Using WMA Technologies in the Lab

Implementation of WMA Workshop
Overview

- Types of WMA Additives
- How different WMA additives used in the lab
  - Blended with Binder
  - In-line Simulation
  - Foamers
- PICTURES!
- Mechanical Aging
WMA Categories

1. Organic Additives
2. Chemical Additives
   1. Typical Dosage Rates
      1. 0.2 to 0.5% of the binder
3. Asphalt Foaming Technologies
   a. Foaming additives
      a. Foaming Additive rates are typically 0.25 to 0.30% by weight of mix
   b. Water Injection Systems
      a. Most water injection foaming systems add 1 to 2% water by weight of binder
WMA Categories

4. Combinations of above
   - Low Emission Asphalt (McConnaughay)
     - Combined foaming and chemical additives
     - Mix production temperatures are typically lower than other WMA processes
Blended with Binder

- Simulate pre-blended chemical or organic WMA additives
- Helpful tools...
  - Syringe or Binder Tin
  - Stirring Rod
- Minimize Aging Time
- Ensure Binder reaches desired temp before mixing
In-line Addition - Simulation

- Add Aggregate + RAP
- Form Crater
- Add Binder to Crater
- Add WMA to Binder
Reaction
Some Additives - Stir
Laboratory Foaming

- Different Models
  - Wirtgen
  - Instrotek
  - PTI
- Power and Compressed Air
- Water and Binder Reservoirs
- Calibrate before use

Source
Wirtgen WLB 10S - Old

- Evaluated by NCAT in the past

- Source
Wirtgen WLB 10S - New

- Source
AccuFoamer

- Manufactured by Instrotek
  - Originally ‘HydroFoamer’
- Smallest of Three Units
What if the machine isn’t working?
Foaming Chamber
Remove Nozzles
Clean and Inspect
Clean Nozzles
PTI – The Foamer
PTI – Disposable Bags
PTI – Binder Setup
PTI – Air and Water Lines
PTI – Insulated Binder Ejection
PTI – Control Panel

Foamer Setup

- Asphalt Temp SP: 0
- Exit Temp SP: 0
- Water % Selection: 2%
- Soak Time SP(M): 0
- Target SP (grams): 0.0
- Units (SAE/Metric): Standard

Setup   Control   Report Setup   Panel Maintenance
Calibration

- Calibrate
  - Water
    - Calibrate water based on binder flowing at 10g/sec
    - Set at 2%, water should flow at 0.2g/sec.
      - “Foam” without binder into beaker
        - Measure mass after at least 60 seconds
          - 2% - At 60 seconds, should have 12g water
        - Adjust air and water pressure if needed
Calibration

- After water calibration is complete, verify that binder is flowing at desired rate.
  - Will vary based on binder grade and temperature
  - Needs to be at 10 g/sec
    - If not, can do one of the following:
      - Adjust set water content on control panel to yield desired water content
      - Empty all binder and recalibrate water to match binder flow rate
      - Increase or decrease binder temperature
# Example Calibration Data

<table>
<thead>
<tr>
<th>% Water Set Point</th>
<th>Water rate, g/sec</th>
<th>Time to foam 100g, s</th>
<th>Total Binder, g</th>
<th>Total Water, g</th>
<th>Actual % Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.0%</td>
<td>0.20</td>
<td>13</td>
<td>100</td>
<td>2.6</td>
<td>2.60%</td>
</tr>
<tr>
<td>1.5%</td>
<td>0.15</td>
<td>13</td>
<td>100</td>
<td>2.0</td>
<td>1.95%</td>
</tr>
</tbody>
</table>
Half-Life
Weigh Material
Tips

- Large Batches
  - A larger volume of binder generally makes for a more consistent foamed asphalt product
  - Split large batch into individual specimens

- Half-Life
  - Know your time limit

- RAP and Binder in pre-timed ovens
- 2% water common for laboratory foaming
- Clean your foamer!!!
All Mixes – Check Temp
Mechanical Aging

- NCHRP Report 691
  - Two Hours
  - Compaction Temperature
  - Used for Performance Testing