Key Areas

• Friction / Texture
• Splash / Spray
• Noise
• Smoothness / Ride Quality
Pavement Friction

• Investigating most suitable equipment
• Working with States on data collection
• Develop Pavement Friction Management Programs with States
• High Friction Surface Treatments
FHWA Toolkit – Friction/Texture

• Equipment loan program
  • GripTester (2)
  • Circular Texture Meter – CTM (3)
  • Dynamic Friction Tester – DFT (3)
FHWA Toolkit – Friction/Texture

• Equipment demonstration program
• Dynatest Highway Friction Tester: Continuous Friction Measurement Equipment (CFME)
• High Friction Surface Treatments
• 11 State Study
• EDC2 Deliverable
CFMEs

• CFME – Continuous Friction Measuring Equipment

• Benefits
  • Continuous measurement and reporting of friction values rather than spot measurement
  • Measurement around curves and through intersections
  • Fixed-slip devices better measure available friction, which better correlates to anti-lock braking
  • Network-level and Project-level testing
Dynatest 6875H HFT

- **Fixed Slip Friction Testing**
  - 14% slip (can be varied)
  - Hydraulically Controlled

- **Continuous Friction Testing**
  - Reports friction at 1 ft intervals
  - Test left wheel path only (can be built for RWP)

- **Texture Measurement**
  - Texture laser in-line with test wheel
  - Reports MPD every 0.01 miles

- **Water System**
  - 500 gal water tank (6875H); also available with 200 gal water tank on standard truck chassis
  - Testing range ~27 miles (0.5 mm water film thickness)
Splash / Spray

- Splash – spray assessment tool development study - VTTI
- Development of a model to predict water film thickness and splash and spray occurrence on pavement surfaces
- Develop recommendations for threshold criteria to classify the impact of splash and spray on highway users.
FHWA Toolkit - Noise

• AASHTO Provisional Standard on Tire/Pavement Noise Measurement PP-76 using On Board Sound Intensity (OBSI)

• Developing two additional AASHTO standards on pavement noise measurement

• TPF 5(135) “Tire/Pavement Noise Research Consortium”
  • Develop lower cost OBSI system
  • Conduct equipment demonstration rodeos
Performance Measure Defined - FHWA

• Performance measurement is the use of statistical evidence to determine progress toward specific defined organizational objectives. This includes both evidence of actual fact, such as measurement of pavement surface smoothness, and measurement of customer perception such as would be accomplished through a customer satisfaction survey.

• http://www.ops.fhwa.dot.gov/perf_measurement/fundamentals/index.htm

• Last updated February 26, 2013
Measurement of customer satisfaction

• FHWA conducted User Survey: 2002
  • Road condition cited as the public’s number one criteria for satisfaction – smoothness.

• Because of the public’s focus on smoothness, any improvements made in both the initial and long term-smoothness of a roadway should lead directly to greater customer satisfaction.
Pavement Smoothness

• Pavement smoothness is probably the single most important indicator of performance from the standpoint of the traveling public (CLIENTS).

• Goal(s): Develop and deploy standards to provide consistent, quality data.

• Collaboration: HQ, RC, HRDI, AASHTO SOM, ASTM, SHAs, Industry and Academia.

• Used Technical Working Groups for Ride Quality and started a Pooled Fund Study.
International Roughness Index (IRI)
Advantages of IRI

• Reproducible, portable and stable with time

• General pavement condition indicator

• Describes roughness that causes vehicle vibrations
IRI is highly correlated to:

• Vertical passenger acceleration (Ride Quality)

• Tire Contact (vehicle control and safety)

• Output from Response Type Roughness Measuring Systems
Properties of IRI Analysis

• IRI computed using quarter car model
Computation of IRI

• Need longitudinal profile containing information relevant to ride

• Computation of IRI performed by a computer program as specified in ASTM Standard E1926

• Parameters of quarter car (e.g., spring stiffness, etc.) referred to as “Golden Car” parameters
Response of IRI to Wavelengths

Gain

Peak at ~ 8 ft
Axle Hop

Peak at ~ 50 ft
Body Bounce

IRI impacted by wavelengths from 4 to 100 ft

Wavelength, ft/cycle
Equipment Requirements for IRI

• Resolution of height sensor 0.001 inch or less

• Sample interval must be less than 2 inches
Inertial Profiler – Measuring Ride Quality
2007 Pavement Condition on the National Highway System (NHS)
National Average = 56.7%, Target 57% in 2009
Good/Very Good (IRI of <95″/mile)

Source: HPMS
Compiled By: Office of Pavement Technology
Federal Highway Administration
March 2008
Developing new standards

• Used Expert Task Group (ETG) – started 2000: consisted of industry, academia, SHA’s & FHWA.

• Provisional Standards on ride quality by 2003 – coordinated with AASHTO SOM – Andy Mergenmeier (P&M TST).

• Full AASHTO Standards on ride quality by 2010 with focus on project level data collection.

• Revised ride standards in 2013 to include network level data collection: AASHTO R43, M328, R54, R56, R57; ASTM E2560.
Goal: To assemble states and the FHWA to:

(1) identify data integrity and quality issues with inertial profilers;

(2) suggest approaches to addressing identified problems;

(3) initiate and monitor projects intended to address identified problems;

(4) disseminate results; and

(5) assist in solution deployment.
FHWA Toolkit

- Smoothness
- Profile Viewer and Analysis (ProVAL) software (www.roadprofile.com) – 10 workshops per year
- ASTM E2560-07: Standard Specification for Data Format for Pavement Profile
- NHI 131100 “Pavement Smoothness”
- AASHTO Ride Quality Standards Implementation Contract
  - M328 Equipment Specification
  - R54 Accepting Ride Quality using an inertial profiler
  - R56 Certification of Inertial Profilers
  - R57 Operating Inertial Profiler
Questions?

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