

# RUBBERIZED ASPHALT PAVEMENT



Waste Tire Working Group  
Department for Environmental Protection  
Energy and Environment Cabinet  
December 3, 2013

# Rubberized Asphalt Pavements

- ▣ Topics
  - Why Rubberized Asphalt?
  - Common Questions & Answers
  - Possible Kentucky Uses
  - Pilot Project
  - Where do we go from here?
  - Resources

# Why Rubberized Asphalt?

- ▣ Tire Derived Fuel \$20-40/ton



# Why Rubberized Asphalt?

- ▣ Crumb rubber \$200-400/ton



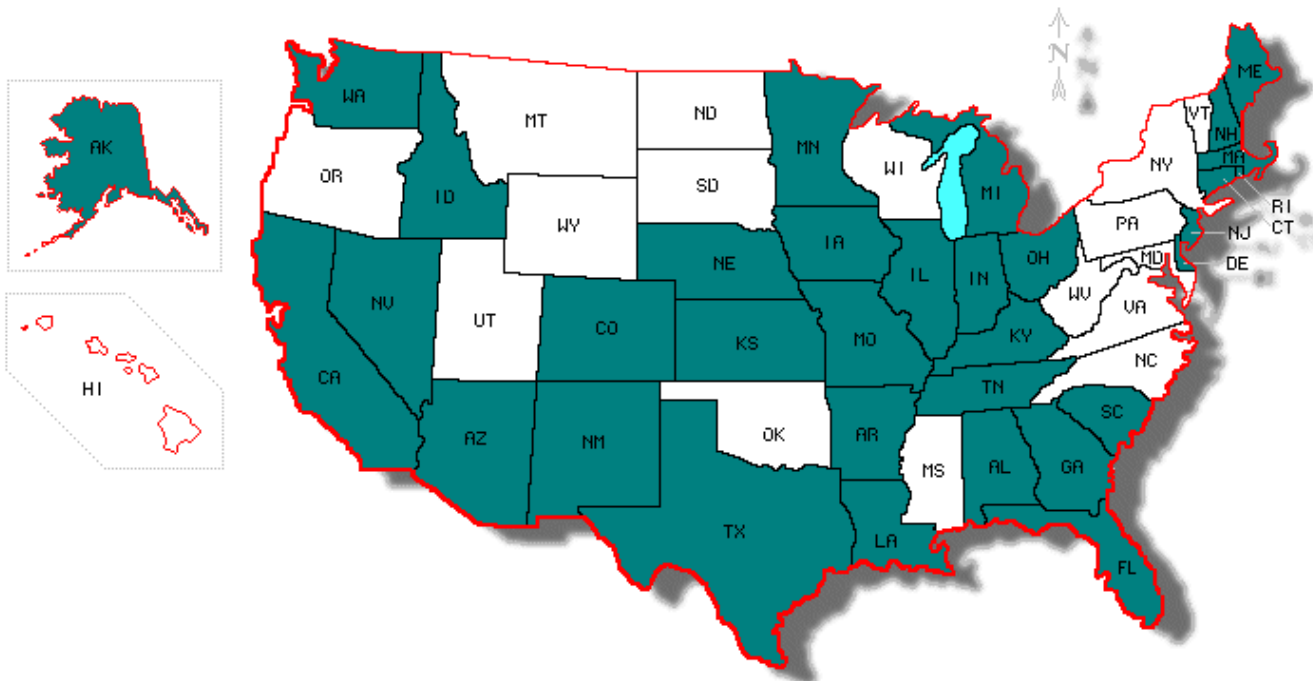
# Rubberized Asphalt Pavements

- ▣ 81% Waste Tires Recycled in KY
- ▣ 18% still landfilled



# U. S. Markets or Tests

● - Rubberized Asphalt



# Binder and Pavement Rehabilitation

- ▣ Stress Absorbing Membrane Interlayer (SAMI)
  - ▣ SAM with Rubberized Gap Graded Asphalt overlying layer



Before: San Jose, p. 4 *Western Pavement Maintenance Forum*  
2009 Award of Excellence in Contracting *Chip Seal / Innovation Category*

