

FAST – the Fast Asphalt Surfacing Test

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Session 6

Skid resistance and its evolution

EPFN 2019

What do we mean by evolution?





INTERNATIONAL VI-GRADE CONFERENCE

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Event

Info



2019 International VI-grade Conference
May 13th-14th-15th, 2019 - Hanau (Frankfurt), Germany

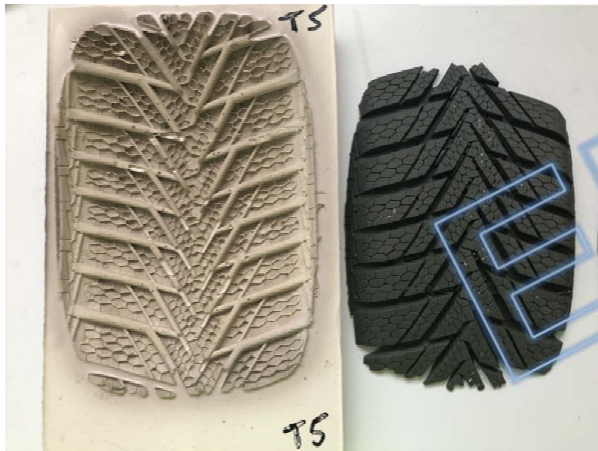
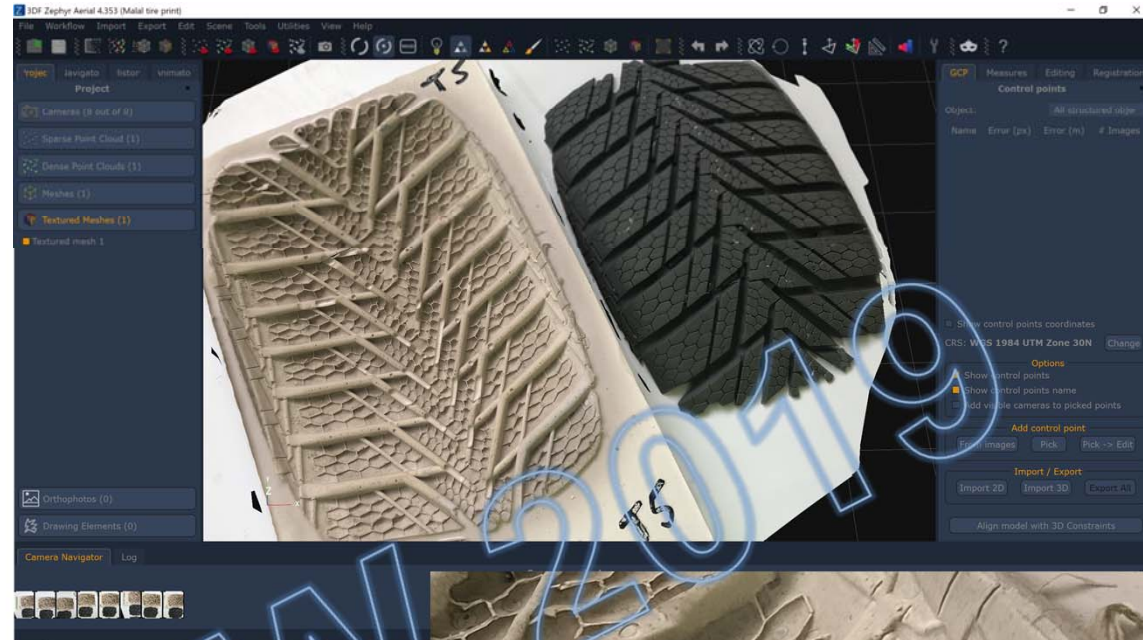
BRIDGING THE GAP BETWEEN TESTING AND SIMULATION

VISUALIZE OFFICIAL PROGRAM

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

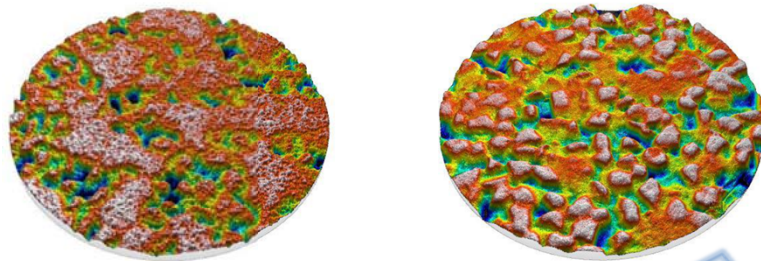


Figure 4: Prepared Model for non-positive (left) and positive (right) locations.

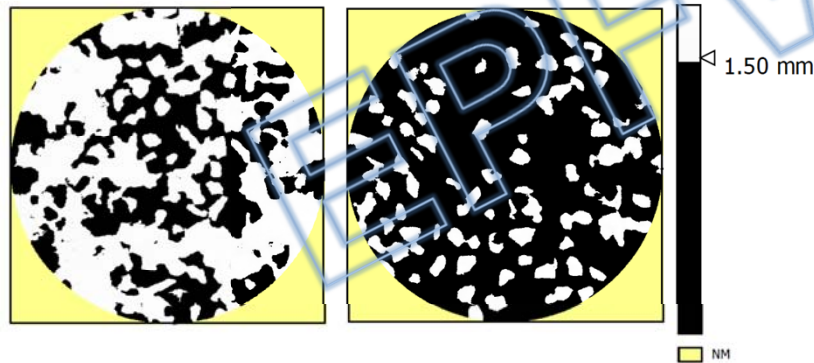


Figure 5: Islands Analysis - Non-Positive (left) and Positive (right) – 1.5 mm Threshold.



TII Publications



**The Use of Close Range
Photogrammetry to Characterise
Texture in a Pavement Surfacing
Material**

CC-PAV-04010
September 2017



Technical

PREVIEW 2019



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

In a recent survey
9 out of 10 hedgehogs preferred
the stopping power of
Hitex

As used on the A38 at Axminster, Devon

Hitex - the first Highways Agency approved
thin layer wearing course developed in the UK

- Outstanding skid resistance
- Excellent traffic noise reduction (in excess of 3dB(A))
- Significantly reduced spray hazard in wet weather conditions
- Rut resistant and durable
- Whole life performance offers considerable cost saving benefits

BARDON
AGGREGATES

Eastland Region Tel: 01698 870811	Northern Region Tel: 01551 732041	Midlands Region Tel: 01555 282000	South East Region Tel: 01895 442852	South West Region Tel: 01934 742621	Bardon Surfacing Division Tel: 01530 510066
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Bardon Aggregates, a Division of Aggregate Industries UK Limited, an Aggregate Industries Plc Company.

HARD AS NAILS

anyone arguing?

