Field Evaluation of Porous Asphalt Pavement

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October 9, 2009

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Porous Asphalt -- Different Applications

- Porous Pavement Structures for Storm Water Management
- Porous Asphalt Surfaces for Noise Control
  - Both offer environmental and other benefits
  - Both need special attention to design, construction and maintenance.

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Porous Asphalt for Storm Water Management

- Porous Surface
- Porous Base
- Allow Infiltration

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Porous Asphalt Surfaces

- New Generation Open Graded Friction Courses
- Porous European Mix
- Porous Friction Course

- For noise control and safety
  - Reduced splash and spray
  - High friction (macrotexture)

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Growing Noise Problem

- Noise causes sleep disturbance, hearing problems, health problems.
- Transportation-related noise is a major factor.
  - Tire-Pavement Noise is a major contributor.
- Noise barrier walls going up across the country.
  - Expensive and of limited effectiveness.

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Why Porous Asphalt Surfaces?

- Control noise generation and propagation at the source, tire-pavement interface
- More cost effective
- Impact more people over a larger area
- Offer other benefits, particularly safety
  - Improved friction
  - Reduced splash and spray

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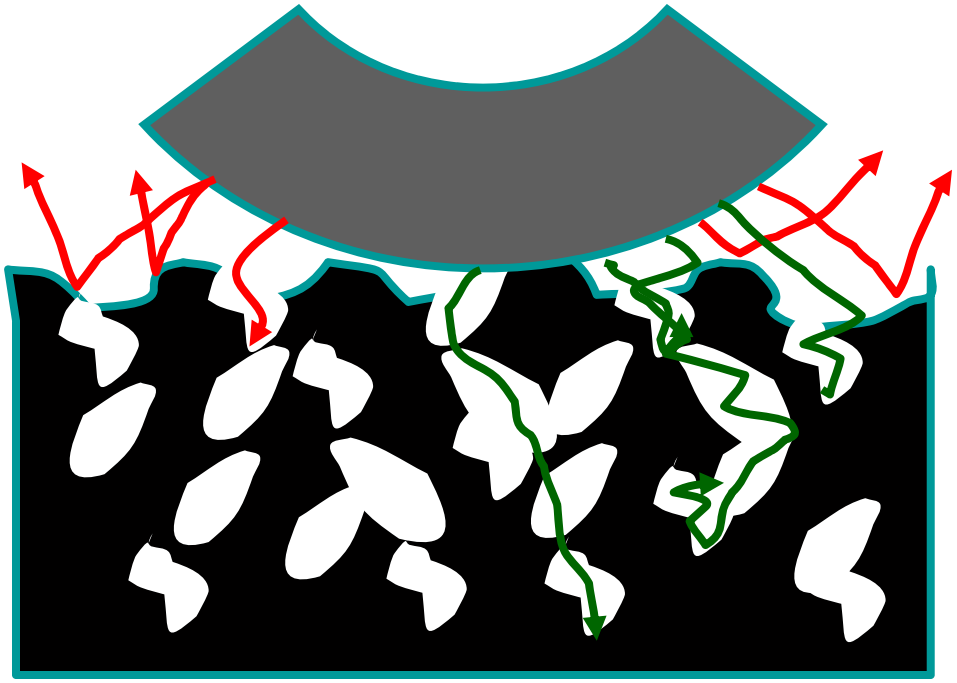
Pavement Porosity



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Two-Layer Porous Pavements

Fine porous layer prevents clogging of lower, coarser porous layer

Long Term Field Evaluation

- I74 Eastbound East of Indianapolis
- Constructed August 2003

- Comparison of Stone Matrix Asphalt (SMA), Porous Friction Course (PFC) and conventional HMA (Superpave)

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The Materials

- 9.5mm mixtures used Steel Slag and PG76-22 binder
- PFC designed at 18-22% air voids
  - Old OGFC designed at 12-15% voids
  - Polymer modified binder and fiber
- SMA has fairly open aggregate structure, but voids are largely filled with matrix of binder and filler (fiber)

