NCAT Pavement Test Track

- 2009 Track Research Findings
- Planning for the 2012 Research Cycle
End-of-Cycle Track Conference

- WMA & high recycled content mixes
- Mechanistic pavement design
- Alternative materials
- Implementation

Pavement Test Track Conference

February 28-29, 2012
The Hotel at Auburn University and Dixon Conference Center

www.ncat.us
Accelerated Pavement Testing (APT)
Implemented Track Findings

- Change from coarse to fine gradations (2000–2003)
- Alternative mix materials (polymers, gravel, etc.)
- Design gyration revisions (139<sub>98</sub>, 100<sub>00</sub>, 80<sub>03</sub>, 60<sub>06</sub>)
- Construction variability limits (PG67 VTM > 2¾%)
- Interim pavement design recalibration (0.44 - 0.54)
Wire Line Rutting Performance

Cycle of Construction by Color (Blue=2003, Red=2006, Yellow=2009); High RAP with Texture; WMA with Green Outline; Thinner Structural Sections in Brown Boxes (All Others on Perpetual Foundations); Trucking Percent Complete via Height of Gray Box on Y-axis

9/30/11

Avg Wheelpath Deflection by Wire Lines (mm)

Sponsored Test Sections

E05 E06 E08 E09 N01 N02 N03 N04 N05 N06 N07 N08 N09 N10 N11 N12 N13 W02 W05 W07 S02 S03 S06 S07 S08 S09 S10 S11 S12 S13
Rutting Performance \_GE+\_

![Graph showing rutting performance comparison between different materials and treatments.](image-url)

- Control Section: 7.1 mm
- PFC Surface: 5.4 mm
- RAP HMA: 1.7 mm
- RAP WMA: 3.7 mm
- Foam WMA: 9.0 mm
- Add WMA: 11.0 mm
- Thio Thick: 9.1 mm
- Thio Std: 9.2 mm
- Kraton Thin: 2.2 mm
- TLA Std: 4.5 mm

- Comparison highlights:
  - 88-15
  - 84-18
2009 GE+ Fatigue Expectations

Forecast Cycles to Failure via AASHTO (millions)

- Control: 0.07
- PFC: 0.07
- RAP: 0.02
- Foam RAP: 0.04
- Foam: 0.07
- Additive: 0.07
- Thiopave-7: 0.08
- Thiopave-9: 0.08
- Kraton: 0.88
- TLA: 0.09
High-Speed Pavement Response

![Graph showing longitudinal microstrain over time for different conditions: ALL, ALC, ALR. The graph indicates a peak of 430 microstrains.](image)
High-Speed Pavement Response

N8 Strain = 21.487e^{0.0335\text{Temperature}}
\quad R^2 = 0.96

N9 Strain = 11.496e^{0.0298\text{Temperature}}
\quad R^2 = 0.9217
High-Speed Pavement Response
2009 GE+ Fatigue Expectations

Actual

10 million ESAL strain cycles

Forecast Cycles to Failure via AASHTO (millions)

Control | PFC | RAP | Foam RAP | Foam | Additive | Thiopave-7 | Thiopave-9 | Kraton | TLA

0.3 | 0.2 | 1.6 | 3.8 | 0.6 | 0.6 | 0.6 | 8.1 | 5.6 | 1.0

95-13 | 89-14
Durability

Macrotexure Slope from 5 to 10 million ESALs

Test Section in 2009 Group Experiment

S9
N10
N11
S10
S11
MS High RAP Reflective Cracking 140-80-60

Crack Map (Trucking Percent Complete via Height of Gray Map Date Box)

Longitudinal Distance from Far Transverse Joint (feet)
- Original after 20M ESALs
- 1.5 inch Mill/Inlay after 10M ESALs
- 4" Mill/Inlay after 10M ESALs

Transverse Offset (feet)

9/30/11
Surface Performance Studies

- Long term performance of high RAP mixes
- OGFC to protect crack susceptible Superpave
- Effect of spray paver on OGFC performance
- 29% F&E versus 15% in both OGFC and SMA
- GTR versus SBS modified PG76-22
Structural Studies

- Two 9” pavements perpetual (like 24”)
- 10” on soft subgrade not perpetual (unlike 14”)
- High polymer mix for construction/rehabilitation
- Layer coefficient recalibration (0.44 $\Rightarrow$ 0.54)
- Higher fatigue life expectation for WMAs
- Higher fatigue life expectation for high RAPs
2012 Research Cycle

- Traditional stand alones
  - Traffic continuation
  - Mill/Inlay
  - Structural Sections
- Green Group (GG)
- Preservation Group (PG)
- Safety Edge implementation
Green Group (GG) Experiment

(3) SMA, OGFC or SUPERPAVE

(2) High Modulus Rut Resistant Asphalt

(1) Flexible Fatigue Resistant Asphalt

Pavement Foundation
Preservation Group (PG) Experiment

- Traffic continuation on 2009 GE+ test sections
- Stop traffic when trigger distress(es) reached
- Apply consensus PP treatments to GE+ sections
- Duplicate / expand study in off-Track research
- County access road to local aggregate quarry
Off-Track “PG” Test Sections

NCAT Pavement Test Track

NCAT

Martin Marietta Quarry + EAP Plant

Lee Road 159
Loaded Trucks in Outbound Lane

- Martin Marietta Quarry
- EAP's Auburn Plant
- Lee Road 159
Condition of Outbound Lane

Original 1-Lane Quarry Road Buildup

Widening

Left WP Good

Right WP Distressed
Proactive versus Reactive Preservation

Original 1-Lane Quarry Road Buildup

- Left WP: Good
- Right WP: Distressed

Widening
Pretreatment Crack Map
Life Cycle of Preservation Alternatives
Life Cycle of Preservation Alternatives

![Graph showing Life Cycle of Preservation Alternatives]
• Micro-surfacing
• 4.75 NMA mix overlays (½ inch vs ¾ inch)
• 9.5 NMA mix 1 inch thick overlay
• 9.5 NMA mix 1 inch thick mill/inlay
• 12.5 NMA mix 1½ inch thick mill/inlay
• Bonded friction course (¾” spray paved FC-5)
• Hot in-place recycling 1½ inch thick
Oklahoma Friction Study 2008-2009
2012 Track Preservation Treatments

- Chip seals (Various agg sizes, design processes, application rates)
- Scrub seals
- Micro-surface
- Cape seals
- Thin-lift HMA (Inlays vs overlays, conventional vs low cost)
- "HMA Cape seals"
- Fog seals (Traditional fog seals vs low pen recycled rubber)
- Micro-milling
- Etc...
Web Reports
Performance data for each section can be viewed by positioning your mouse over the section in question and left-clicking. Based on feedback from our research sponsors, the performance reports have been revised to include crack maps. The 2009 performance reports are now a fully integrated and active part of the web presentation.

- N1 through N11 and S8 through S12 are structural sections
- All other sections have deep perpetual foundations
- Research cycle of construction shown by color

1,339,922 ESALs as of 2300 hours on December 5.
Questions?

Dr. R. Buzz Powell, PE
Assistant Director & Test Track Manager

277 Technology Parkway
Auburn, AL  36830

Phone: (334) 844-6857
Cell: (334) 750-6293

Email: buzz@auburn.edu
Web: www.pavetrack.com