Smatex - A range of Stone Mastic Asphalt products specially tailored for heavily trafficked and industrial areas.

- Hard-wearing and resistant to rut development
- High levels of bitumen for enhanced long-term durability
- An economic alternative to conventional asphalt
- Thin layer characteristics offer environmental benefits

BARDON
AGGREGATES

Eastland Region Tel: 01698 870811	Northern Region Tel: 01551 732041	Midlands Region Tel: 01555 282000	South East Region Tel: 01895 442852	South West Region Tel: 01934 742621	Bardon Surfacing Division Tel: 01530 510066
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Bardon Aggregates, a Division of Aggregate Industries UK Limited, an Aggregate Industries Plc Company.

Bardon Superstructure
Hidden strength

Bardon Superstructure
Maximum value engineering opportunities

- Long life asphalt base layer
- Developed with Shell Bitumen
- Allows thinner pavement design
- Suitable for trunk roads
- Strong, durable and dependable

Developed in collaboration with **Shell Bitumen**

AGGREGATE
INDUSTRIES

FOR MORE INFORMATION CONTACT THE BRANDZED PRODUCTS HELPING
0845 600 0860

AGGREGATE INDUSTRIES UK LIMITED, AN AGGREGATE INDUSTRIES PLC COMPANY

Bardon Thinpave
- as quiet as a mouse

SLEEPY HOLLOW

Bardon Thinpave is Highways Agency approved

Bardon Thinpave
The silence is deafening

- High textured ultra-thin surfacing
- Excellent noise reduction properties
- Reduced traffic spray hazard
- Cost effective overlay solution

AGGREGATE
INDUSTRIES

FOR MORE INFORMATION CONTACT THE BRANDZED PRODUCTS HELPING
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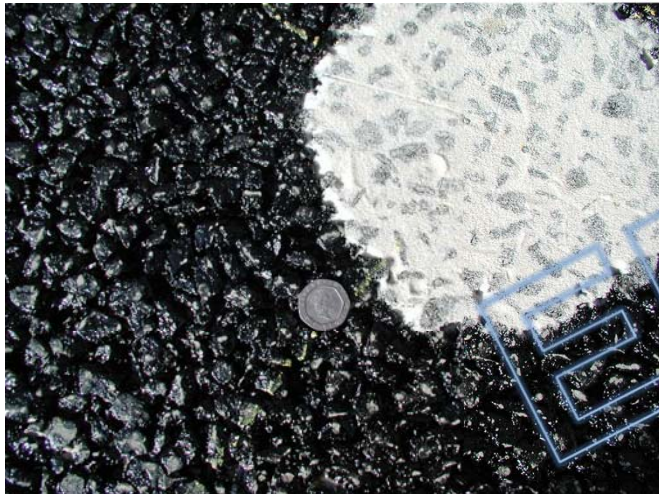
AGGREGATE INDUSTRIES UK LIMITED, AN AGGREGATE INDUSTRIES PLC COMPANY

Stages in the evolution of a surfacing

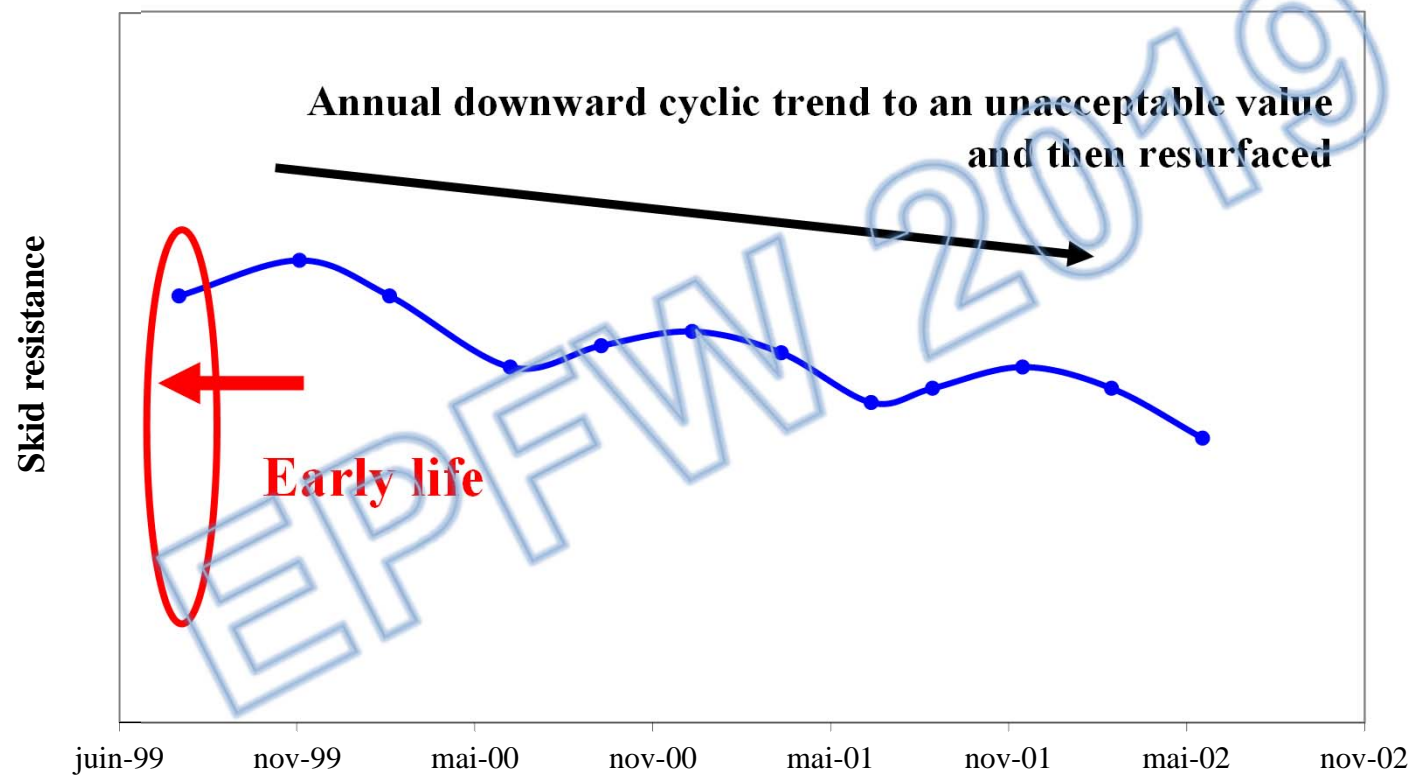
1. Aggregate mixed with bitumen.
2. Laid and compacted.
3. Opened to traffic.
4. Trafficked and assumes an equilibrium level of skid resistance in relation to everything around it.
5. Eventually resurfaced.
6. Old surface becomes part of new surface