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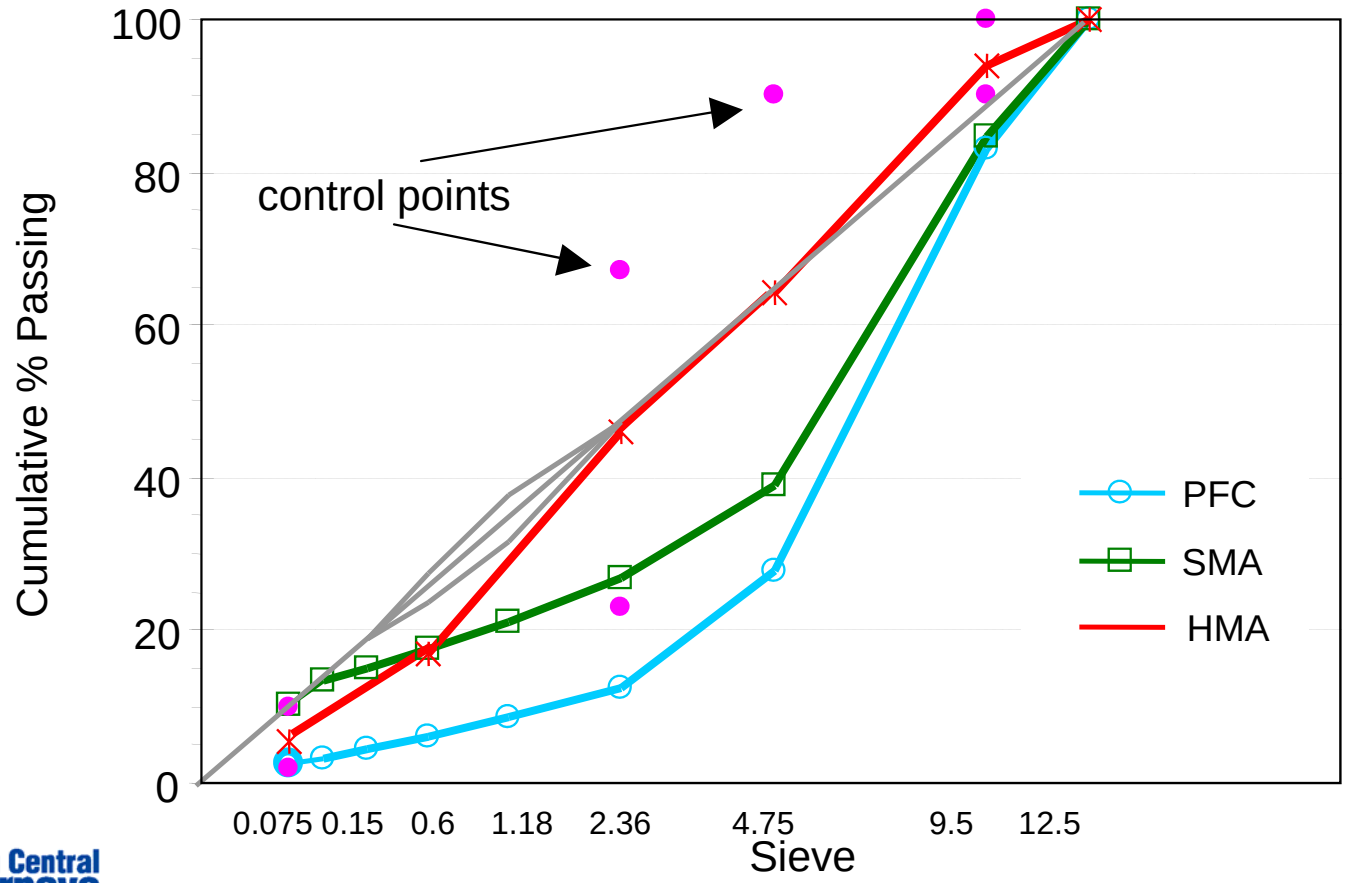
Design Gradations



