HMA & WMA Technologies

Kent R. Hansen, P.E.
Director of Engineering
National Asphalt Pavement Association
Pavement evaluation and project selection
Materials and Mix Design
Construction & Quality Control
Performance

www.store.asphaltpavement.org
Recommended Mix Types
Surface Courses

Min Lift Thick Range, mm

Low Traffic
Medium Traffic
High Traffic

DFG 4.75
DFG 9.5
DFG 12.5
DFG 19
SMA 9.5
SMA 12.5
SMA 19.0
OGFC 9.5
OGFC 12.5
DCG 9.5
DCG 12.5
DCG 19.0

Mix Type

NAPA
Results of Long-Term Pavement Performance
SPS-3 Analysis: Preventive Maintenance of Flexible Pavements

FHWA Publication No.: FHWA-HRT-11-049

FHWA Contact: Larry Wiser, HRDI-30, (202) 493-3079, larry.wiser@dot.gov
Recycling
RAP & RAS
States increasing RAP use

- Increased RAP Use from 2007 to 2009
- No Increase since 2007
States that have experimented with or routinely use high RAP mixtures
High RAP Performance

The performance and life of pavement containing up to 30 percent RAP is similar to virgin pavements with no RAP. A survey of LTPP sections containing at least 30 percent RAP showed similar performance to virgin sections.
The Value of Milling

- Removes cracked and aged pavement surface
- Improves pavement smoothness
- Maintains curb height, drainage inlets, and bridge clearances
- Improves bond with overlay

Ref: Randy West, NCAT
Why use asphalt shingles in asphalt pavement?

All materials commonly used in asphalt pavements

- Granule/Aggregate
- Asphalt-Impregnated Mat (fiberglass or organic felt)
- Fine Mineral Surfacing
Sources

- Manufactures’ waste
  - Limited ~1 MT annual
  - Not in every state

- Tear-offs
  - ~10 MT annual
  - Everywhere?
    - State regulations
    - Processors

Approximate Location of Fiberglass & Organic Shingle Manufacturing Facilities

Ref: Economic Impact Analysis of the Proposed Asphalt Roofing and Processing NESHAP Final Report, USEPA, July 2001

Recycling Asphalt Shingles into Asphalt Pavements
Kent R. Hansen, P.E.
States Allowing RAS in Asphalt Mixes
Pooled Fund Study

TPF-5(213) Performance of Recycled Asphalt Shingles in Hot Mix Asphalt

Sponsoring Agency – Missouri DOT

Partners – CA, CO, IA, IN, MN, MO

http://www.pooledfund.org/projectdetails.asp?id=441&status=4
RAS Summary

Shingles are too valuable to throw away.
Use manufacturers’ waste if available
Tear-offs
  – Work with roofers to get clean material.
  – Work with local agencies on sampling plan
Performance
  – Improved rutting resistance
  – Reduced temperature susceptibility
  – Minimum affect on cold temperature properties
RAS Summary (cont)

- **Mix AC Content**
  - Will reduce the amount of new asphalt required
  - Total asphalt contents often higher (0.2-0.4%)

- **Plant production**
  - Similar to RAP

- **Mix design**
  - Similar to RAP

- **Construction**
  - Use conventional equipment
  - Some contractors report easier density
The purpose of this Expert Task Group (ETG) is to coordinate, develop, and improve national guidance and recommendations for the asphalt pavement recycling program. This group will provide feedback as well as encourage correct utilization of recycling technologies and address construction problems with current state-of-the-practice solutions.

The members consist of representatives from highway agencies, industry, and academia.

The ETG is sponsored by FHWA.
What is WMA?

Allows a reduction in the temperatures at which asphalt mixes are produced and placed.
WMA Technologies Available in U.S.

In 2005
WMA Technologies Available in U.S.

In 2011 30+
WMA Technologies Available in U.S.