Evolution of an SMA



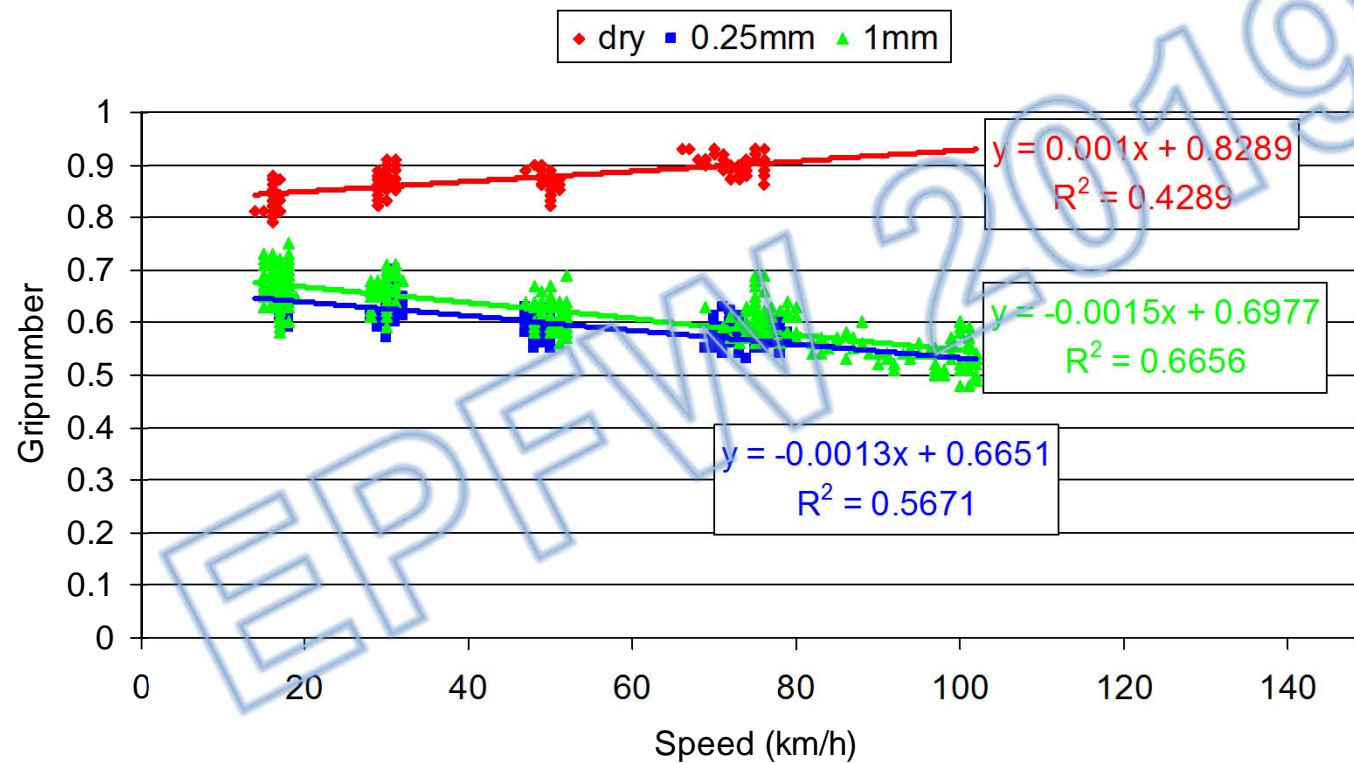
Typical evolution in skid resistance for most types of road surface



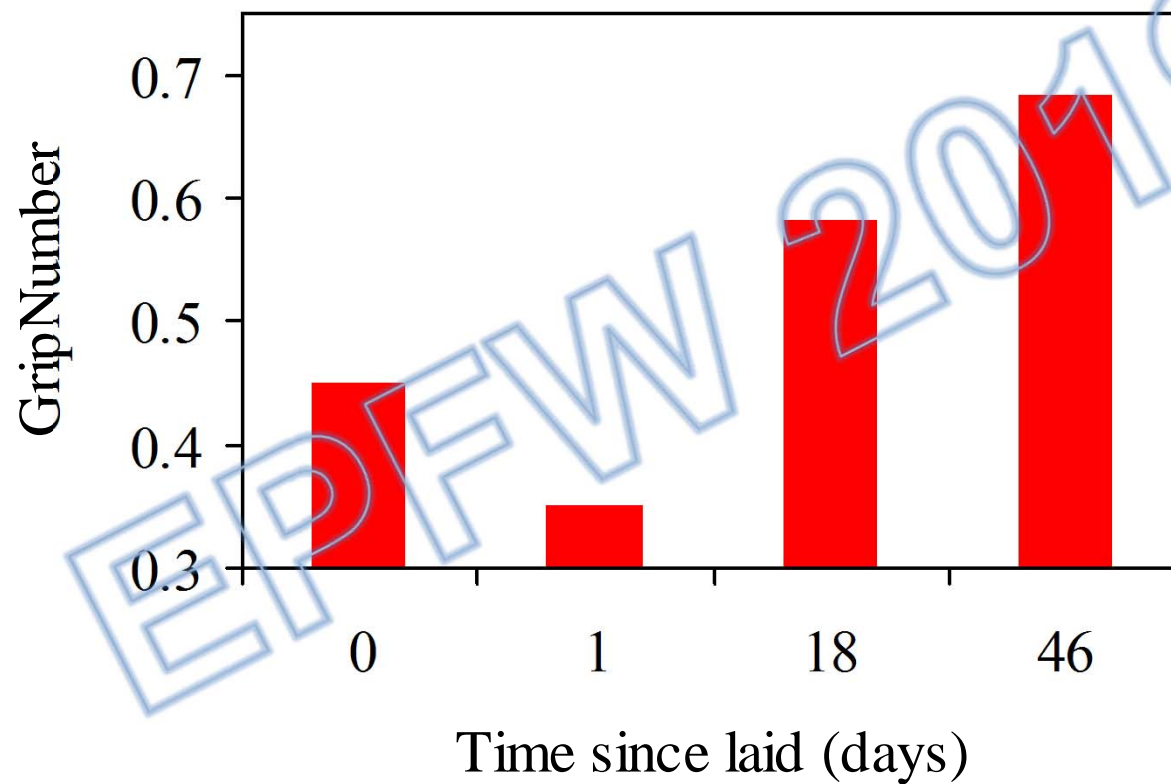
14mm thin surface – measuring initial skid resistance