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Construction


CAT
INGERSOLL-RAND


SMA vs. PFC

Conventional HMA

Performance

- Friction and Surface Texture
- Noise Measurements
- Splash and Spray

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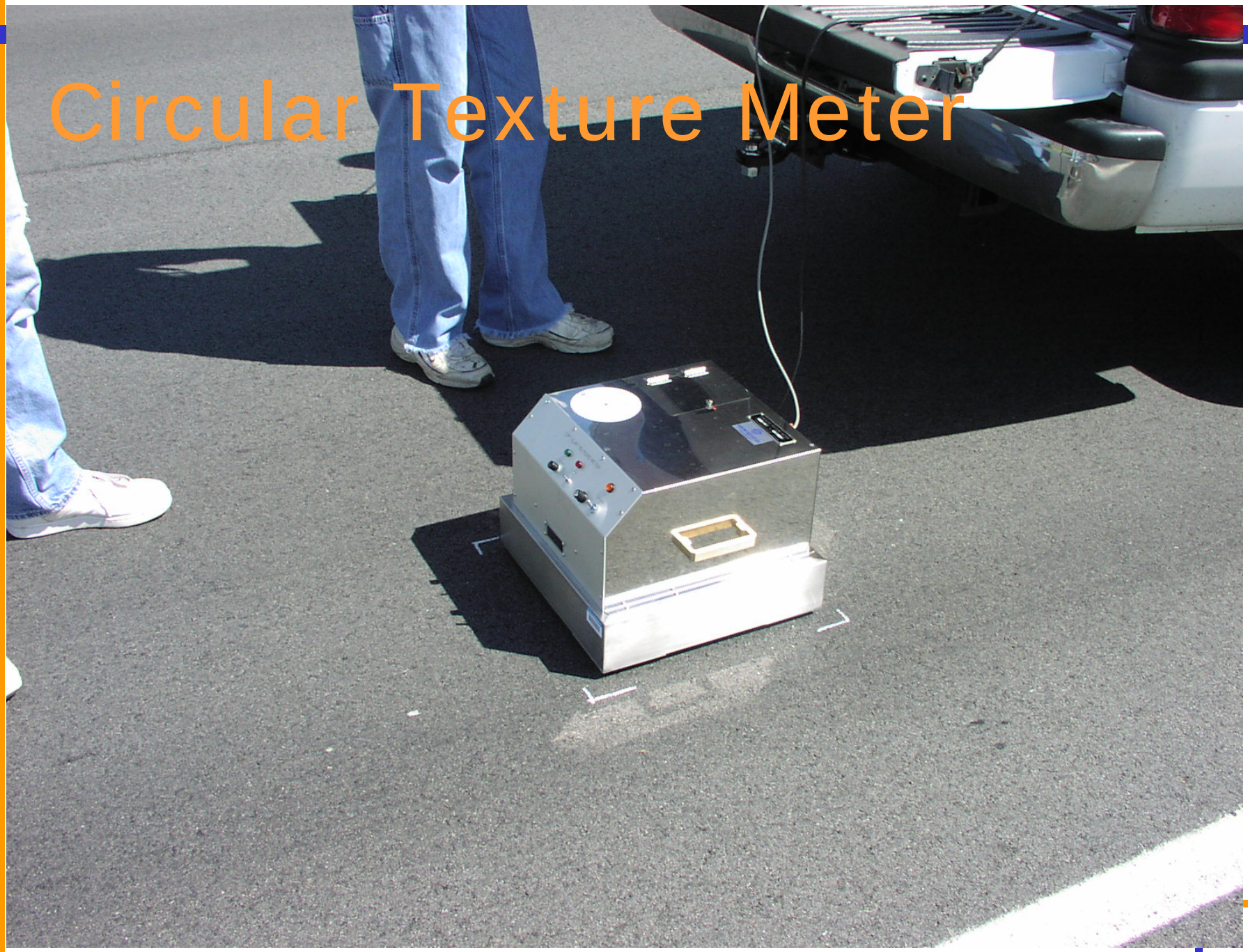
Circular Texture Meter



Dynamic Friction Tester

DFT and CTM

- DFT readings influenced by both micro- and macrotexture
- CTM measures macrotexture
- DFT and CTM used together to determine International Friction Index
  - Correlates well with other standard devices

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Initial Field Data Comparison

Surface	DFT 20	CTM	F60
Porous	0.51	1.37	0.36
SMA	0.37	1.17	0.28
HMA	0.52	0.30	0.19

Porous and SMA tested before trafficking.

