Warm Mix Asphalt Outlook: Is It For Real?

NAPA Young Leaders’ 2007 Conference
October 26, 2007
General Trends

- Regulations
- Activism
- Higher Production Temperatures
- Increasing Energy Costs
What is Warm-Mix Asphalt?

- Hot-Mix Asphalt 275-325°F
- Warm-Mix Asphalt 220-275°F
- Half-Warm Mix Asphalt 180-220°F
- Cold Mix Asphalt 60°F
Brief History

- 1997 German Bitumen Forum
- 2000 Second Euroasphalt & Eurobitume Congress (Barcelona)
- NAPA 2002 European Scan Tour
  – Denmark, Germany, and Norway
- NAPA 2003 Annual Convention
  – San Diego
- World of Asphalt 2004
- 2005-2007 – Numerous U.S. Field Trials
- 2007 – FHWA/AASHTO Scan Tour
Goals for **Warm-Mix Asphalt**

- Use existing hot-mix asphalt plants
- Meet existing standards for hot-mix asphalt specifications
- Focus on dense-graded mixes for wearing courses
- **WMA quality** = hot-mix asphalt quality
Hot Mix (155 °C)  
311 °F

WAM (110 °C)  
230 °F
Potential Advantages of Warm Mix

- Improved working conditions
- Lower fumes and emissions
- Lower energy consumption
- Lower plant wear
- Decreased binder aging
- Early site opening
- Cool weather paving
- Compaction aid for stiff mixes
- Increased plant production
- Longer storage
- Longer haul distances
Warm-Mix Asphalt Technical Working Group

- Members: FHWA, NAPA, SAPA, AASHTO, State DOTs, NCAT, Contractors, Labor, NIOSH
- Mission: Evaluate and validate WMA and share information
- Purpose: Guidance for research and implementation of WMA
Warm Mix Asphalt
Scan Tour

May – June 2007
Norway-Germany-Belgium-France
Performance of WMA

- Consensus of European Countries that WMA should provide equal or better performance than HMA
  - Norway – performance mixed
  - Germany – performance same or better
  - France – toll road operator, district, and city of Paris pleased with performance to date
Available WMA Technologies

- Colas LT or DB – Polyolefin or 2-Phase – Europe
- Evotherm DAT – MeadWestvaco
- Foamed Asphalt - Astec Industries
- Low Energy Asphalt – Fairco
- Low Energy Asphalt Concrete – BAM - Europe
- Sasobit – Sasol Int./Moore and Munger
- SuBit – Licomont – Europe
- WAM Foam – Shell/Kolo Veidekke - Europe
- Zeolite – Eurovia/Hubbard Construction and PQ Corp.
WAM-Foam

• Two-Phase Addition of Asphalt
  – Aggregate coated with “soft” asphalt
  – Hard asphalt foamed to mix with pre-coated aggregate
  – Requires plant modification for foaming
Two-phase bitumen mixing method

- hard asphalt
- soft asphalt
- mineral aggregates

Courtesy IFTA GmbH
WAM Foam
Warm asphalt mixes by adding Aspha-min®, a synthetic zeolite.
Aspha-Min®

• Add 0.3 percent by mass to mix
  - Water is released at high temperatures
    • Range of 185 to 360° F
    • Foams the asphalt
      - Reduced viscosity
  • Reported by Eurovia
    - 54° F reduction
    - Fuel savings of 30%

Aspha-Min® is a fine white powder
Aspha-Min®
Aspha-min and Advera WMA*
Applications

- California
- Colorado
- Florida
- Ohio
- Missouri
- North Carolina
- Tennessee
- Wisconsin
- Wyoming

*Zeolite is also available from PQ Corp. under the name Advera WMA
Sasobit®

• Product of
  - Sasol Wax GmbH (Germany)
• Fischer-Tropsch parrafin wax
  - Fine crystalline long chain aliphatic hydrocarbon
  - Produced from coal gasification
• Available in
  - Flakes or powdered form
  - 2, 5, 20, and 600 kg bags
Sasobit Experience

- Two early Sasobit Field Trials - Maryland
  - High-RAP-content Mix – Not Warm Mix
  - Washington Beltway Paving – Warm Mix
- Subsequent trials in California, Colorado, Illinois, Missouri, New Jersey, Ohio, Tennessee, Virginia, Wisconsin, Wyoming
Frankfurt Airport

- Able to bear heaviest aircraft in 2-3 hours
- Reduced cooling, key to 300-step project
• Innovative chemical additive technology
• Openly available to end-users; no licensing
• Delivered in binder to drum or batch plant
• Developed to optimize chemical structure
• Molecular structure imparts coating, workability, strength, and adhesion
Evotherm DAT North American Field Trials

- 2005 - 2007
  - California
  - Colorado
  - Indiana
  - Missouri
  - NCAT Test Track
  - Ohio
  - South Carolina
  - Tennessee
  - Texas
  - Wisconsin
  - Ontario, Canada
Low Energy Asphalt

• Developed by Fairco – France
• Marketed by:
  – Advanced Concepts Engineering – Van Nuys, CA
Low Energy Asphalt

- Coarse Aggregate heated to 266°F.
- CA coated with binder.
- Cold, wet sand + filler added.
- Leaves plant at 195°F.
- Plant modification required.
- Conventional paving equipment
- At least one project in New York State completed in 2007
Low Energy Asphalt

Mix Cool to Touch ~ 185°F
Double Barrel Green

• Foaming Technology
  – Asphalt
  – Cold Water
  – Air
• Temp ~ 250 – 270°F
Double Barrel Green
Foamed Asphalt Applications

- 2007
  - California
  - Florida
  - North Carolina
  - Ohio
  - South Carolina
  - Tennessee
  - Vancouver, BC, Canada
Other Technologies

• BAM – Low Energy Asphalt Concrete
  – Foam Process
  – 195°F
• Colas
  – 2-Phase Process
  – Polyolefins SuBit (Licomont): Montanwax
  – Temp drop similar to Sasobit
• SuBit (Licomont): Montanwax
  – Temp drop similar to Sasobit
Applications

- Dense-graded mixes
  - Majority of projects
  - RAP – Wisconsin and Missouri
- SMA
  - Maryland – Washington Beltway
- Open-graded mixes
  - Florida
  - China
- Asphalt Rubber
  - California
Initial product approval; how do we evaluate the products?
Implementation Goals

• **WMA should be an acceptable alternative** to HMA at the contractor’s discretion, provided the WMA meets applicable HMA specifications.
Implementation Goals

• DOT use, encourage more field trials with:
  – Higher traffic
  – Larger size with representative production of WMA
  – Built in conjunction with a control section
  – Monitored for a minimum of three years by the agency
  – Data collection guidelines developed by the WMA TWG can be found at:
    http://www.hotmix.org/view_article.php?ID=537

• Consider using on commercial/private sector work