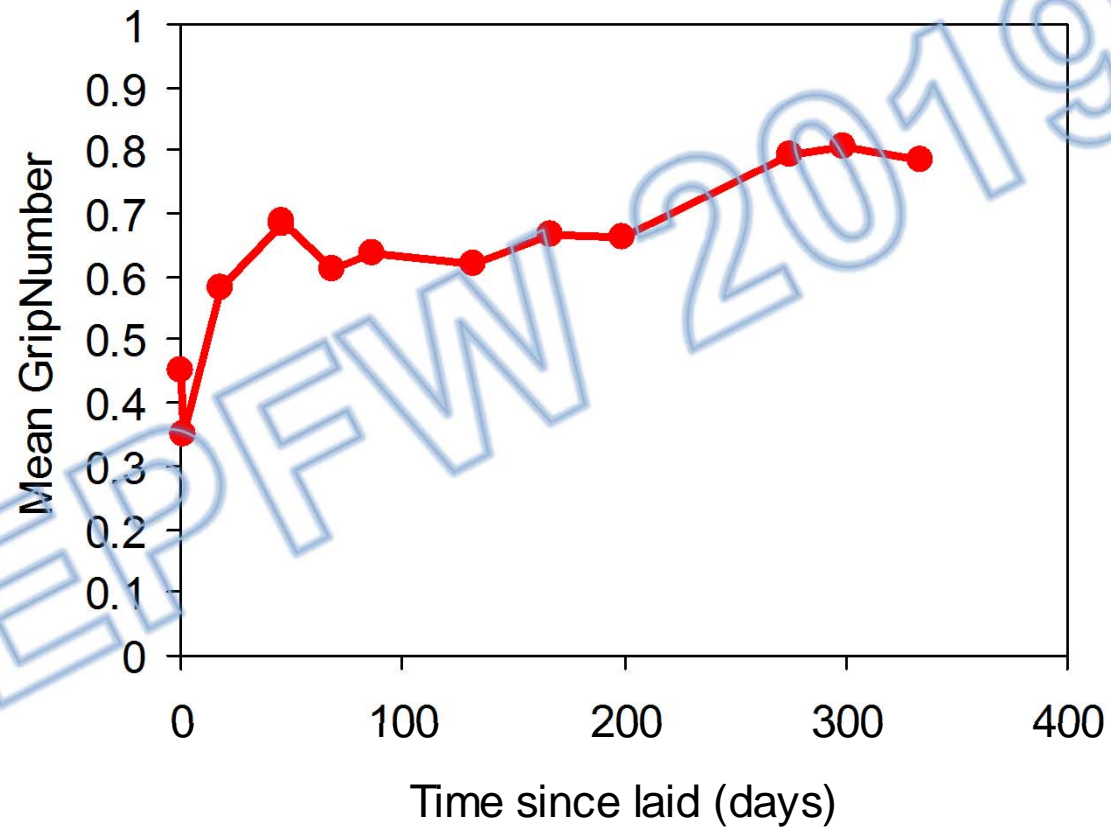
1 day old 14mm thin surfacing



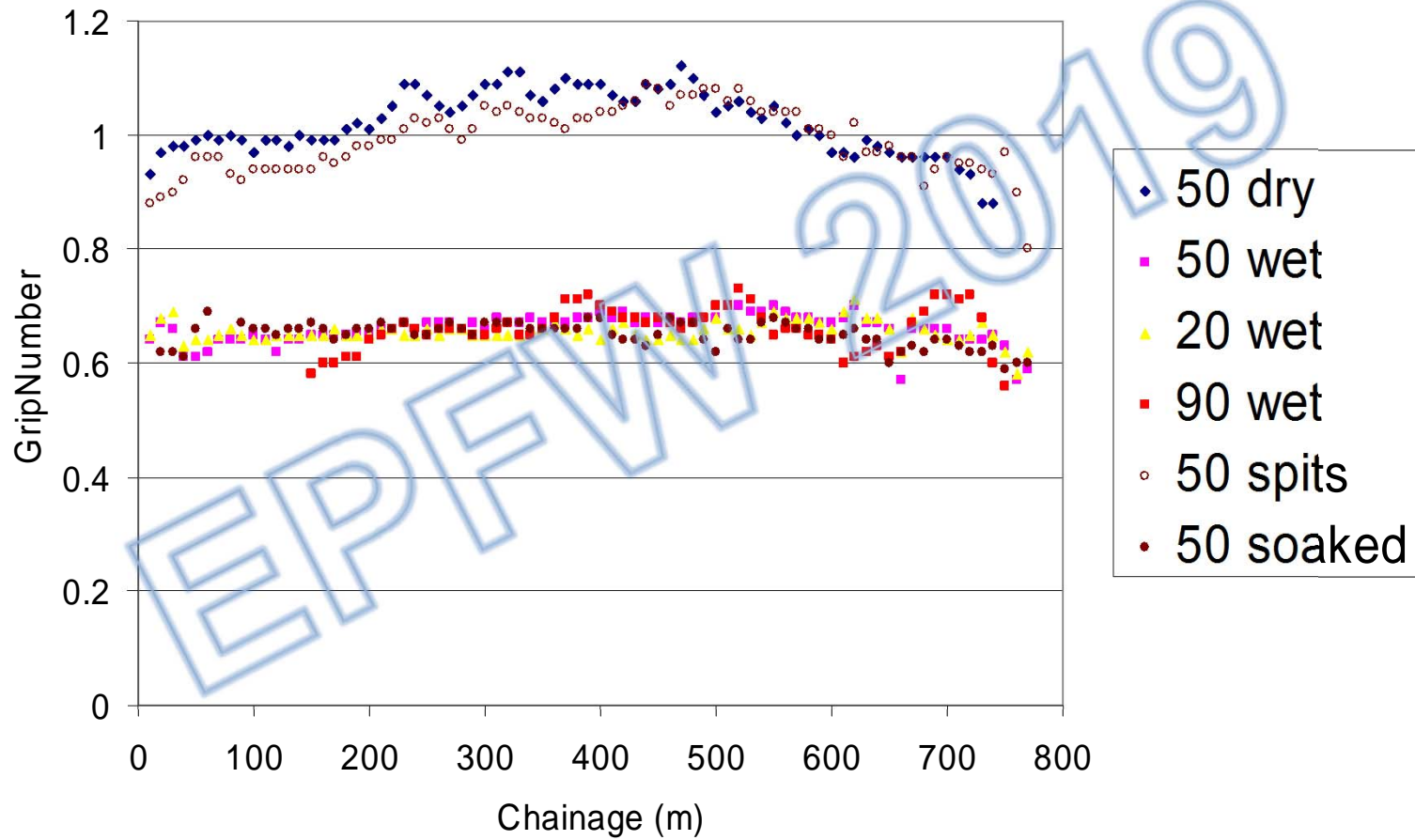
Initial drop followed by rise



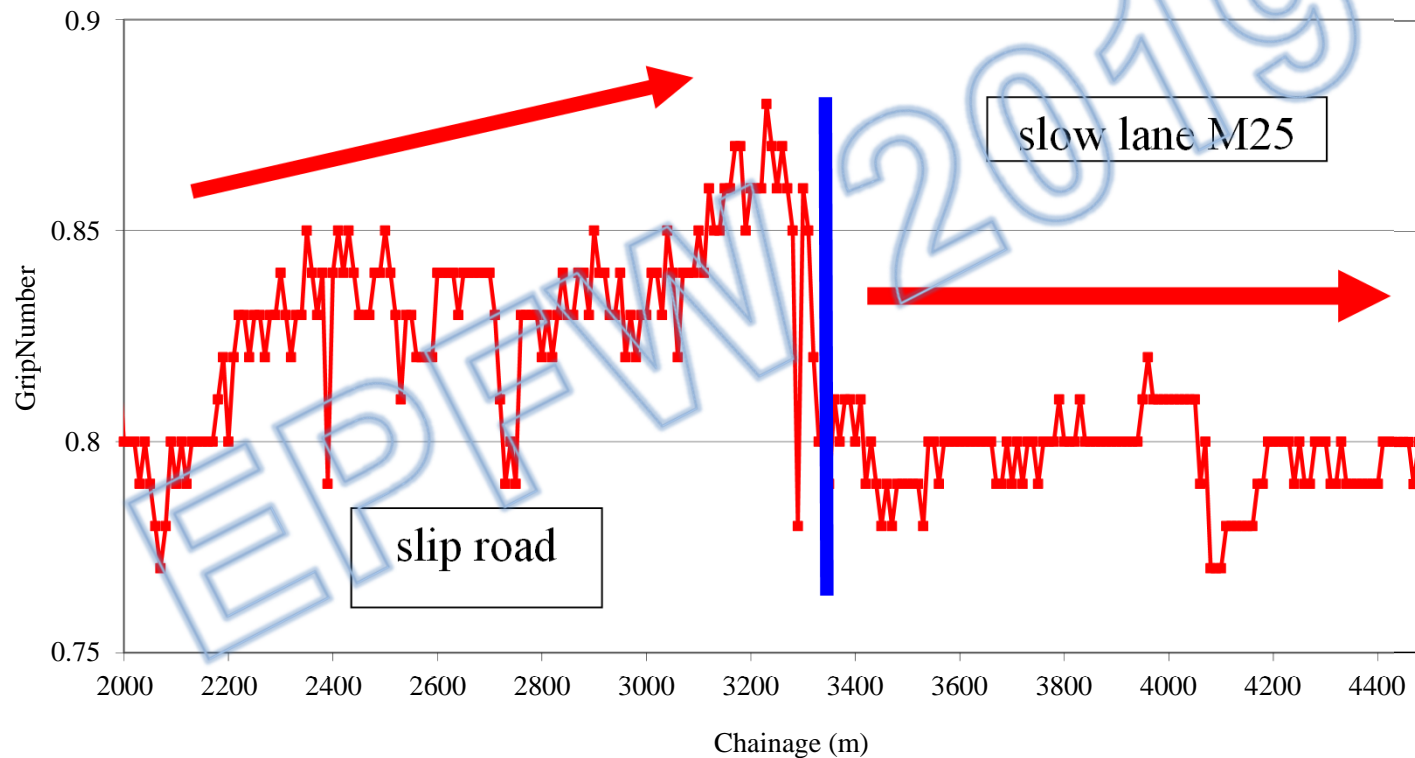