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Initial Sideline Noise Data

At 80 kph (50 mph)

Vehicle	HMA	SMA	PFC
Impala	72.6	74.8	68.1
Volvo	75.2	75.5	70.1
Silverado	74.5	77.0	71.6

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CPX Data (dBA)

Speed	HMA	SMA	PFC
72 kph	93.0	94.2	89.7
97 kph	96.4	97.6	92.6

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Preliminary Findings

- PFC significantly quieter than SMA or conventional HMA – CPX and sideline
- In car noise significantly different and lower on PFC
- PFC provides higher macrotexture than SMA and much higher than HMA
- Friction levels are currently higher for PFC and SMA than HMA
- Significantly reduced splash and spray

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Splash and Spray

- Video by Wayne Jones, Asphalt Institute

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Long Term Performance

- Questions remained -- how long will these effects persist?
  - Does the PFC clog and lose effectiveness?
  - High permeability is supposed to help prevent that, but ….
  - Will traffic wear off film and increase IFI on PFC and SMA?
  - Will PFC lose macrotexture and friction?

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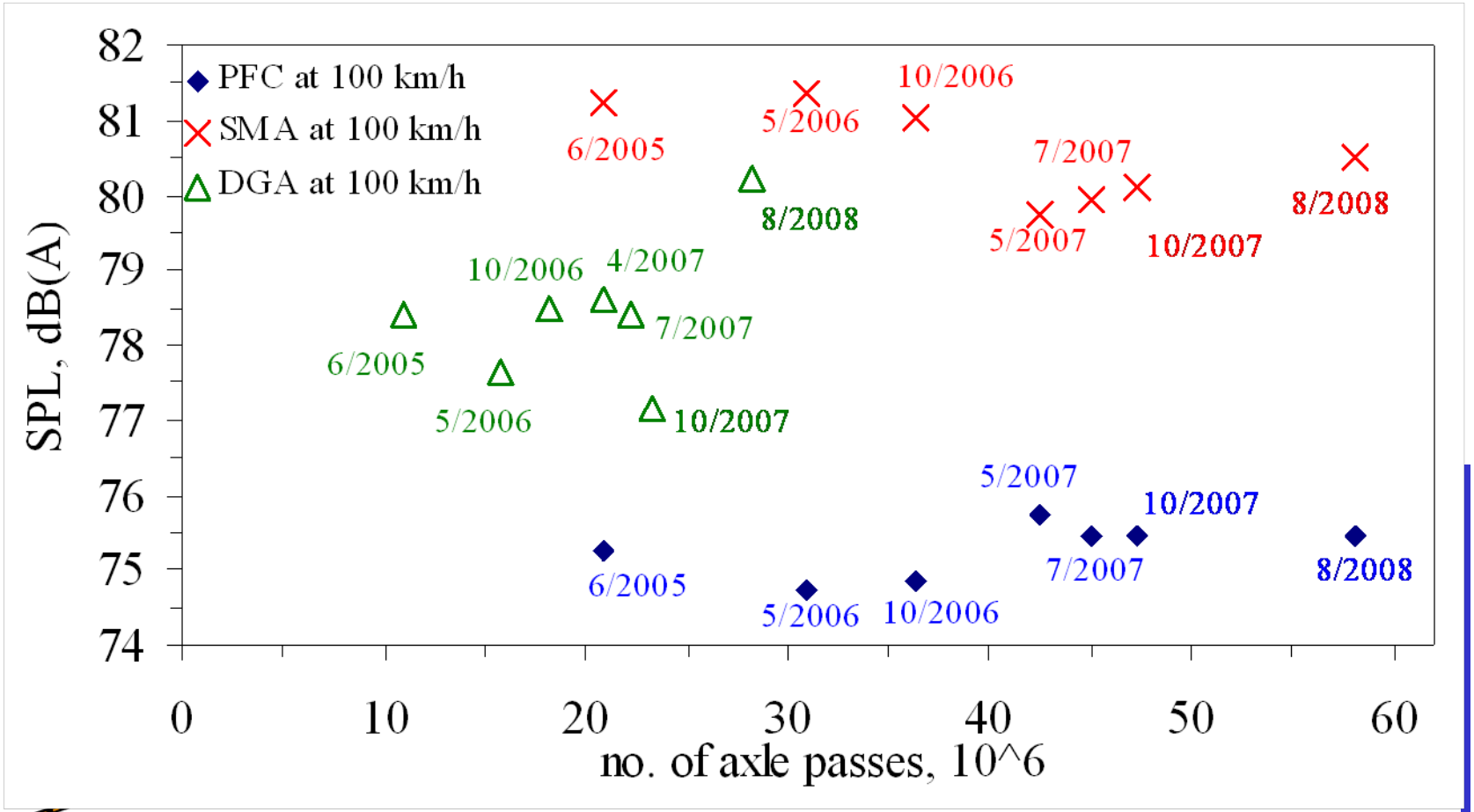
Changes in Noise vs. Traffic