# Binder and Pavement Rehabilitation

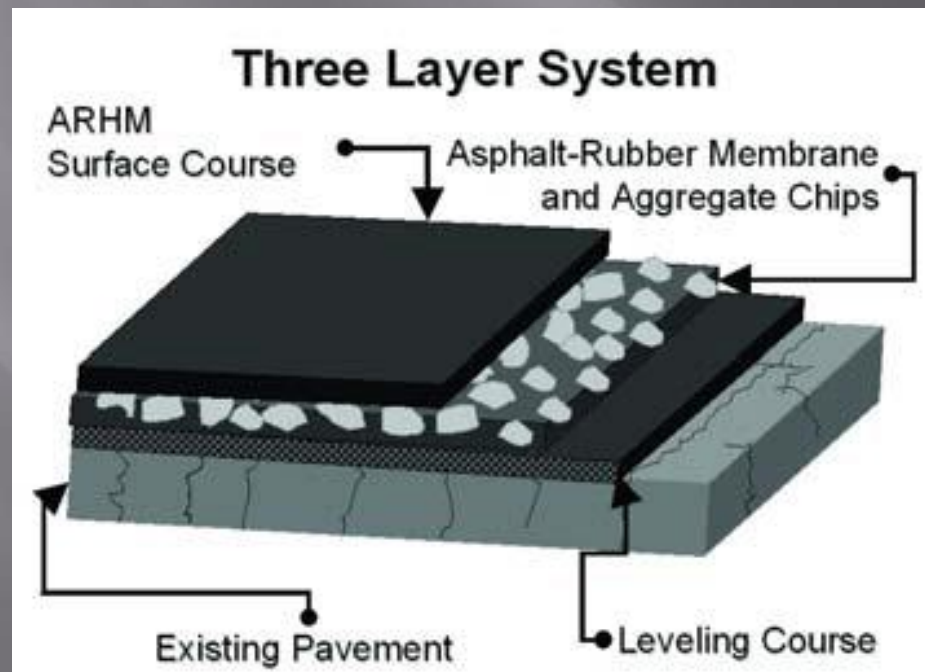


After: San Jose, p. 5 *Western Pavement Maintenance Forum*  
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# Binder and Pavement Rehabilitation

- ▣ TWO AND THREE LAYER SYSTEMS
  - Asphalt-rubber SAMI and either the gap or open graded hot mix material as the final wearing course
  - Avoids costly reconstruction



# Frequently Asked Questions

- ▣ How many waste tires can be used?
  - A two-inch-thick RAC resurfacing project uses about 2,000 scrap tires per lane mile (CAL Recycle)
  - Depending on type of use, 500-2,000 tires per lane-mile (Liberty Tire)



# Frequently Asked Questions

- ▣ How many waste tires are used?
  - rubberized asphalt uses 100 million pounds of crumb rubber per year (RMA Market Report for 2007).
- ▣ 2% U.S. Waste Tire Generation
- ▣ FL highest with 5% of annual waste tire generation



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manufacturers  
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# Frequently Asked Questions

- ▣ Why isn't it more widely used?
  - “Experimental”
  - Engineers expected comfort with the usual materials
    - ▣ Test sections needed to familiarize engineers, contractors, plant operators
    - ▣ Training of asphalt plant hot mix operators by AR operators is required



# Frequently Asked Questions

- ▣ Does the use of rubber cause dangerous emissions?
  - New additives reduce emissions
  - NIOSH finds emissions no more generally than conventional asphalt
  - Aroma is different



# Frequently Asked Questions

- ▣ **Can rubberized asphalt be recycled?**
  - City of Los Angeles. LA., recycled a 12-year old RA pavement
  - Met specifications and passed all tests



# Frequently Asked Questions

- ▣ **Can RA be used in cold climates?**
  - California uses in Sierra Mountains
  - Alaska and Sweden use to counter snow tires stud damage
  - Massachusetts and New Jersey use
  - Proper mix design and construction practices are critical (no OGFC)



