Takeaways

• Sustainability in NAPA

• Current Challenges in Sustainability for Pavements

• Industry Research Projects
Innovative Asphalt Technologies

- Porous Asphalt
- Warm Mix Asphalt (WMA)
- Reclaimed Asphalt Pavement (RAP)
- Ground Tire Rubber (GTR)
- Recycled Asphalt Shingles (RAS)
- Perpetual Asphalt Pavement
Recent Events

2010 – FHWA Sustainable Pavements Program
2012 – Industry Roadmap Mission

To improve asphalt pavement design, material, and sustainable technologies to ensure the continued delivery and performance of economical, safe, quality pavements.

2014 – Diamond Achievement Sustainable Commendation Added
& NAPA Sustainability Committee Created
Industry Research Fund

- 7 NAPA-SAPA Task Groups
- $1 Million Program
- Funded by NAPA & SAPAs with 100% SAPA Participation
<table>
<thead>
<tr>
<th>THE TEAMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pavement Design</td>
</tr>
<tr>
<td>Pavement Type Selection</td>
</tr>
<tr>
<td>Best Quality and Competitiveness</td>
</tr>
<tr>
<td>Pavement Preservation</td>
</tr>
<tr>
<td>Environmental Sustainability</td>
</tr>
<tr>
<td>Legislative</td>
</tr>
<tr>
<td>NEW! Private Sector Markets &amp; Local Roads</td>
</tr>
</tbody>
</table>
Challenges - New Era of Transparency

- Transitioning to Credits that Require Measurement of Environmental Performance
- Cities, States, and Federal Govt. Adopting
Pavement Life Cycle Assessment

Inputs – Materials, Energy, Water
- Raw Material
  - Aggregates
  - Admixtures
  - Asphalt Binder
  - Transport

- Production
  - Fuel
  - Water
  - Equipment

- Construction
  - Transport
  - Paving

- Use
  - Vehicle Operation
  - UHI
  - Stormwater Runoff
  - Maintenance/Workzone congestion

- End of Life
  - Landfill
  - Recycle

Recycle/Reuse

Outputs – Solid Wastes, Emissions to Air, Emissions to Water

LCA
Environmental Product Declarations

EPD declares quantified environmental data for a defined product

- Fair
- Comparable
- Third Party Reviewed
- Credible

Source: PE International, Values are for illustration purposes only.
NAPA EPD Program

- Program Overseen by the Sustainability Committee
  - Created in Sept. 2014
  - International Standards
- PCR Asphalt Mixtures
  - Product: - 1 US Ton
  - Mix-specific and plant specific
  - Meeting DOT specifications

www.asphaltpavement.org/epd
NAPA EPD Program Goal

- Benchmark environmental performance
- Communicate environmental performance transparently

Therefore PCR
- Prescribes Public Data
- No Proxies
EPD Delivery

1. Identify Program Operator
2. Identify or Develop a PCR – Program Operator $
3. Conduct LCA study – LCA Consultant $
4. Development of EPD – LCA Consultant $
5. Verification of EPD & LCA study – 3rd Party Reviewers $
6. Publish EPD – Program Operator $

Challenge: Current Process is Timely
CREATE PLANT

Create Plant: Use this page to enter the data for a new plant. This will in turn populate the data needed to specify mixes, and create an EPD. All data is private and secure.

<table>
<thead>
<tr>
<th>Plant Name:</th>
<th>Test Plant 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Tonnage Produced:</td>
<td>210,000 Ton/yr</td>
</tr>
<tr>
<td>Natural Gas Usage (yearly):</td>
<td>80,268 MCF/yr</td>
</tr>
<tr>
<td>Natural Gas Usage (daily):</td>
<td>321 MCF/day</td>
</tr>
<tr>
<td>Electricity Usage (yearly):</td>
<td>617,240 kW/yr</td>
</tr>
<tr>
<td>Electricity Usage (daily):</td>
<td>1,691 kW/day</td>
</tr>
<tr>
<td>Onsite Generator Fuel Type:</td>
<td>CHOOSE ONE</td>
</tr>
<tr>
<td>Onsite Generator Fuel Usage:</td>
<td>Gal/yr</td>
</tr>
</tbody>
</table>

Need help? Download our Guide to Plant Data [HERE](#).
Mix Page: Complete an incomplete mix by choosing Edit, or create an EPD for a particular mix by choosing Make EPD. Want to create a new mix? Go to the **NEW MIX** page.