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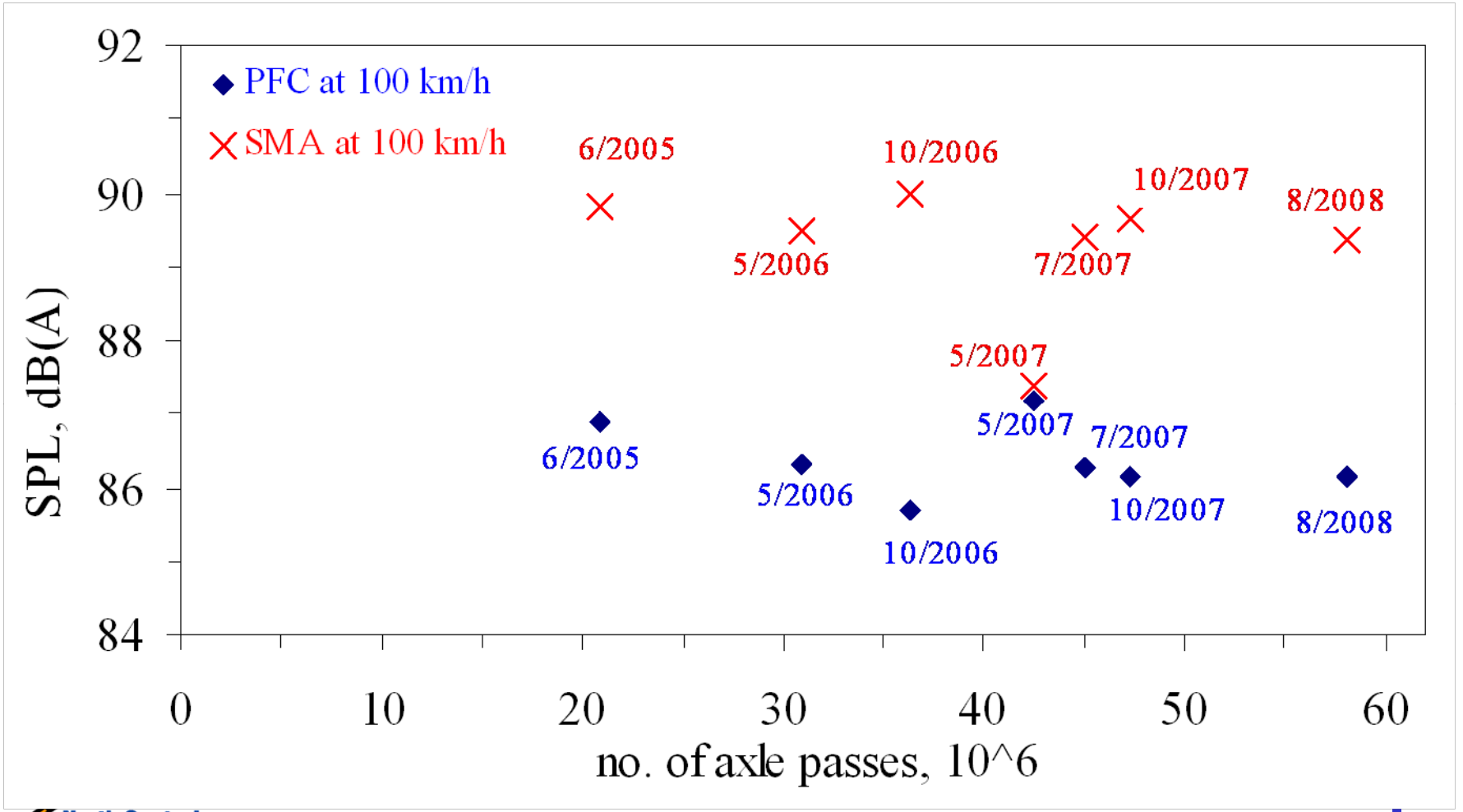
Heavy Vehicle Noise