... and beyond
2nd International WMA Conference

- 550 persons
- 24 countries
Stakeholder Engagement: WMA Technical Working Group

Established 2005

Co-Chairs:
Matthew Corrigan
Ron White
Warm-mix Asphalt, the Wave of the Future

Warm-mix asphalt technologies allow the producers of asphalt pavement material to lower the temperatures at which the material is mixed and placed on the road. Reductions of 50 to 100 degrees Fahrenheit have been documented. Such drastic reductions have the obvious benefits of cutting fuel consumption and decreasing the production of greenhouse gases. In addition, engineering benefits include better compaction on the road, the ability to haul paving mix for longer distances, and extending the paving season by being able to pave at lower temperatures.

Read more about the benefits of warm-mix asphalt

Mark Your Calendar!
2nd International Conference on Warm-mix Asphalt
October 11-13, 2011
The Every Day Counts Initiative

Accelerating Technology Deployment

Warm Mix Asphalt (WMA)

www.fhwa.dot.gov/everydaycounts
1. By December 2011, 40 State DOTs and all Federal Lands Divisions will have a specification &/or contractual language that allows WMA on Federal-aid or Federal Lands projects.

2. By December 2012, at least 30 State DOTs will have achieved set targets for WMA usage.
**Course Description**

**Special Mixture Design Considerations and Methods for Warm Mix Asphalt - WEB-BASED**

**PROGRAM AREA:** Pavements and Materials  
**COURSE NUMBER:** FHWA-NHI-131137

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<th>LENGTH</th>
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<tr>
<td>2011</td>
<td>2 Hours</td>
<td>0 Units</td>
<td>$0 Per Participant</td>
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<tr>
<td>2012</td>
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**TRAINING LEVEL:** Basic

**CLASS SIZE:** Minimum: 1; Maximum: 1

**DESCRIPTION:**

Highway transportation agencies are exploring the use of warm mix asphalt (WMA) for pavement projects. One of their main questions, particularly for agency mixture design technicians and engineers, is how WMA design differs from hot mix asphalt (HMA) design. "Mixture Design for Warm Mix Asphalt" is a Web-based training that presents the modifications to the current Superpave volumetric design procedure, as described in AASHTO R35, that are needed to complete a WMA mixture design. The training highlights key differences in WMA and HMA design procedures, and provides an opportunity to apply the AASHTO R35 standard practice to a WMA design modification.

**OUTCOMES:**

Upon completion of the course, participants will be able to:
## RAP/RAS/WMA Survey

### RAP

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Estimated Tons Million</th>
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<tr>
<td></td>
<td>2009</td>
</tr>
<tr>
<td>Tons Accepted</td>
<td>67.2</td>
</tr>
<tr>
<td>Tons use in HMA/WMA</td>
<td>56.1</td>
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<tr>
<td>Tons used in Aggregate</td>
<td>6.2</td>
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<tr>
<td>Tons used in Cold Mix</td>
<td>1.5</td>
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<tr>
<td>Tons used in Other</td>
<td>0.7</td>
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<tr>
<td>Tons Landfilled</td>
<td>0.1</td>
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<tr>
<td>Avg. RAP %</td>
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## RAP/RAS/WMA Survey

### RAS

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<td>2009</td>
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<tr>
<td><strong>Companies/branches reporting using RAS</strong></td>
<td>44</td>
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<tr>
<td><strong>Tons Accepted</strong></td>
<td>957</td>
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<tr>
<td><strong>Tons use in HMA/WMA</strong></td>
<td>701</td>
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<tr>
<td><strong>Tons used in Aggregate</strong></td>
<td>6</td>
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<td><strong>Tons used in Cold Mix</strong></td>
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<td>123</td>
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<tr>
<td><strong>Tons Landfilled</strong></td>
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57% increase
## RAP/RAS/WMA Survey

### WMA

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<td>Companies/branches reporting using WMA</td>
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<td>DOT</td>
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<td>Other Agency</td>
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<td>Commercial &amp; Residential</td>
<td>4.8</td>
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<td>Total</td>
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Percent increase = 148%