<table>
<thead>
<tr>
<th>Mixes</th>
<th>Plant</th>
<th>Status</th>
<th>Actions</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mix 1A</td>
<td>#44 Georgia</td>
<td>Incomplete</td>
<td>Make EPD</td>
<td>Edit</td>
<td>Delete</td>
</tr>
<tr>
<td>7-42C</td>
<td>#7</td>
<td>Complete</td>
<td>See EPD</td>
<td>Edit</td>
<td>Delete</td>
</tr>
<tr>
<td>Mix 1B</td>
<td>#44 Georgia</td>
<td>Complete</td>
<td>Make EPD</td>
<td>Edit</td>
<td>Delete</td>
</tr>
<tr>
<td>Mix 1C</td>
<td>#44 Georgia</td>
<td>Complete</td>
<td>Make EPD</td>
<td>Edit</td>
<td>Delete</td>
</tr>
</tbody>
</table>
Asphalt Mixture Production

Transportation

End of Service Life

Maintenance

Use Phase

Construction

Source Materials

Reuse

Disposal

<0.1%

Challenge: What about full LCA for asphalt pavements?
Surface texture
the roughness of the aggregate materials in a pavement

Smoothness
surface unevenness that affects perceived ride quality

Pavement stiffness
how the pavement deflects under a vehicle’s weight

Almost 75 percent of the oil consumed in the United States is used as vehicle fuel. Increases in vehicle fuel economy over the past few decades, fuel costs, and a significant increase in the number of miles traveled have all helped to improve fuel economy. Numerous factors influence the fuel economy of a vehicle, including aerodynamic properties, engine, the weather, and air temperature. However, just three short factors impact fuel economy: vehicle internal friction, air drag, and road surface. The three top factors are also the most important based on the vehicle's speed.

The rolling resistance force a vehicle must overcome to maintain speed is linked to its internal friction, internal pressure, and the properties of the pavement. Three main properties are commonly understood to influence rolling resistance:

- Surface texture: the roughness of the aggregate materials in a pavement
- Smoothness: surface unevenness that affects perceived ride quality
- Pavement stiffness: how the pavement deflects under a vehicle’s weight

Vehicle Energy Consumption by Speed:

- Rolling resistance:
  - Internal friction: 20%
  - Air resistance: 25%
  - Aerodynamic Drag: 55%

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Vehicle Fuel Economy and the role of pavement Smoothness

When it comes to America’s roads, drivers want surfaces that are safe, durable, and support fuel efficiency. Pavement smoothness is critical in achieving each of these goals, and the Federal Highway Administration (FHWA) recently determined that smoothness is the key factor in ensuring satisfaction for road users.

Thanks to advanced materials and construction techniques, asphalt provides a smooth, continuous surface that meets standards with a lessening of pavement roughness and associated noise issues. An improved surface reduces fuel consumption and increases safety and comfort for the driver.

NAPA (National Asphalt Pavement Association)
• Utilizes LTPP Data
• Free
• Web Based, Customizable
• Life-Cycle Emission Benchmarking
Measuring Rolling Resistance

- Evaluating Equipment that Measure RR
  - Most equipment only simulates passenger cars
  - Couple of equipment in R&D phase for heavy vehicles
  - TUG – Most repeatable and robust but only simulates passenger cars

- In contact with Miriam Study Researchers
About 4.16M scrap tires were used to make quiet, rubberized asphalt pavements.

Reuse of old pavements SAVES 13,500 Olympic-size pools worth of landfill space.
About **1.9M** tons of roofing shingles were put to use in new pavement mixes and other road-building uses.

**72M** tons of old pavements were put to use in new pavement mixes and other road-building activities.
99%+ of the material removed from old asphalt pavements is reused in new pavements.

$2.8B+ SAVINGS from recycled materials compared to the cost of raw materials.

WARM-MIX ASPHALT technologies have the benefit of reducing energy consumption which decreases the production of greenhouse gases.

32%+ Nearly a third of all asphalt pavement mixtures are produced using warm-mix technologies.
Specialization in Asphalt Sustainability Implementation Webinar Series

Drivers
• Legislative, Regulatory and Market

Opportunities
• Design, Construction and Maintenance of Porous Pavements
• Recycled Materials: Ground Tire Rubber
• Recycled Materials: RAP and RAS
• Sustainable Plant Operations

Tools
• FHWA Sustainable Pavements Program
• Green Rating Systems: Infrastructure
• Green Rating Systems: Buildings
• Creating a Successful Sustainability Program
• Environmental Product Declarations

www.asphaltpavement.org/webinar
THANK YOU

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