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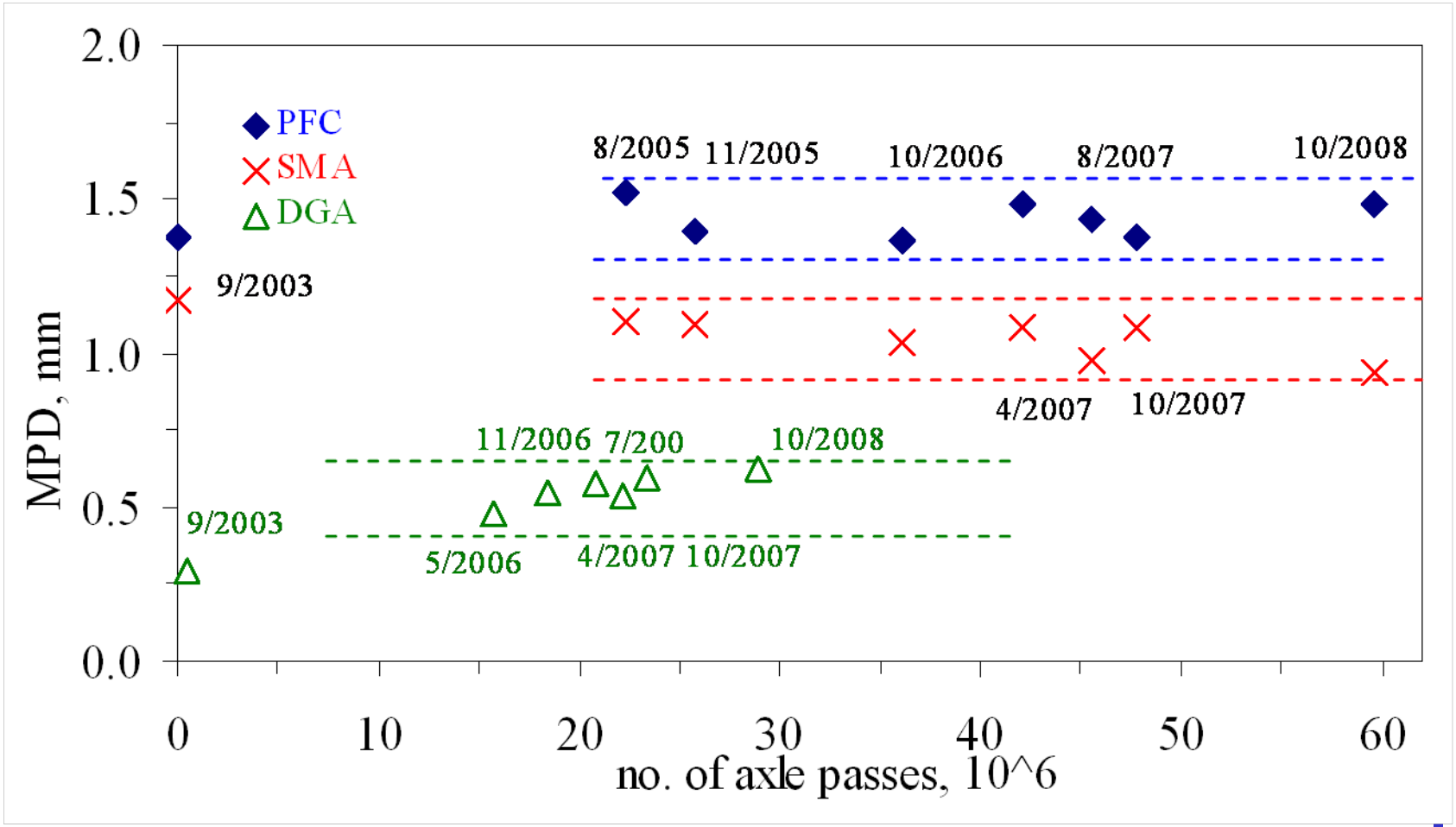
Changes in Texture