# Possible Uses in KY

- ▣ Polymer Replacement
  - Polymer shortage increased cost in 2008 and changed projects
  - KY TC paved interstates using PG specs without polymer
  - Rutting susceptibility potential increased and pavement endurance decreased
  - TC wants to be in a position to continue paving should polymer shortage return





# Pilot Project

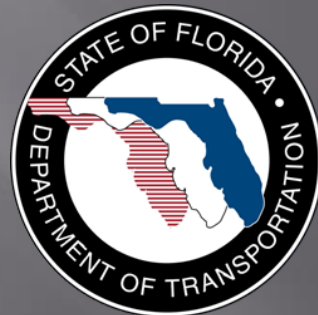


To Protect and Enhance Kentucky's Environment

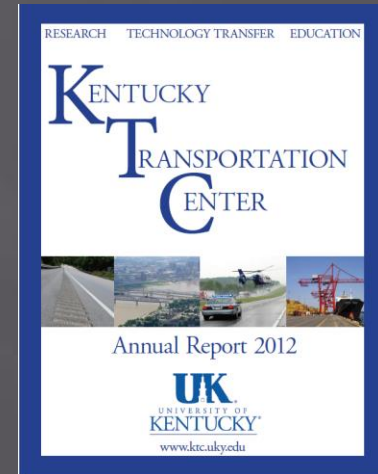
Eaton Asphalt  
Paving Co.



TAG Resource  
Recovery



Modified Asphalt  
Solutions, Inc



# Pilot Project

- ▣ July 24, 2013 Planning Meet at District 6, Florence:
  - Rejected KY 18 (Road to Florence Mall from I-75) due to structural problems with underlying concrete
  - Selected KY 8 (2.2 mile from I-471 to Dayton KY)



# Pilot Project

- ▣ July 24, 2013 Planning Meet at District 6, Florence:
  - One lane is control using standard asphalt and 0.38A PG 76-22 (interstate grade) Superpave 0.38 spec.
  - Both 6.0% base asphalt, 5.0-5.2% liquid with 20% RAP
  - Other lane is same as above plus 14% ground tire rubber with 100% passing #30 size



# Pilot Project

- ▣ July 24, 2013 Planning Meet at District 6, Florence:
  - EEC to pay \$85,000 over initial \$651,000 project costs
    - ▣ \$70,000 to TC for rubberized asphalt and interstate quality asphalt over regular street asphalt
    - ▣ \$15,000 to UK for long-term testing



# Pilot Project

- ▣ September 25, 2013 Preconstruction Meet and Project Start:
  - Discussed testing
  - Ingredient added to make rubberized asphalt handle similar to regular asphalt, decreases rubber smell



# Pilot Project



Spraying the tack coat looking northeast. Ohio River floodwall on right and background. Photo by Mark Belshe RPA

# Pilot Project



Paving train applying rubberized asphalt looking west.  
Photo by Mark Belshe RPA

# Pilot Project



Paving train applying rubberized asphalt looking southwest.  
Photo by Mark Belshe RPA



# Pilot Project



Workers smoothing rubberized asphalt around manholes looking southwest. Photo by Mark Belshe RPA

