SHRP2 R06(E): Real-Time Smoothness Measurements during Construction

Robert Otto Rasmussen, PhD, INCE, PE (TX)
Robotto@TheTranstecGroup.com
What have we delivered from this project?

- Validation of innovative tools for evaluating concrete pavement smoothness in real time.
- Tools that can possibly be used for quality control and process improvements.
- Process improvements as a result of timely feedback.
- Improved understanding about what construction artifacts can affect smoothness.
What can’t we deliver from this project?

- A replacement for conventional profiling for acceptance.
- A replacement for better practices to construct smoother pavements.
Project Objectives

- Demonstrate and evaluate real-time smoothness measuring technologies for concrete paving.

- Develop draft specifications and construction guidance for use with these technologies.
Real-Time Smoothness Technologies

Device 1: GOMACO Smoothness Indicator (GSI)
Real-Time Smoothness Technologies

Device 2: Ames Engineering Real Time Profiler (RTP)
I-75 Widening and Reconstruction

Adel, Georgia
May 6-12, 2010
CRCP

Thanks to GDOT and The Scruggs Company for all of your help!!
What happened in front of the spreader?
What happened in front of the paver?

Video Camera
Technology Evaluation: Diary

What happened behind the paver?
Technology Evaluation

Evaluate Profiler Operation and Identify Construction Artifacts
Rough Trackline: Profile and Leg Motion

Profile from Dipstick
Leg height from sensor

Profile elevation (in)
Leg height (in)
Station
Quiz: Profile (Hardened)

Every 3 feet

Elevation (mils)

Distance (ft)

What is it ????
Quiz: Profile (Hardened)

Transverse Bars spaced 3 ft c-c

Reinforcement Ripple!!
Technology Demonstration #1

- Project: Vilonia Bypass (New Alignment)
- Owner: Arkansas State Highway and Transportation Department
- Contractor: Interstate Highway Construction
- Real-Time Smoothness Vendor: GOMACO
- April-May 2011
GOMACO GSI Behind the Paver
Line Sensor Adjustments
Localized Base Failures
Stringline Swap
Technology Demonstration #2

- Project: DFW Connector
- Owner: Texas Department of Transportation
- Contractor: Northgate Constructors
- Real-Time Smoothness Vendor: Ames

- June 2011
Paving Train
Stringless Paving Guidance
Ames RTP – Paver Mounted
Ames RTP Power Supply
Phase III, Demo #2B & #3

- Project: I-94 Reconstruction
- Owner: Michigan Department of Transportation
- Contractor: Interstate Highway Construction
- Real-Time Smoothness Vendor: GOMACO and Ames

July 2011
Work Bridge Mounted
Stringline Sensor Moved off Line
Stringline Sensor Moved off Line
Stringline Sensor Moved off Line
Stringline Sensor Moved off Line
Paver Adjustments
Paver Adjustments
Phase III, Demo #4

- Project: I-90 Reconstruction
- Owner: New York State Thruway Authority
- Contractor: Cold Spring Construction
- Real-Time Smoothness Vendor: Ames

August 2011
The Mystery at 18 ft.
The Mystery at 18 ft.
The Mystery at 18 ft.
The Mystery at 18 ft.
Findings – Visualization
Findings – Visualization
Findings

- Both vendors made some changes, but others are recommended.
- Mounting to the paver is not always the best.
- Paving crews embraced the technology.
- RTS technology is well suited for:
  - Identifying impacts on smoothness
  - Tuning the paver
  - Quality control
Project Deliverables

- Model Specifications
- Guidelines
- Documentation of profiler performance and recommendations
Thank You!

Project Principals:
Robert Otto Rasmussen, PhD, INCE, PE (TX)
Steven M. Karamihas, MSME
Helga N. Torres, MSE, PE (GA)
Gary J. Fick, MS

Senior Program Officer:
James W. Bryant, Jr., PhD, PE