

### Efficiency and Performance of Diamond Grinding In Texas, USA

Prasad Buddhavarapu Andre Smit Jorge Prozzi



SaferRoads2014

# Introduction

- Maintenance of a 8.7 mile stretch of 20 to 40 years old CRCP in Fort Worth on I35W
- Diamond Grinding vs. thin-overlay
  - Cheaper
  - Bridge clearance issues
  - Texture improvement
- Evidence of immediate improvement in surface properties
- Monitor the deterioration of the surface properties

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# Project Layout (Before Grinding)



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# **Testing Schedule**

- April 2012 (immediately after the construction)
- August 2012 (after 4 months)
- February 2013 (after 9 months)
- July2013 (after 15 months)

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# **Field Tests**

- Texture
  - Laser based Circular Texture Meter (CTM)
    - Mean Profile Depth (MPD)
  - Volume based Sand Patch Test
    - Mean Texture Depth (MTD)
- Skid resistance
  - ASTM Skid Trailer
    - Skid number
- Pavement noise
  - on-board sound intensity device (OBSI)
- Roughness
  - TxDOT inertial profiler





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# Deterioration of surface properties

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Mean Profile Depth (MPD, mm)

Note: Significant changes are highlighted.

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### Skid Number (SN)

Note: Significant changes are highlighted.

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# Before Grinding Surface Roughness

### **0** Months

**4** Months

**119** Months





### IRI (inch/mile)

Note: Significant changes are highlighted.

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OBSI (dBA)

Note: Significant changes are highlighted.

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# Influence of Site features on the deterioration

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# Statistical Analysis

- Dependent Variables (4 different models)
  - MPD (CTM)
  - Skid number
  - Surface Roughness (IRI)
  - Pavement Noise (OBSI)
- Explanatory Variables (Indicator)
  - Traffic direction: North/ South
  - Pre-existing condition: Carpet drag/Burlap drag/Transverse Tining
  - Traffic: Lighter & faster/ heavier & slower (or Inner/outer lanes)
  - Wheel path: Left/right/in-between
  - Time of measurement-specific Fixed effects
  - Interactions terms

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# Surface Texture (MPD)

- Pre-existing condition
  - All three sections deteriorated uniformly over time
- Traffic speed and load
  - Outer lane deteriorated faster than inner lane over time
- Wheel path
  - Right wheel paths deteriorated faster

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# Skid Resistance (SN)

- Pre-existing condition
  - All three sections deteriorated uniformly over time
- Traffic speed and load
  - Uniform deterioration for the first 9 months
  - Subsequently, outer lane deteriorated faster than inner lane over time
- Traffic direction
  - North bound sections deteriorated faster over time

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# Surface Roughness(IRI)

- Pre-existing condition
  - All three sections deteriorated uniformly over time
- Traffic speed and load
  - Traffic speed and load did not influence the deterioration over time
- Traffic direction
  - Traffic direction did not influence the deterioration over time
- Wheel path
  - Right wheel paths deteriorated faster

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# Pavement Noise (OBSI)

- Pre-existing condition
  - All three sections deteriorated uniformly over time
- Traffic speed and load
  - Outer lane deteriorated faster (became louder) over time
- Traffic direction
  - Traffic direction did not influence the deterioration over time

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### Conclusions

- Short-term benefits of Diamond Grinding
  - Texture: reduced by 0.3mm reaching 0.96mm
  - Skid number: reduced by 7 SN reaching 27 SN
  - Roughness: maintained
  - Pavement Noise: reverted to pre-grinding levels
- Predominant presence of Limestone aggregate is a potential cause of faster deterioration.

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# Thank you !

Contact Information: Prasad Buddhavarapu Email: <u>prasad.buddhavarapu@utexas.edu</u> Phone: +1 512 903 3939

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