# Pilot Project



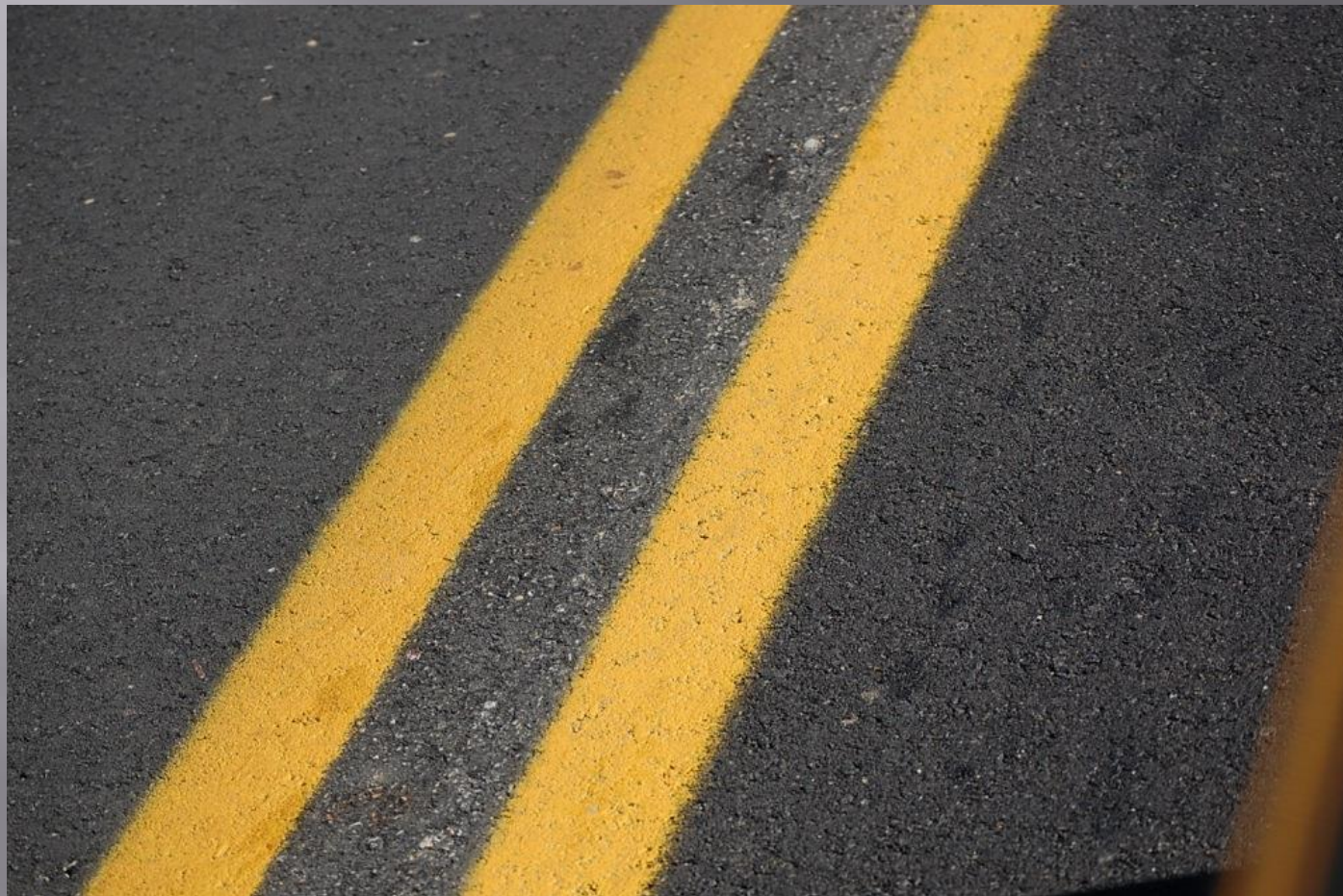
Vibratory roller with view to southeast.  
Photo by Mark Belshe RPA

# Pilot Project



Downtown Dayton KY rubberized and polymer asphalt. Photo by Brian Donnelly TC

# Pilot Project



Close-Up of control and rubberized asphalt. Photo by Brian Donnelly TC.

# Pilot Project



Close-up of rubberized asphalt. Photo by Brian Donnelly TC.

# Pilot Project Results

- ▣ Density Tests: 100% payment or 92% density
- ▣ Initially there were high void content in the mix, but this was quickly brought under control with deletion of sand and add 0.3% asphalt.



# Pilot Project Results

- ▣ Constant adjustments made at plant
  - District 6 QA suspects rubber settlement occurred
  - Contractor says 14% AR too high
  - Rubber particles meet spec (100% passing #30 sieve)
  - RPA engineer says worked like regular asphalt
  - FL DOT says watch settling of rubber particles (stir, haul distance)



# KTC Pilot Project Results

- ▣ KY Transportation Center permeability tests yield normal results
- ▣ Spring: Skid testing, visual survey, another round of cores





# Pilot Lessons Learned

- ▣ Look at lower AR% used by other states: FL 10%, GA 5%
  - May require +polymer or additive
  - May require KY to lower elasticity spec from 75% to 70% or lower (KY highest in U.S.)



