WMA & RAP and New Technologies

National Center for Asphalt Technology
Current NCAT Focus Areas

- Warm mix asphalt
- High recycled content mixes (RAP & RAS)
- Alternative binder materials
- Optimized structural design
- Pavement preservation
- Automated QC technologies
- Drainable, quiet pavements
2009 GE+ Fatigue Expectations

Actual

10 million ESAL strain cycles
Green Group (GG) Experiment

(1) Flexible Fatigue Resistant Asphalt
(2) High Modulus Rut Resistant Asphalt
(3) SMA, OGFC or SUPERPAVE

Pavement Foundation
WMA Mix Design

• Drop in additive technologies
  – Mixing/compaction temps via technology provider
• Lab foamers are recommended
  – No way to replicate proprietary technologies
• NCHRP 9-43 “Volumetrics Plus” approach
  – Compactability \( \frac{N92_{comp-30F}}{N92_{comp}} \leq 1.25 \)
  – T283 (≥ 80 percent) and coating test for moisture
  – FN with criteria as function of traffic
  – Mix above PG grade of recycled materials
RAP Mix Design

• Tier 1: Up to 15% RAP
  – use specified binder grade

• Tier 2: 15%-25% RAP
  – use one full binder grade lower, e.g., PG 58-28 instead of PG 64-22

• Tier 3: Over 25% RAP
  – Extract, recover and grade RAP binder
  – use blending charts to determine required binder grade
WMA+RAP Plant Production

• Plant temperatures (foam/additive)
  – Water injection
  – Additive addition
    Plant site
    Terminal blend
    Combination foam/additive

• Testing (moisture/moisture sensitivity)
• QC/QA
• Cost versus project savings
WMA+RAP Laydown

- Haul time & equipment temperatures
- Temperature behind screed
- Standard HMA best practices
- Significant density differences
WMA+RAP National Perspective

- Federal requirements (9-43)
- Other state specifications/requirements
- Hindsight is 20/20
Shingles

- Processing requirements
- Stockpile practices
- Plant modifications
- Mix quality control
- Mix design specifications
- Source of materials
Alternative Binder Materials

• Post consumer versus manufacturing waste RAS
• Modification via recycled tire rubber
• Highly polymer modified mixes
• Supplementation with Trinidad Lake pellets
• Sulfur replacement WMA technology
• Improved bond strength via tack practices
Optimized Structural Design

• M-E design validation / local calibration
  - Perpetual pavements vary from 9 to 14 inches

• Interim layer coefficient recalibration
  - Increase from 0.44 to 0.54 for dense mixes
  - Recommend 0.15 as interim PFC value

• Thinner structures via stiff interlayers

• High polymer mix for construction / rehabilitation
Pavement Preservation

- Reactive versus proactive methodologies
- Combination of plant mix and non-plant mix
- Aggressive pavement management is essential
- Decision trees to identify ideal alternative(s)
- Life cycle as a function of pretreatment condition
Life Cycle of Preservation Alternatives
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