First year for a 14mm thin surfacing



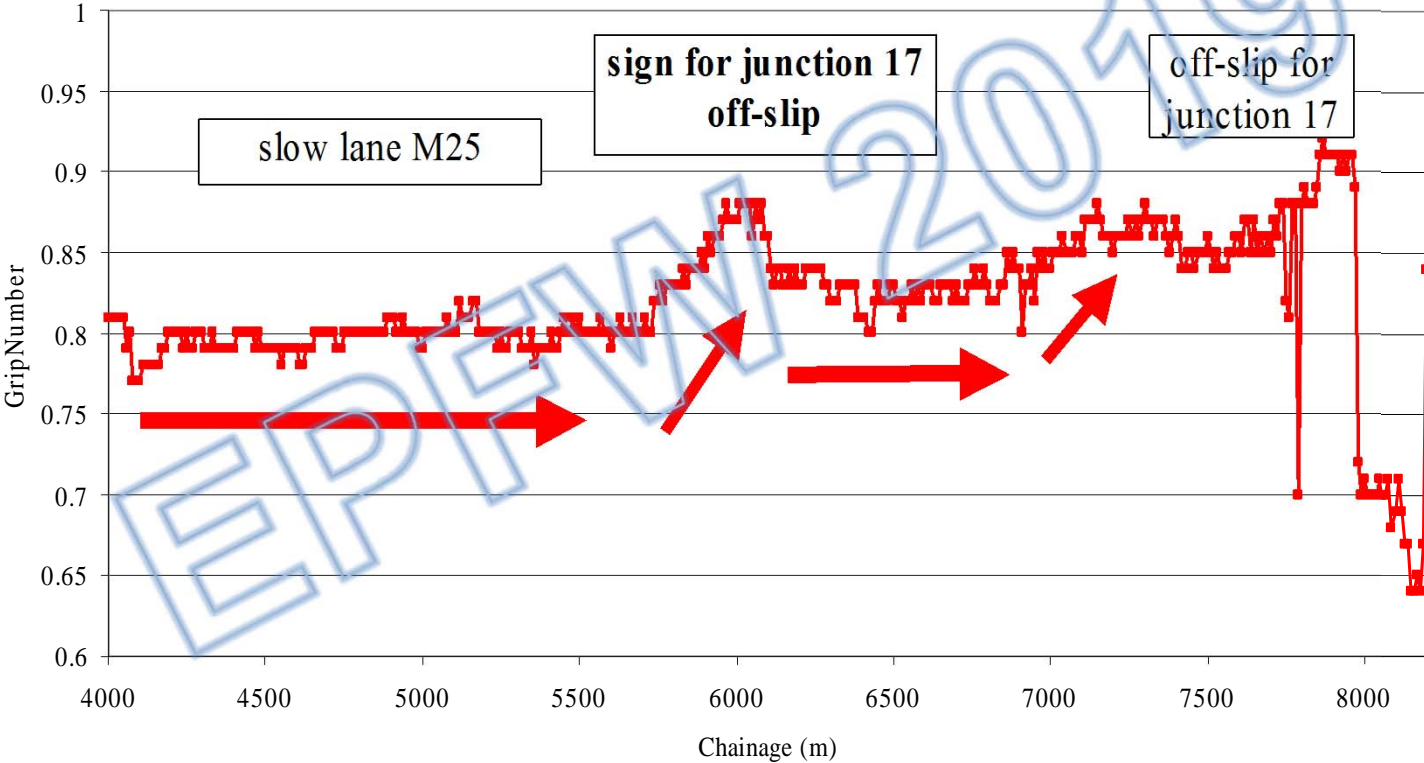
14mm SMA – different test conditions
- flat speed profile once wet