# Pilot Lessons Learned

- ▣ Do another pilot project that meets 70-22 GTR spec and do long-term testing (contractor)
- ▣ Not many contractors in state have vertical tanks or stirring equipment like Eaton
- ▣ KY not ready if polymer prices increase



# Pilot lessons Learned

- ▣ Rubberized Asphalt currently costs \$12.00 per ton vs. \$8.00 polymer-modified asphalt
  - Costs good only for this project
  - Costs varies with transportation distance and other factors
  - May swing the other direction with polymer shortage



# After Pilot

- ▣ KTC & DWM attended Rubberized Asphalt Conference in AZ Oct. 14-17, 2013
- ▣ DWM led round table at KACo annual meeting November 21
- ▣ Presentation to Annual Meeting for Plantmix Asphalt Industry of Kentucky in February 2014 at Louisville



# After Pilot

- ▣ Plot polymer shortage strategy with Division of Materials to adjust specs , tests or recommendations
- ▣ Pursue future hot-mix pilot with Transportation Cabinet
- ▣ Pursue chip-seal pilots with counties



# Resources



**KENTUCKY**  
TRANSPORTATION CABINET

RESEARCH   TECHNOLOGY TRANSFER   EDUCATION

**K**ENTUCKY  
**T**RANSPORTATION  
**C**ENTER

A horizontal strip of four small images. From left to right: a road with a white line, a river with a dam, a car on a road, and a red crane at a port.

Annual Report 2012

**UK**  
UNIVERSITY OF  
**KENTUCKY**

[www.ktc.uky.edu](http://www.ktc.uky.edu)

# Resources



U.S. Department of Transportation  
**Federal Highway Administration**



# Resources



<http://rubberpavements.org/>

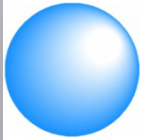


<http://www.ra-foundation.org/>





# Resoruces



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<http://www.rma.org/scrap-tires/>

**BRIDGESTONE**



# Resources

## U.S. EPA Scrap Tire Workgroup Website



- Wastes Home
- Resource Conservation Home
- Common Wastes and Materials Home
- 
- Scrap Tires Home**
- Basic Information
- Uses
- Environmental Issues
- Laws/Statutes
- Where You Live
- Grants/Funding
- Science/Technology
- Publications
- Scrap Tire Workgroup**
- 
- Information Resources
- Laws & Regulations
- Educational Materials
- Partnerships

Wastes – Resource Conservation – Common Wastes & Materials – Scrap Tires

### Scrap Tire Workgroup

<http://www.epa.gov/epawaste/conserva/materials/tires/workgroup.htm>

[Goals Committee](#) | [Civil Engineering Committee](#) | [Tire Derived Fuels Committee](#) | [Ground Rubber Committee](#) |

#### Background

The Scrap Tire Workgroup was created in 2003 by EPA to gather together public and private individuals who share a common goal: to effectively manage over 300 million scrap tires generated each year in the U.S. and to eradicate the 500 million tires in stockpiles.

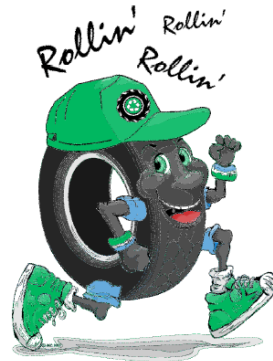
Since its inception, the Workgroup has supported the successful achievement of critical tasks in the field of scrap tire management. Its efforts have delivered environmental, social and economic benefits to individual states and the country as a whole.

(See Contribution to EPA's 2011-2015 Strategic Plan)

The scrap tire industry in the U.S. is worth over \$500 million dollars annually and employs over 10,000

people.

The Scrap Tire Workgroup is committed to the sustainable use of scrap tires: products made from crumb rubber, such as automotive parts, rubber products and flexible materials; rubberized asphalt; civil engineering uses; and tire derived fuel.



#### Workgroup Contact information

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<http://www.epa.gov/wastes/conserva/materials/tires/workgroup.htm>

# Questions?

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To Protect and Enhance Kentucky's Environment

Member U.S. EPA Scrap Tire Committee

