Contractor Experiences with WMA

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HMA  WMA
Topics

✦ Experiences
✦ Observations
✦ Challenges
✦ Opportunities
Plant Locations and WMA Hardware

- ≈ 75 Fixed + Portable Plants
- ≈ 40% with Foaming Systems
  - Astec
  - Gencor
  - Maxam
  - Stansteel
- + Chemical Tech Prepared
- + Project Specific Prepared

Committed to WMA
WMA Materials and Mix Type

- Mix Design Methods
  - Superpave, Superpave+, Marshall, Hveem
- WMA Technologies
  - Wax, Foam (2x), Chemical (several)
- Binder Types
  - Neat, PMA, CRM, TR
- Recycled Materials
  - RAP (≤35%), RAS (≤5%), RAP+RAS
- Mix Types
  - Dense, Gap Graded, Open
- Many Small Jobs: 300-85,000 tons
Flexibility

Paved Yard Dust / Moisture Control

Multiple RAP/RAS Bins

Up to 50% RAP Capable

Ventura Plant Environmental Features

List of environmental features:

- Condenser
- Baghouse
- Covered conveyors
- Multiple RAP/RAS Bins
- Paved Yard Dust / Moisture Control
- Volatile Emissions Capture System
- Plastic Flaps
- Astec Double Barrel Green Warm Mix System

Types of mixes:

- RAP/RAS
- RAP/WMA
- RAP/RAS/WMA
- CRM/RAP
- CRM/WMA/RAP/RAS
- CRM/RAP/RAS
WMA Use by Technology

Percentage of Total WMA Production

WMA Technology

- Wax
- Foam Z
- Chemical
- Foam H2O
Observations

- Production and Placement Like HMA at Lower Temperatures
- Batch, Counterflow and Double Drum Plants
- Used Transfers, Belly Dumps, Pickup Machines, MTV
- 2+ Hour Hauls
- Paving at Ambient Down to 40 F
- More Comfortable Paving Crew Conditions
Observations

- No Baghouse Condensation Issues
- No Moisture in WMA on Discharge Issues
- No Silo Storage Issues
- No Workability Issues
- No Significant Cost Savings
Cooling Rate/Compaction Time/TenderZone

50°F Temperature Drop

HMA = 3.6°F/min = 14min

WMA = 2.4°F/min = 21min

≈ 1.5 Times

PG70-10
3” Lift
70°F ambient
Worker Conditions

Warm Mix

Hot Mix
Rubberized Crack Filler
(No Swelling)
In-Place Density

- Equal Density at Cooler Temperatures
- Same Compactive Effort - *Normally*
- WMA does Not Fix a Tender Mix

<table>
<thead>
<tr>
<th>Hot Mix</th>
<th>Warm Mix</th>
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<tbody>
<tr>
<td>92.6%</td>
<td>92.9%</td>
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Tough Environments to Test WMA

- So Cal Plant Site
- Reno Lumber Yard
- SR70 Temp Pavement
- Anchorage International Airport
**Good Performance**

- Lower Initial Stiffness but No Rutting
- No Moisture Sensitivity

Oldest Project Spring 2008
Operational Impacts

- **Plant Ops**
  - Additional Equipment
  - Additional Raw Material
  - So What Technology(s) to Use?

- **Construction Ops**
  - All Positive

- **Big Picture**
  - Resistance to Change
    - Internal and External Acceptance
    - Knowledge Transfer Needs
  - Pace of Acceptance (Short-term ROI)
  - Marketing
What Technologies and Hardware
Selection of Technologies

- Owner’s or Contractor’s Selection
- Environmental Benefits
  - Emission and Energy Reductions
- WMA Equipment Capital Cost
  - $25k to $75k per Plant
  - $50k / $0.25/ton / 200k tons
- Existing Plant Capabilities
  - RAP and Controls Compatibility
- Simplest
  - Fewest/Ease of Plant Change Requirements
- Fewest Raw Materials
  - Supply Chain Control = Schedule
- Cost of Technology Additive
  - $0.00 to $3.00+ per ton
- Annual Plant Production
Challenges

- Low Tonnages
- Multiple Technologies at One Plant
- Proliferation of Specs (Rationale)
  - Hot WMA
    - $\geq 285^\circ F$ Behind Screed
    - Breakdown $\geq 270^\circ F$
    - Finish $\geq 160^\circ F$
  - Don’t Core for 24 and 72 hours
  - Curing vs. not Curing FMLC
- RAP + RAS in WMA
Challenges

- Multiple WMA Technologies at a Single Plant
Challenges

Multiple WMA Technologies at a Single Plant
Our Challenges & Opportunities
Together

- Assuring We Get WMA Right
  - No Performance Issues
  - None to Date?
- Proliferation of Specs
- Aggressiveness with RAP/RAS/WMA
- TB COC Binder Acceptance for Simplicity
Our Opportunities

- Coupling Technologies (mix and beyond)
- Sustainable Roadway Design and Construction (Greenroads)...
- CIR + RAP + WMA +...
Where We Are Today

- Recognized and Embraced WMA Benefits – Committed
  - Keep G G --- Keep our Industry G
- Encouraged by
  - Relative Pace of Implementation
  - Improvements in Technologies
  - Entire Industry Involvement – This Example
- Will Stay the Course with Rest of You!
Thank You!

Questions?

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