Improving Pavement Preservation Life Using Warm Mix Asphalt

2nd International WMA Conference – St. Louis, MO

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California Highway Network
50,000+ lane miles in the SHS
Pavement Maintenance

CT maintenance goal: Repair 2,700 miles per year
2011 baseline funding – $234 million
Preventive Maintenance

- **PM Cost-Benefit Ratio: 6–1**

Diagram showing:
- **Surface Damage**: 4-7 Years
- **Minor Damage**: 5-7 Years
- **Major Damage**: 10+ Years

Time:
- Good
- Failed

Pavement Condition:
- Each $1 spent here
  - Seals, thin overlays (Preventive Maintenance)
  - Spends $6 here
    - Thicker overlays (CAPM)
  - Spends $20 here
    - Rehabilitation/Reconstruction

PM Cost-Benefit Ratio: 6–1
Flexible Treatments
- Chip Seals
- Slurry Seal
- Microsurfacing
- Crack Sealing
- Thin Hot Mix (HMA) Overlays
Thin HMA Overlays

- 80% of PM funding on HMA overlays
- CT definition: 30 mm (1.2 inch) thick
- 3 types
  - Dense Graded Thin Blankets
  - Open Graded (OGFC, RHMA–O and RHMA–O–HB)
  - Gap Graded (RHMA – G)
Since 1995, 12 million tons of RHMA placed
By 2013, RHMA usage will be 35% of the total HMA production
In 2010, total RHMA 1,131,881 tons (total HMA 2,578,896 tons)
Thin overlays and WMA

- 9 climatic regions
- Coastal areas
- Night paving
- Long haul distance
- Low ambient temperatures = reduced compaction times
- Premature failure!
4 hr hauls

"Chunks" in the mat

Paving in the "mist"
# WMA in Thin Overlays

<table>
<thead>
<tr>
<th>Project Location (County/Route/Post mile)</th>
<th>Mix Type</th>
<th>Binder Type</th>
<th>WMA Tonnage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humboldt 200 PM R0.0/R4.3</td>
<td>½” OGFC</td>
<td>PG 58-34 PM</td>
<td>3,100 tons</td>
</tr>
<tr>
<td>Mendocino 1 (Fort Bragg)</td>
<td>½” HMA</td>
<td>PG 64-16</td>
<td>5,200 tons</td>
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<tr>
<td>Mendocino 1 PM 15.3/20.8</td>
<td>½” OGFC</td>
<td>PG 58-34 PM</td>
<td>4,260 tons</td>
</tr>
<tr>
<td>Mendocino 1 PM 43.9/50.6</td>
<td>1 “ OGFC</td>
<td>PG58-34 PM</td>
<td>6,000 tons</td>
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<tr>
<td>Glenn 5 PM R20.0/R28.8</td>
<td>½” RHMA-O</td>
<td>PG 64-16</td>
<td>12,000 tons</td>
</tr>
<tr>
<td>El Dorado 50 PM 66.7/67.8</td>
<td>½” HMA</td>
<td>PG 64-16</td>
<td>3,000 tons</td>
</tr>
<tr>
<td>Placer 49 PM 7.5/11.0</td>
<td>½” RHMA-O</td>
<td>PG 64-16</td>
<td>8,500 tons</td>
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<tr>
<td>Placer 28 PM 8.0/9.4</td>
<td>¾” HMA</td>
<td>PG 64-16</td>
<td>7,800 tons</td>
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<tr>
<td>Sutter 99 PM 0.0/8.7</td>
<td>½” RHMA-O</td>
<td>PG 64-16</td>
<td>15,000 tons</td>
</tr>
<tr>
<td>Yuba 70 PM 16.4/18.9</td>
<td>½” RHMA-O</td>
<td>PG 64-16</td>
<td>9,000 tons</td>
</tr>
<tr>
<td>San Luis Obispo 1 PM 25.7/27.7</td>
<td>½” OGFC</td>
<td>PM 58-34 PM</td>
<td>1,900 tons</td>
</tr>
<tr>
<td>San Diego 94 PM 52.8/63.7</td>
<td>½” RHMA -O</td>
<td>PG 64-16</td>
<td>12,000 tons</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>88,720 tons</strong></td>
</tr>
</tbody>
</table>
CA 1 in Morro Bay – May 2008
Before Construction – 2007

AADT 24,000
4.4% Trucks
Project Information

- 1.2” (30mm) OGFC PG 58–34 PM
- 2000 ton control section and 3 WMA test sections (Evotherm, Advera & Sasobit)
- Ambient temperature between 50 °F and 60 °F
- Mixing temps 260 °F to 290 °F (vs. 320 °F)
- Final compaction by 220°F (vs. 250 °F)
Morro Bay: 2008 – 2011
Interstate 5 in Orland, CA

AADT 26,000
25.3 % Trucks
Project Information

- 1.2” (30mm) RHMA-O PG 64–16
- 3,000 tons of Control (320°F)
- 12,000 tons Evotherm WMA (285°F to 305°F)
- Ambient temperature between 60 °F and 70 °F
- Mix workable down to 230°F
Orland: May 2011
Dr. David Jones will discuss in great detail during his presentation on Wednesday!
Instead….Bonus Case Studies!

Humboldt County SR200 McKinleyville

Sacramento County Interstate 5 Rehab
SR 200 in McKinleyville, CA
Connector between 101 and 299
1.2” (30mm) OGFC PG 58–34 PM
RE nervous about mat being “tender”
Did not use WMA on approach to 101
Significant portions of non–WMA had to be ground out within 24 hrs due to failure

“Chunking” of mix observed during construction due to poor tarping, construction delays and cool weather conditions
April 2011

Warm Mix

Raveled Hot Mix

Caltrans,
McKinleyville SR 200
Paved June 2008
I–5 Slab Replacements (2011)

- 9” DGAC, PG 64–10
- 3 Lifts
- 8 hours, night paving
- Mix Temp: 255°F
Conclusions

- WMA has significantly improved the service life of thin overlays in CA
- WMA improves the workability of RHMA
- CT continues to find new uses for WMA in maintenance applications
Questions?