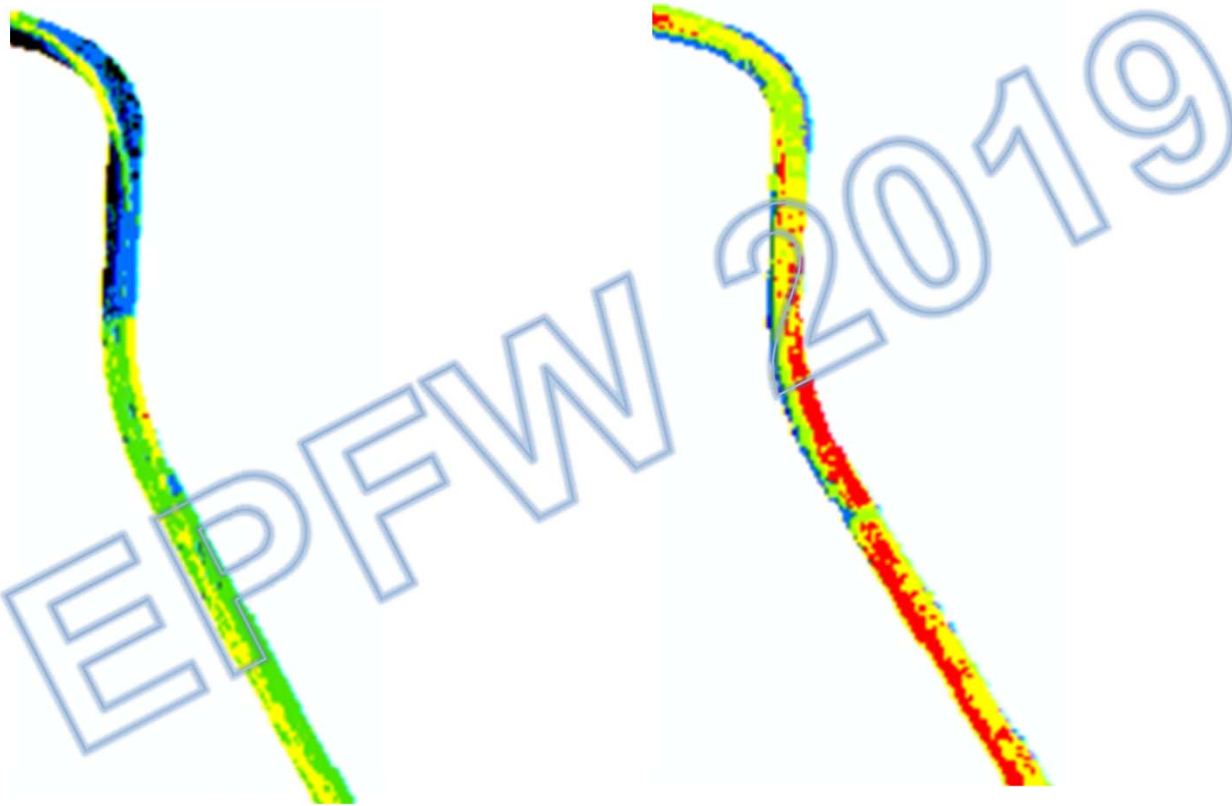
Slip road unto M25 (same aggregate and mix)
- why does grip increase towards end of slip?



Impact of a motorway sign and an off- slip



Wet grip / dry grip...



Construction Products Regulation

4.4.2011

EN

Official Journal of the European Union

L 88/5

REGULATION (EU) No 305/2011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 9 March 2011

laying down harmonised conditions for the marketing of construction products and repealing
Council Directive 89/106/EEC

(Text with EEA relevance)

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE
EUROPEAN UNION,

(4) Member States have introduced provisions, including requirements, relating not only to safety of buildings and other construction works but also to health, durability, energy economy, protection of the environment, economic aspects, and other important aspects in the public interest. Laws, regulations, administrative measures or case-law established either at Union or

Having regard to the Treaty on the Functioning of the European

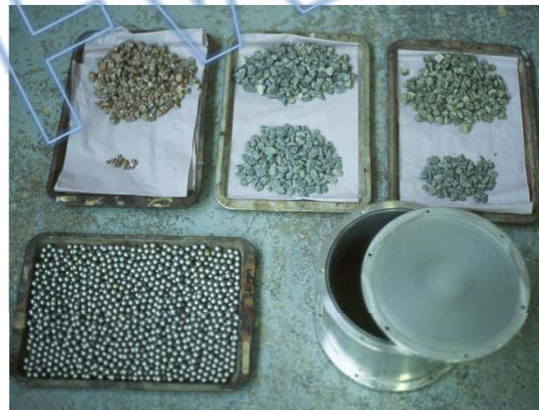
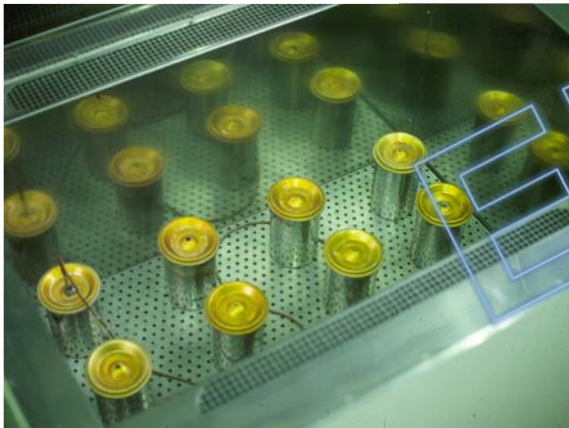
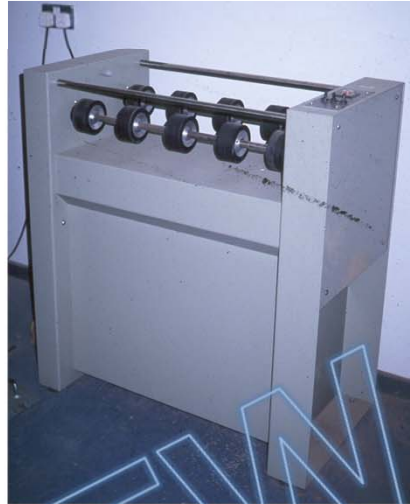
1. Mechanical resistance and stability
2. Safety in case of fire
3. Hygiene, health and environment
4. Safety and accessibility in use
5. Protection against noise
6. Energy economy and heat retention
7. Sustainable use of natural resources.

