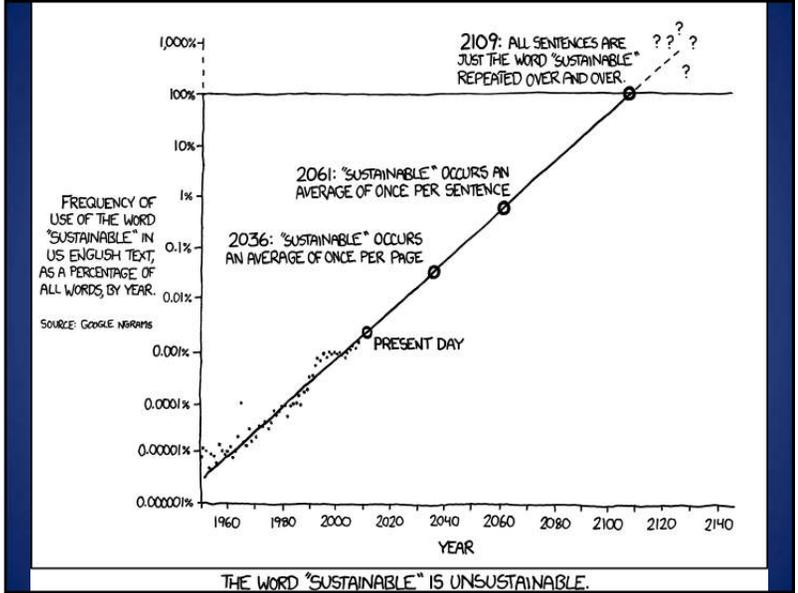


Minimizing Paving Costs with Sustainable Materials

for IRC 2014
Presented by



Sustainability

- Definition: "practices that conserve resources in a manner that allow growth and development to be sustained for the long-term without degrading the environment".
- Controversy over what practices, products, materials actually meet the definition
- The simple approach:
 - 3Rs, Reduce-Reuse-Recycle

Alternative Titles

- Saving money and saving the environment – No, (unintended consequences)
- Doing more with less
- Increasing performance and value - cost effectively, not just cutting cost
- The rest of this presentation will focus on the use of several asphalt paving technologies that improve the 3Rs of asphalt pavement and reduce the cost when implemented.

Asphalt is the Sustainable Pavement

- Reclaimed asphalt pavement (RAP) is 100% reusable
- Reclaimed asphalt shingles (RAS) –recycled waste
- Asphalt Rubber using ground tire rubber (GTR) - recycle
- Bio based and other additives – reduce use of petroleum
- Other waste products, recycled aggregates
- Warm Mix technology reduces energy and emissions at the plant and paving site
- Perpetual (long-lived) pavement – reduce reconstruction
- Porous pavements reduce stormwater runoff and pollution
- Visit:
http://www.flexiblepavements.org/sustainable_pav.cfm

RAP

- Reclaimed Asphalt Pavement (RAP) is the big story in re-use and reduction.
- RAP is the most re-used/recycled of all materials

OHIO is a high RAP usage State



According to an FHWA/NAPA survey in 2013, new asphalt concrete in Ohio used an average of 28% RAP and nearly 100% of all RAP was reused in new asphalt concrete.

RAP

- In Ohio nearly 100% of old asphalt pavement is reclaimed (RAP)



RAP

- Nearly 100% of the RAP is re-used to produce new asphalt concrete.



RAP

- Approximately 28% (average) of every ton of new asphalt concrete is reused RAP.
- Use of virgin materials are reduced.
- The numbers are getting better every year as equipment and technology improves.



Reclaimed Asphalt Shingles (RAS)

- Research and demonstration projects in the 1980's and '90 showed RAS could be beneficially used in HMA.
- Some producers have routinely used manufacturer's waste RAS in HMA.
- A 1997 FHWA/ODOT study showed use of shingle manufacturing waste could improve the performance characteristics of asphalt concrete

RAS from Tear-offs

- 10 million tons of asphalt Shingles enter waste stream each year
 - 1 million tons manufacturer waste
 - 9 million tons tear-offs or used Shingles
 - Third largest construction material waste
- The Asphalt Roofing Manufacturers Association (ARMA) analyzed a number of recycling options and identified HMA as the best use
 - Volume of waste used
 - Ease of recycling since Shingles composed of materials routinely used in HMA

Why recycle shingles into asphalt concrete?