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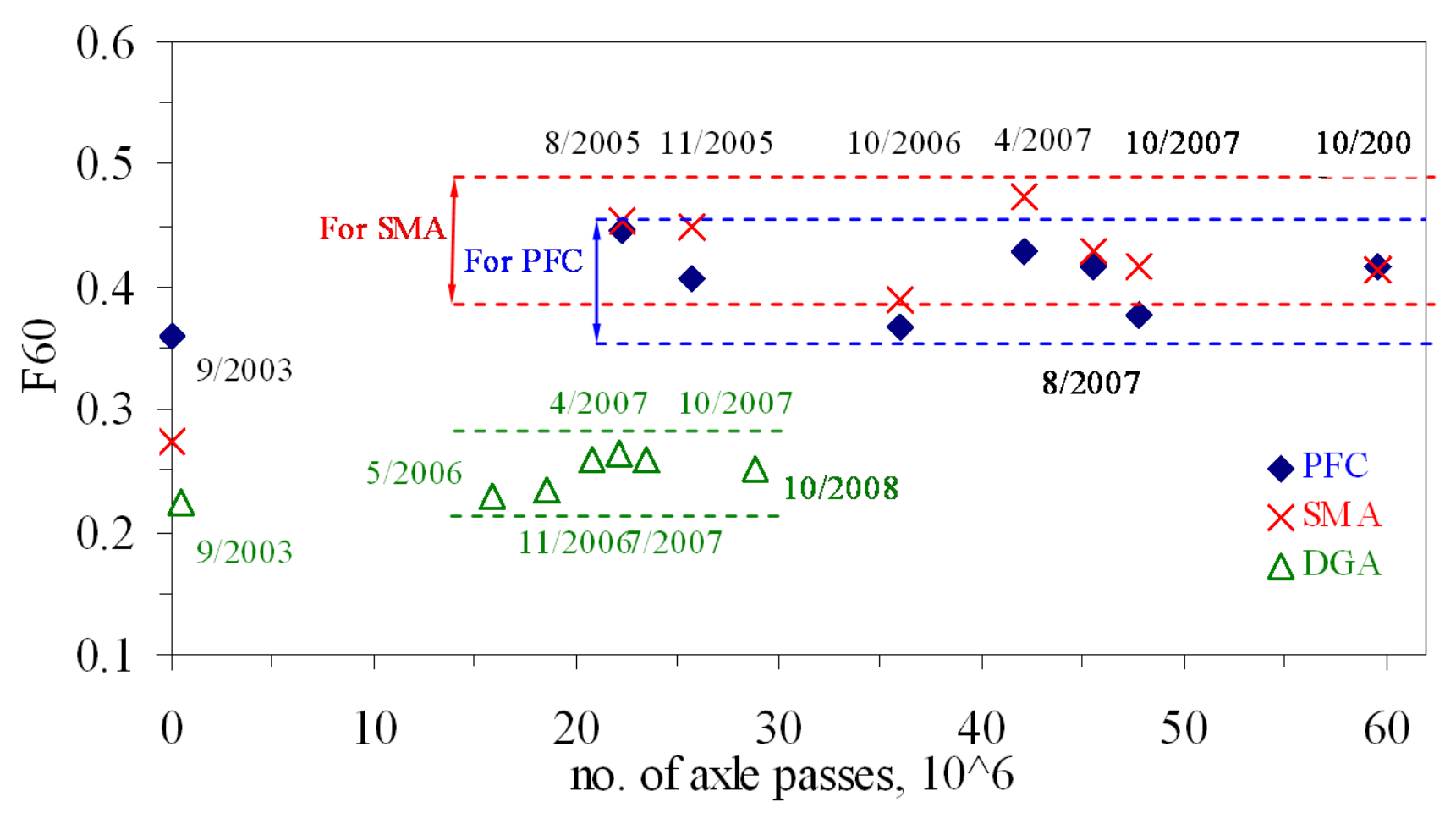
Changes in Friction (F60)



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Conclusions

- Porous Friction Courses can perform well over the long term
- Steel Slag aggregate withstood effects of traffic
- Void structure was maintained
  - Proper material selection and mix design
  - Proper maintenance
  - Proper application (high speed)

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