State-of-the Art in the Measurement of Pavement Surface Characteristics



PDRG-RPUG 1st Joint Meeting 19 April 2019









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What are Pavement Surface Characteristics?

- Vehicle/tire interactions with the road surface:
 - Noise & vibration
 - Braking
 - Steering & handling
 - Ride quality(evenness)
 - Hydroplaning
 - Rolling resistance (fuel consumption)
 - Tire wear
 - Vehicle durability



What are Pavement Surface Characteristics?





Why do we Measure Pavement Surface Characteristics?

- 1. Evaluate conformance with requirements.
 - a) Construction quality for acceptance.
 - b) Periodic testing of performance requirements (PPP / JEHDRA).
 - c) Laws and regulations (noise, friction, fuel economy).
- 2. Evaluate changes in pavement over time.
 - a) Asset management
- 3. To improve road, vehicle, and tire engineering.





Texture Classifications for Pavement Surface Characteristics





Texture Classifications for Pavement Surface Characteristics





Macrotexture



Microtexture



Measuring "Profiles" with Straightedges











Measuring Profiles with Inertial Profilers

Accelerometer

Computer (inside van)

Lasers (Height Sensors) Wheel Encoder (Distance Sensor)

Measuring Profiles with Inertial Profilers









Measurements of 3-D Profiles

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Calculating Evenness from Profiles: International Roughness Index (IRI)

Page 11



Viewing and Analyzing Profiles for Evenness







Viewing and Analyzing Profiles for Evenness







Viewing and Analyzing Profiles for Evenness











Measuring Profiles in Real-Time during Construction



Measurements for Texture







Measurements for Texture: Old, Worn Asphalt



Measurements for Texture: Good, New Asphalt



Measurements for Texture: Variability in Surface Texture



ement Engineering Specialists

Measurements for Texture: Variability in Surface Texture

Possible Causes of Raveling

Raking of Loose Mix

Excessive Mix Temperature





Measurements for Friction (Grip)







Grip Measurements for Improving Pavement Engineering

Sandstone Gabbro Slag Expanded Shale/Clay Granite Trap Rock

Limestone



A "cocktail" of aggregates can result in targeted grip levels. Also important to understand stability of grip with time.



Measurements for Tire-Pavement Interaction Noise



Tire-Pavement Interaction Noise

Quietest pavement we have measured: Precast Porous Concrete located in the Netherlands

Tire-Pavement Interaction Noise

media Stab

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Predicting Tire-Pavement Interaction Noise from Texture



Predicting Tire-Pavement Interaction Noise from Texture



Measurements for Rolling Resistance









Measurements for Rolling Resistance



Measurements for Rolling Resistance

Improper use of vibratory roller introducing texture





Improper use of vibratory roller introducing texture



Pavement Management





Pavement Management





Pavement Management





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