FAST – the Fast Asphalt Surfacing Test

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Session 6

Skid resistance and its evolution
What do we mean by evolution?
The 2019 edition of our International Conference was a great success with a record attendance of 242 participants from more than 100 companies, universities and research centers from 20 countries from all over the world!
3d modelling using an iPhone
Use of 3d modelling to solve a macrotexture problem

Figure 4: Prepared Model for non-positive (left) and positive (right) locations.

Figure 5: Islands Analysis - Non-Positive (left) and Positive (right) – 1.5 mm Threshold.
The surface

• Complex.
• 3-dimensional.
• Texture at different scales.
• Keeps changing.
• Understanding is difficult.

• Prediction and measurement of in-service performance is fundamental for everyone – not just the road people...
Examples of asphalt mix development dating from about 20 years ago
Stages in the evolution of a surfacing

1. Aggregate mixed with bitumen.
2. Laid and compacted.
3. Opened to traffic.
4. Trafficked and assumes an equilibrium level of skid resistance in relation to everything around it.
5. Eventually resurfaced.
6. Old surface becomes part of new surface.
Evolution of an SMA
Typical evolution in skid resistance for most types of road surface

Annual downward cyclic trend to an unacceptable value and then resurfaced

Early life
14mm thin surface – measuring initial skid resistance
1 day old 14mm thin surfacing

\[ y = 0.001x + 0.8289 \quad R^2 = 0.4289 \]
\[ y = -0.0015x + 0.6977 \quad R^2 = 0.6656 \]
\[ y = -0.0013x + 0.6651 \quad R^2 = 0.5671 \]
Initial drop followed by rise
First year for a 14mm thin surfacing
14mm SMA – different test conditions
- flat speed profile once wet
Slip road unto M25 (same aggregate and mix)
- why does grip increase towards end of slip?
Impact of a motorway sign and an off-slip

![Graph showing grip number and chainage for slow lane M25 off-slip for junction 17. The graph indicates the impact of a motorway sign and an off-slip.](image)
Wet grip / dry grip...
Construction Products Regulation

Performance for the life of the product from initial design, during in-service life and then when its recycled.
Some different aggregates – can we predict their evolution?
Some standard aggregate test methods
PSV v. AAV for 3 rock types

- Basalt
- Gritstone
- Limestone
• 3 year project
• Aim was to improve prediction of early life skid resistance of new asphalt surfacing materials
• Standard and non-standard laboratory test methods
• 12 main aggregates
• Road trial sites in UK and Ireland
• Differing types of use
3 hours additional angled polishing
more stress = different ranking
(up to 26 points further reduction)
PSV and FAP – do they predict performance?
FAP aggregate testing v. PSV (German data)
FAP / PSV
FAP - before and after polishing

HRA
Positive texture

(a)  (b)

SMA
Negative texture

(a)  (b)
Same PSV aggregate – 3 different mixes

Friction coefficient vs. Number of polishing cycles for HRA, 0/14mm SMA, and 0/10mm SMA.
More examples of using FAP for product development
Understanding the FAP interface
Road Test Machine #1
RTM data - four types of asphalt
Effect of nominal size on the development of early life skid resistance for SMA
Evolution of wet skid resistance for same type of asphalt surfacing made with different rock types
Why develop the FAST test?

• Construction Products Regulation – so what?
  • Performance for the life of the product.
• Does the PSV / FAP test methods predict aggregate performance?
  • Standard lab test.
• Does the Friction After Polishing test have issues?
  • Expensive.
  • Only 1 FAP in the UK and 1 in Ireland.

• Need for a simple and affordable device to test asphalt mixes for friction and other surfacing characteristics
Use of a hand grinder to simulate a FAP

![Hand grinder image]

![Pendulum value graph]

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<th>4 Inch Grinder Brush</th>
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The FAST test method
Examples of brushes and pads evaluated
A simple test method

- Testing slabs of SMA10.
- Compared the different abrasive pads and brushes to find which was most suitable.
- A green abrasive pad was found to be best compromise.
- “Scoured” the surface....
- Testing stopped at 1 minute intervals and friction measured using a pendulum tester.
SMA10 data
Comparison of green and black pads

![Graph showing comparison of green and black pads over time]
Conclusions

• Reviewed the evolution of skid resistance.
• Considered road data with laboratory prediction.
• Proposed a new simple test method.
• Different polishing brushes and abrasive pads were evaluated using test slabs of SMA10.
• Equilibrium in approximately 10 minutes.
• The decrease in friction is comparable to what would be expected in-service.
• Although developed as a laboratory test, this new method could be used on-site.