- Economic benefits
 - Considerable cost savings per ton of HMA – replaces some of the most costly ingredient, asphalt binder
 - Reduces the use of virgin binder
- Important where RAP is in insufficient supply
- It's the right thing to do
 - Process can be engineered to provide asphalt mixtures with equivalent or improved performance
 - Keeps waste out of the landfill

RAS Challenge

- Shingles typically contain:
 - Asphalt
 - Tear-offs contain 30 – 40% asphalt content
 - Manufacturer waste 18 – 22% asphalt
 - 40 to 60% hard rock granules and fillers
 - 1 to 12 % fiber and other materials
- But, RAS from tear-offs is harder to re-use and blend the reclaimed asphalt

ODOT RAS Specifications

- In 2010 and 2011 ODOT specifications were modified to permit the use of post-consumer, tear-off shingles in asphalt concrete
- Requires careful testing and processing to ensure no asbestos or other hazardous or deleterious material.
- Development continues on how best to incorporate tear-off RAS

Ground tire rubber recycling

- Recycled GTR has been used in asphalt pavement mixtures in various ways
- As a aggregate replacement (dry process)
- And in a more beneficial method known as the 'wet process' or Asphalt Rubber
- Recycle 1000 tires per inch per mile

Ground tire rubber recycling

- In the wet process, GTR is reacted with the asphalt at the rate of 15 to 20% to cause swelling and partial digestion of the rubber particles into the asphalt.
- This type of blending can be done at the asphalt terminal or asphalt mixing plant.
- Properly done, this modification produces a beneficial improvement of the asphalt elastic properties similar to what we are used to seeing in polymer modification of asphalt.

GTR

- This blending of a large volume of rubber into the binder is a two-edged sword.
- It uses more recycled material, but
- It can be more problematic than polymer modification to produce consistent results.
- The detrimental effects of over processing are discussed in a White Paper, "The Effects of Digesting Crumb Rubber in Modified Binders (MB)", available at http://rubberpavements.org/Library_Information/White_paper_Effects_of_Digestion_of_CR_ETG_Feb_15_2011.pdf

ODNR GTR Demo projects

- Several done in Ohio
- Lucas County, King Rd., 2004
- Franklin County, Frank Rd., 2006



More GTR information

- Chapman presentation, OAPC 2009, <http://www.flexiblepavements.org/documents/OHIOGTR.pdf>
- <http://www.rubberpavements.org/faq.html>

Bio-Derived Asphalt Binders

- Many companies and research institutions (Iowa State U) are busy developing alternative binders and supplements from crops, bio-mass or bio wastes.
- See the discussion at <http://www.fhwa.dot.gov/pavement/materials/pubs/hif10002/ahpm04.cfm>
- Also, Ecopave Australia and Road Oyl

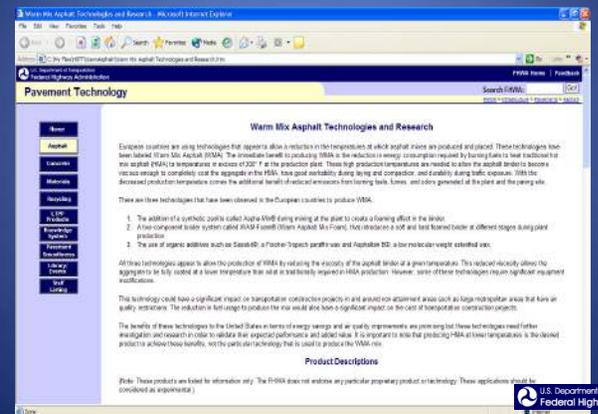
Bio based additives

- An Ohio Company is developing a bio-oil from swine manure waste that can be used to extend and improve asphalt binder, based on laboratory results.
- The process is ready for full-scale production and testing.
- Nu-Vention Solutions, Inc BR2, http://nuventionsolutions.com/BR_2_Technology.html

Other recycled aggregates

- Steel slag
- Foundry sand
- Glass
- Wet bottom boiler slag

FHWA, Every Day Counts, WMA www.fhwa.dot.gov/pavement/wma.htm



Reduce pavement reconstruction by using long-life pavement

No asphalt base pavement on Ohio's Interstate system has ever required replacement or major rehabilitation – see the study: [Economic Evaluation of Ohio's Flexible and Rigid Interstate Pavements](http://www.flexiblepavements.org/images/ecoeval.pdf) at: <http://www.flexiblepavements.org/images/ecoeval.pdf>

The **Perpetual Pavement Concept** – base that lasts indefinitely with just surface maintenance

Economics and Sustainability

- If the process is not economical, its not sustainable
- Economics drives 3R activities – not all currently being used, but may become important
- The economics are changing constantly:
 - Cost of asphalt, polymers and aggregates
 - New equipment and technology for using reclaimed materials

For more Information on Sustainable Pavement visit: http://www.flexiblepavements.org/sustainable_pav.cfm



Questions?

- About Sustainability in Asphalt Pavements?