Performance for the life of the product from initial design, during in-service life and then when its recycled.

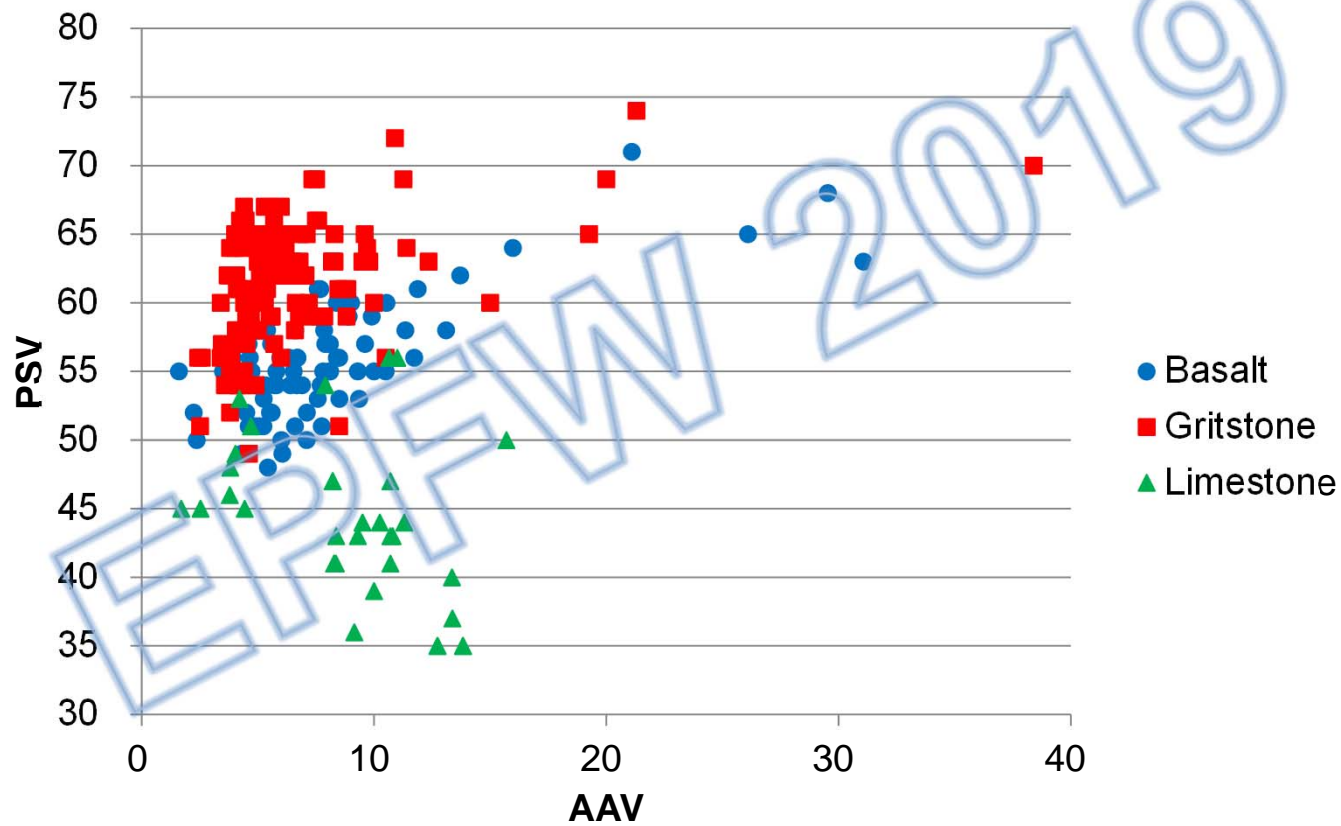
Some different aggregates –
can we predict
their evolution?



