Warm Mix Asphalt
“The Material of Today”

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A child’s view...

Courtesy of Dr. Ray Bonaquist’s Daughter

Hi I’m Hot Mix.  

Hi I’m WMA.
A child’s view...

To Avoid © Issues...

Hi I’m Hot Mix.  

Hi I’m WMA.
The Every Day Counts Initiative

- www.fhwa.dot.gov/everydaycounts

- EDC is designed to identify and deploy innovation aimed at shortening project delivery, enhancing the safety of our roadways, and protecting the environment.

- Accelerating Technology Deployment
Selected Innovations (Round 1)

- Warm Mix Asphalt (WMA)
- The Safety Edge
- Geo-synthetic Reinforced Structures (GRS)
- Prefabricated Bridge Elements & Systems (PBES)
- Adaptive Traffic Control Systems
10 Regional EDC Summits
Fall 2010

[Map showing 10 regional EDC Summits locations across the United States, each marked with a star.]
Performance Metrics

1. By December 2011, 40 State DOTs and all Federal Lands Divisions will have a specification &/or contractual language that allows WMA on Federal-aid or Federal Lands projects.

2. By December 2012, at least 30 State DOTs will have achieved set targets for WMA usage.
Factors Driving Development

1. Improve field compaction... less variable ... better performance!!!

2. Environment- “Green Highway Construction”, reduce energy consumption, CO₂, and other emissions

3. Worker comfort ... reduced fatigue

4. Extend paving season, increase usage of RAP, and longer haul distances
EDC WMA Memorable Message

• I.C. = I.P.

Improved Compaction = Improved Performance

• F.E.W. key benefits
  – Fuel
  – Emissions
  – Worker Comfort
Currently more than thirty (30+) WMA Technologies Marketed and Available in the US.

Lake Asphalt of Trinidad and Tobago
General Technology Categories

Material Processing
- Ex. LEA (Hot Coated Coarse Agg + Moist Fine Agg + Additives)

Organic Additives
- Waxes, Zeolite

Chemical Additives
- Surfactants

Foaming Processing
- Water Injection, Zeolite

Hybrid Systems
- Ex. $H_2O + $Surfactant
Technology Overview

• Many US technologies’ web-link at:
http://warmmixasphalt.com/wmatechnologies.aspx

“This listing does NOT constitute an endorsement or approval.”
Stakeholder Engagement
WMA Technical Working Group

- FHWA
- NIOSH
- NAPA
- AASHTO
- NCAT
- State DOT
- State APA
- Industry
- Labor
National Research Initiatives

• WMA TWG Task Force 08-02 “National Program for WMA Technologies”
  – To utilize AASHTO National Transportation Product Evaluation Program (NTPEP)

• Resulted in... NCHRP 20-07 Task 311 “Development of a Warm Mix Asphalt Technology Evaluation Program”
National Research Initiatives

• NCHRP 9-43 “Mix Design Practices for Warm Mix Asphalt” $500,000

• NCHRP 9-47A “Engineering Properties, Emissions, and Field Performance” $900,000

• NCHRP 9-49 “Long Term Field Performance of Warm Mix Asphalt Technologies”
  – Phase I, Moisture Susceptibility - $450,000
  – Phase II, Long-Term Performance - $900,000
NCHRP Project 09-43

- Final report completed and published as NCHRP Report 691 “Mix Design Practices for Warm-Mix Asphalt”

- http://trb.org/Main/Blurbs/Mix_Design_Practices_for_WarmMix_Asphalt_165013.aspx
NCHRP Project 09-43

• Products:
  – Appendix to AASHTO R35 with commentary “Special Mixture Design Considerations and Methods for Warm Mix Asphalt (WMA)”
  – WMA Mix Design Workshop/Training Module
    • Being converted to web based training thru NHI
  – Chapter on WMA Mix Design for the NCHRP Project 09-33 Mix Design Manual
  – “Standard Practice For Measuring Properties of Warm Mix Asphalt (WMA) for Performance Analysis Using the AASHTO MEPDG” (AASHTO Darwin ME Software)
New Resource

www.ct.gov/dot/AASHTO-R35
Approved Laboratory Foaming Device
Actual Laboratory Foaming Device, 3+

PTi – THE FOAMER

D&H Equipment – Hydro Foamer

Wirtgen, WLB 10 S
Recycled Asphalt Binders ...
High temperature PG grade of recycled asphalt binder $< \text{ or } \leq$ planned compaction temperature

![Graph showing the relationship between WMA compaction temperature and RAP high temperature grade.](image-url)

Courtesy of Dr. Bonaquist
National Research Initiatives

TWG Proposed NCHRP projects for 2012:

• D-05 Develop an Approach for Lab Mix Short Term Aging That Correlates to Various HMA Plant Processing and Warm Mix Asphalts

• D-07 Short-Term Laboratory Conditioning of WMA Mixtures for Mix Design and Performance Testing

• D-08 Asphalt Foaming Characteristics for Warm Mix Asphalt Applications

• D-09 Laboratory Foaming and Mixing Processes for WMA Mix Design
National Research Initiatives

Combined into two NCHRP projects for 2012:

• NCHRP 9-52 “Short-Term Laboratory Conditioning of WMA Mixtures for Mix Design and Performance Testing”

• NCHRP 9-53 “Asphalt Foaming Characteristics for Warm Mix Asphalt Applications”
National Research Initiatives

Proposed NCHRP project for 2013:
• “Recycled Asphalt Shingles (RAS) and Recycled Asphalt Pavement (RAP) in HMA/WMA Mixtures”
• Endorsment by:
  – SOM TS 2c Asphalt-Aggregate Mixtures
  – FHWA WMA Technical Working Group
  – FHWA RAP Expert Task Group
  – TRB Committee AFK10 General Issues in Asphalt Technology

- Stockpile Moisture Management
- Burner Adjustments and Efficiency
- Aggregate Drying and Baghouse Temperatures
- Drum Slope and Flighting
- Combustion Air
- RAP usage
- Placement Changes
WMA Usage

Percentage of Total Asphalt Production in US
source: National Asphalt Pavement Association
WMA Usage

Percentage of Asphalt Production for State DOTs

source: National Asphalt Pavement Association

2009: 6%
2010: 15%
2011: Increase
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