U.S. Department of Transportation
Federal Highway Administration

Office of Pavement Technology
Asphalt Pavement Program

Long-Life Asphalt Pavements for the 21st Century

Warm Mix Asphalt Technologies

warmmixasphalt.com

U.S. Department of Transportation
Federal Highway Administration

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 U.S., WMA pavements must have equal or better performance when compared to traditional HMA pavements

U.S. Department of Transportation
Federal Highway Administration

What is WMA?

- Allows a reduction in the temperatures at which asphalt mixes are produced and placed
  - Some technologies provide reduced viscosity at lower temps
  - Other technologies are not fully understood

U.S. Department of Transportation
Federal Highway Administration

Hot Mix Asphalt 275-325°F

Warm Mix Asphalt 250-275°F

Cold Mix Asphalt 60°F

Hot Mix Asphalt
320°F

Warm Mix Asphalt
250°F

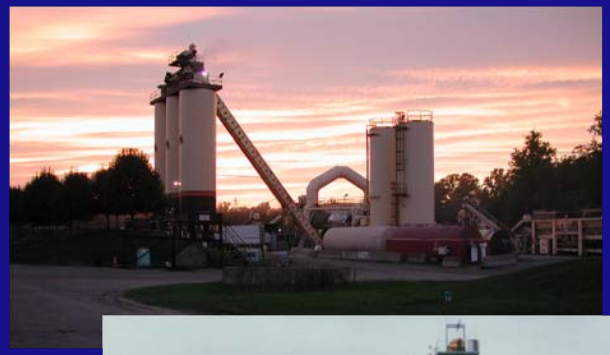
U.S. Department of Transportation
Federal Highway Administration
Federal Highway Administration

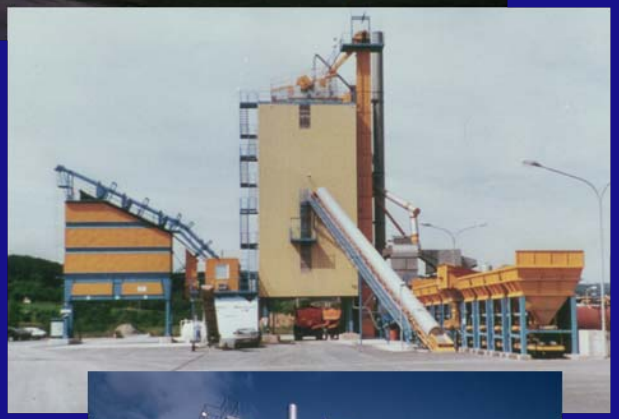
Brief U.S. History

- NAPA European Scan 2002
  - Germany and Norway
- NAPA Annual Meeting 2003
  - San Diego
- World of Asphalt 2004
  - Nashville
- WMA TWG 2005
- FHWA International Scan 2007
- International WMA Conference 2008

Why WMA?

- Potential Advantages**
  - Energy Savings
  - Decreased Emissions
    - Visible and Non-Visible
  - Decreased Fumes
  - Decreased Binder Ageing
  - Extended Paving Season
  - Compaction Aid
  - Increased RAP usage

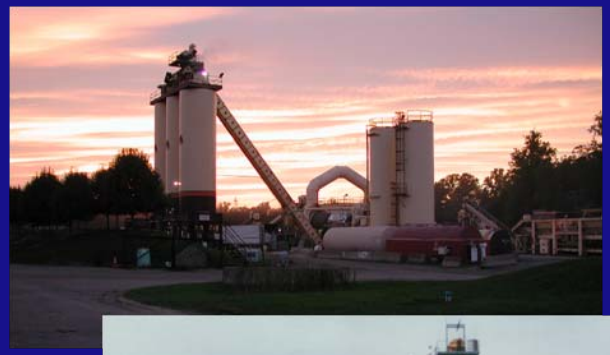


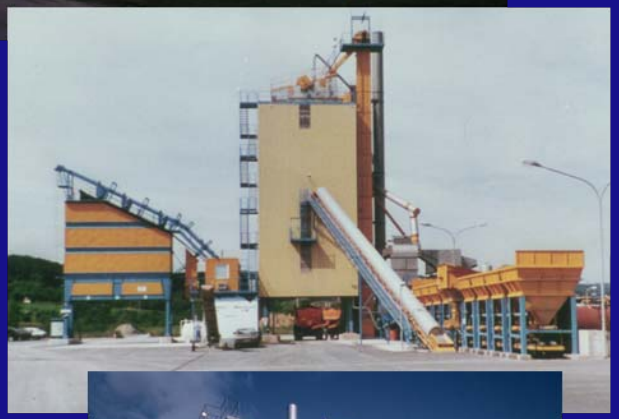


 **Advantages will only be realized by optimizing production operations and utilizing best practices

U.S. Department of Transportation
Federal Highway Administration

Why WMA?





- Potential Advantages**
  - Energy Savings??
  - Decreased Emissions
    - Visible and Non-Visible
  - Decreased Fumes
  - Decreased Binder Ageing??
  - Extended Paving Season
  - Compaction Aid
  - Increased RAP usage??

 **Advantages will only be realized by optimizing production operations and utilizing best practices

U.S. Department of Transportation
Federal Highway Administration

How Many WMA Technologies are Available in the U.S.?

How Many WMA Technologies are Available in the U.S.?

Currently Twenty (20) Technologies Marketed and Available in the U.S.

