; background-color: #f08080;">HMA</div> <div style="text-align: center; margin-top: 10px;"> - 40° - 60° - 80° - 100° </div>	Total Project	Extend Paving Season	Yes
		Production	Improve Aggregate Coating
	Reduce Fuel Usage (F)		No
	Reduce Emissions (E)		No
	Enhance Worker (W) Comfort		No
	Transport	Extend Effective Haul Distance	Yes
	Lay-Down	Improve Compaction (I.C.=I.P.)	Yes
		Reduce Emissions (E)	No
		Enhance Worker (W) Comfort	No



Ex. At Typical WMA Temperatures...



Relative Production Temperature (°F)	Zone	Driver	WMA Technology Category...	
<div style="background-color: #ff0000; color: white; padding: 5px; text-align: center;">HMA</div> <div style="background-color: #ff4500; color: white; padding: 5px; text-align: center;">- 40°</div> <div style="border: 1px solid black; background-color: #ff8c00; color: white; padding: 5px; text-align: center;">- 60°</div> <div style="background-color: #90ee90; color: black; padding: 5px; text-align: center;">- 80°</div> <div style="background-color: #008080; color: white; padding: 5px; text-align: center;">- 100°</div>	Total Project	Extend Paving Season	Maybe	
		Production	Improve Aggregate Coating	Yes
			Reduce Fuel Usage (F)	Yes
			Reduce Emissions (E)	Yes
	Enhance Worker (W) Comfort		Yes	
	Transport	Lay-Down	Extend Effective Haul Distance	Maybe
			Improve Compaction (I.C.=I.P.)	Yes
			Reduce Emissions (E)	Yes
			Enhance Worker (W) Comfort	Yes