Technology Overview**

- WAM-Foam
- Low Emission Asphalt
- Aspha-Min
- Advera
- Sasobit
- REVIX
- Evotherm
- Cecabase RT
- Thiopave
- Rediset WMX
- AquaFoam
- Ultrafoam GX
- Terex
- Accu•Shear
- Aquablack
- Double Barrel Green

Mathy Tech. & Eng. Services and Paragon Technical Services, Inc

**FHWA does not endorse any particular proprietary product or technology.

Technology Overview**

- TLA-X
- Iterlow-T & HyperTherm
- Static Inline Vortex Asphalt Blender
- Ad-RAP (ECOBIT)

More to come …

Many other technologies are also used Internationally.

U.S. Department of Transportation
Federal Highway Administration

**FHWA does not endorse any particular proprietary product or technology.

WMA Trials and Demonstrations

Jan 2010

Yellowstone N.P.

Over 140 documented WMA projects constructed to date.

Alaska

Hawaii

U.S. Department of Transportation
Federal Highway Administration

WMA Technical Working Group (TWG)

- FHWA / NAPA sponsored
- Co-Chairs
  - Matthew Corrigan, FHWA
  - Ron White, Industry
- Represented
  - State DOT
  - State APA
  - NCAT
  - Hot Mix Asphalt Industry
  - AASHTO
  - Labor
  - NIOSH

U.S. Department of Transportation Federal Highway Administration

NAPA NATIONAL ASPHALT PAVEMENT ASSOCIATION

WMA TWG Accomplishments

- www.warmmixasphalt.com
- Material Testing Framework
- Emission Testing Framework
- WMA Best Practices Document
- WMA Guide Spec for Highway Construction
- Research Needs Identified
  - Developed five (5) research statements
  - Submitted through AASHTO to NCHRP
    - All projects highly ranked by SCOR
    - Total $2.9 million

National Research Initiatives

TRB TRANSPORTATION RESEARCH BOARD OF THE NATIONAL ACADEMIES

- 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
  - Phase II, Long-Term Performance

U.S. Department of Transportation Federal Highway Administration

Written Summary of WMA @

http://www.fhwa.dot.gov/pavement/asphalt/wma.cfm

Warm Mix Asphalt Technologies and Research - Asphalt - Pavements - FHWA - Windows Internet Explorer

http://www.fhwa.dot.gov/pavement/asphalt/wma.cfm

File Edit View Favorites Tools Help

Warm Mix Asphalt Technologies and Research - Asph...

U.S. Department of Transportation
Federal Highway Administration

Search | Feedback

Pavements

Research | Design | Construction | Preservation | Maintenance | Management | Rehabilitation

FHWA > Engineering > Pavements > Asphalt > Warm Mix Asphalt

- Design and Analysis
- Materials and Construction Technology
- Management and Preservation
- Surface Characteristics
- Construction and Materials Quality Assurance
- Environmental Stewardship

Warm Mix Asphalt Technologies and Research

European countries are using technologies that appear to allow a reduction in the temperatures at which asphalt mixes are produced and placed. These technologies have been labeled Warm Mix Asphalt (WMA). The immediate benefit to producing WMA is the reduction in energy consumption required by burning fuels to heat traditional hot mix asphalt (HMA) to temperatures in excess of 300° F at the production plant. These high production temperatures are needed to allow the asphalt binder to become viscous enough to completely coat the aggregate in the HMA, have good workability during laying and compaction, and durability during traffic exposure. With the decreased production temperature comes the additional benefit of reduced emissions from burning fuels, fumes, and odors generated at the plant and the paving site.

There are three technologies that have been developed and used in European countries to produce WMA:

1. The addition of a synthetic zeolite called Aspha-Min® during mixing at the plant to create a foaming effect in the binder.
2. A two-component binder system called WAM-Foam® (Warm Asphalt Mix Foam), which introduces a soft binder and hard foamed binder at different stages during plant production.
3. The use of organic additives such as Sasobit®, a Fischer-Tropsch paraffin wax and Asphaltan B®, a low molecular weight esterified wax.

The Aspha-Min and Sasobit products have been used in the United States. Additional technologies have been developed and used in the United States to produce WMA:

4. Plant production with an asphalt emulsion product called Evotherm™, which uses a chemical additive technology and a "dispersed asphalt technology" delivery system.
5. The addition of a synthetic zeolite called Advera® WMA during mixing at the plant to create a foaming effect in the binder.

All five technologies appear to allow the production of WMA by reducing the viscosity of the asphalt binder at a given temperature. This reduced viscosity allows the aggregate to be fully coated at a lower temperature than what is traditionally required in HMA production. However, some of these technologies require significant equipment modifications.

This technology could have a significant impact on transportation construction projects in and around non-attainment areas such as large metropolitan areas that have air quality restrictions. The reduction in fuel usage to produce the mix would also have a significant impact on the cost of transportation construction projects.

The benefits of these technologies to the United States in terms of energy savings and air quality improvements are promising but these technologies need further investigation and research in order to validate their expected performance and added value. It is important to note that producing HMA at lower temperatures is the desired product to achieve these benefits, not the particular technology that is used to produce the WMA mix.

Product Descriptions

Events

- View all Upcoming Pavements Events

More Information

- Foamed Asphalt
- Pavement Publications
- Warm Mix Asphalt: European Practice

Contact

Matthew Corrigan
Office of Pavement Technology
202-366-1549
E-mail Matthew

Done | Internet | 100%

U.S. Department of Transportation
Federal Highway Administration