Some standard aggregate test methods

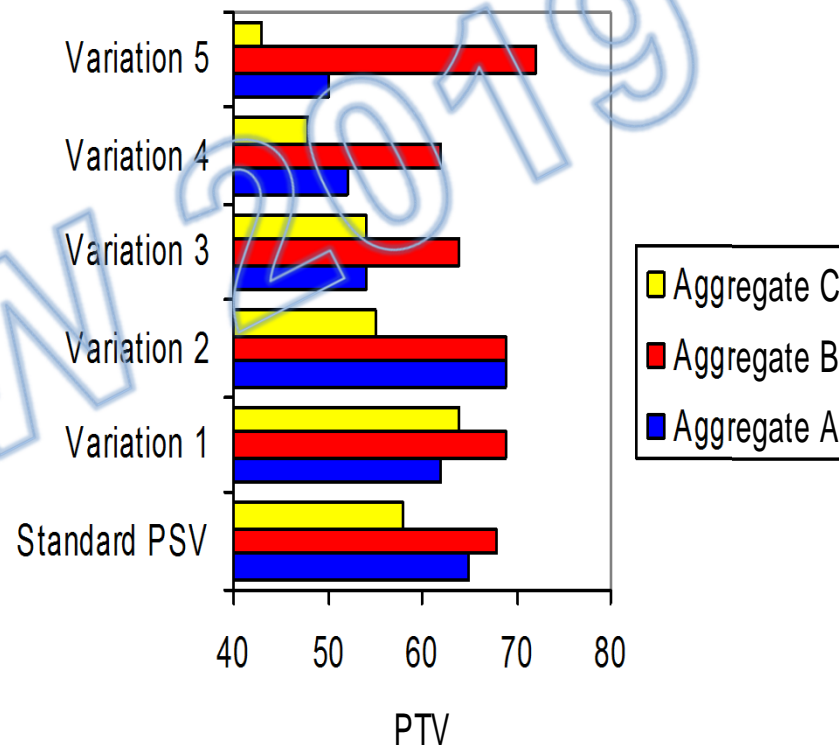


PSV v. AAV for 3 rock types

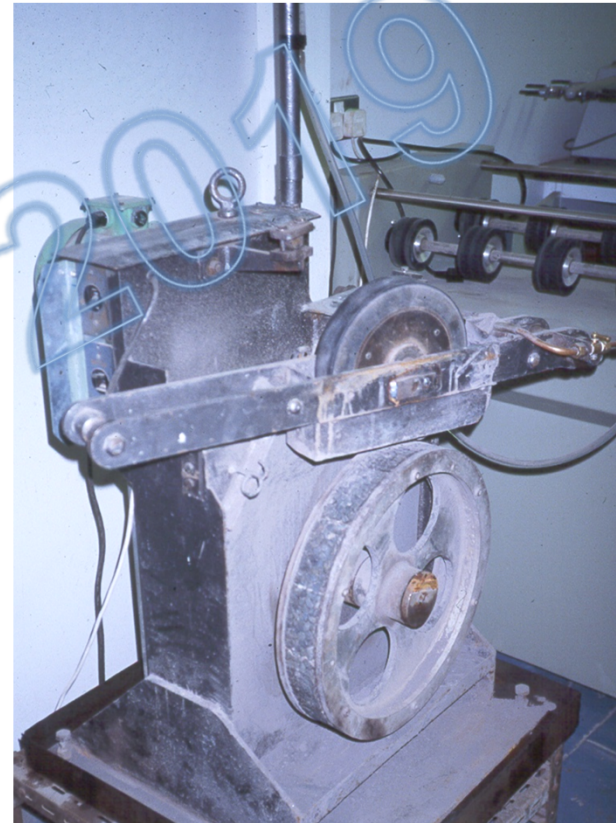
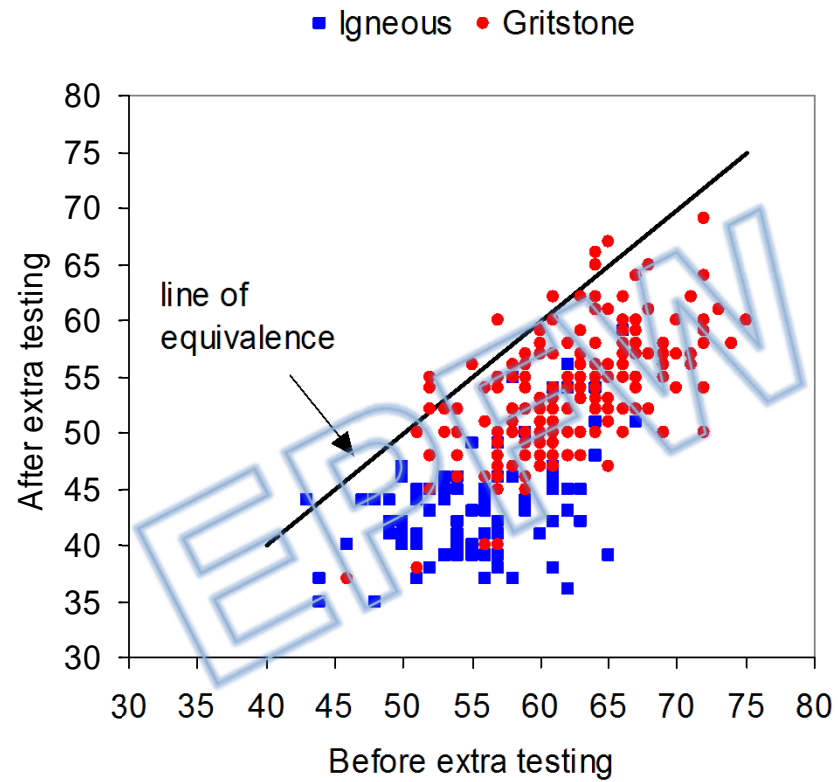


- 3 year project
- Aim was to improve prediction of early life skid resistance of new asphalt surfacing materials
- Standard and non-standard laboratory test methods
- 12 main aggregates
- Road trial sites in UK and Ireland
- Differing types of use

SKIDGRIP



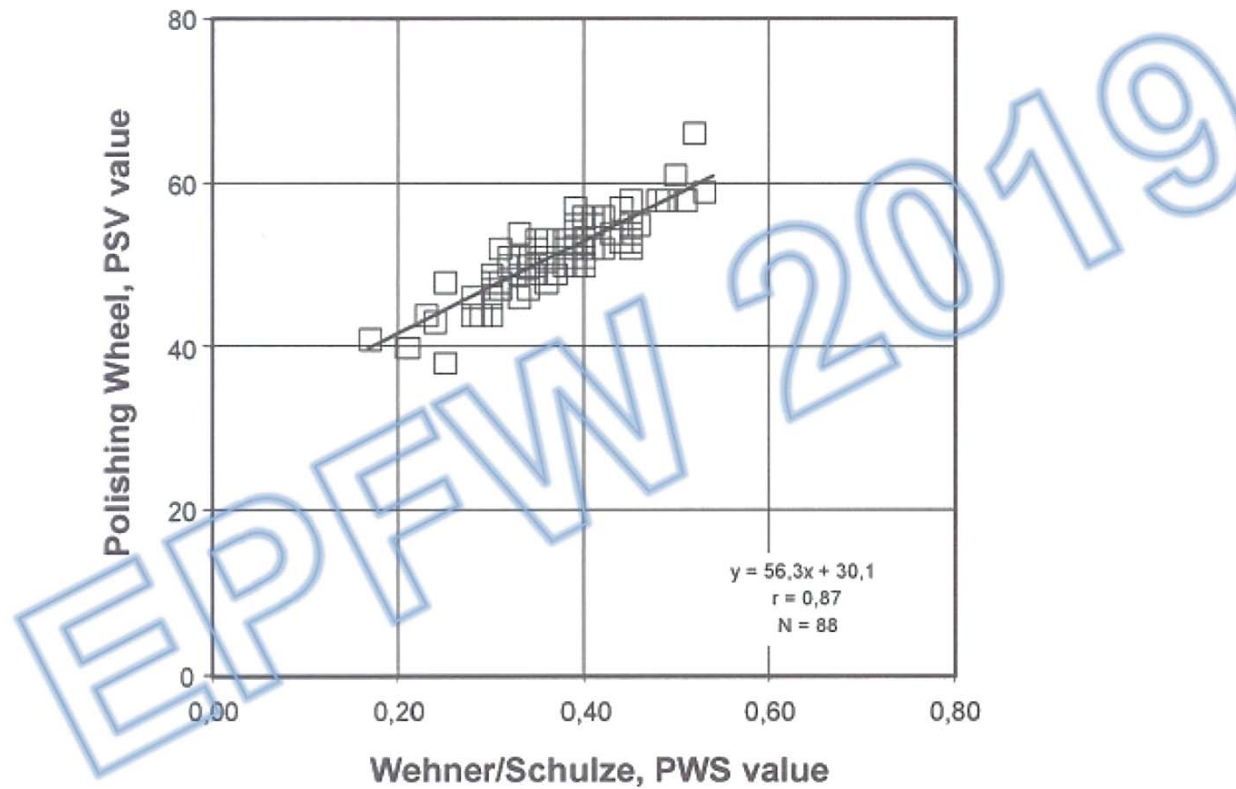
3 hours additional angled polishing
more stress = different ranking
(up to 26 points further reduction)



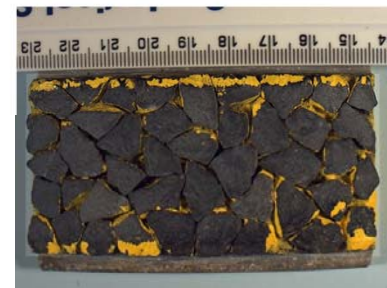
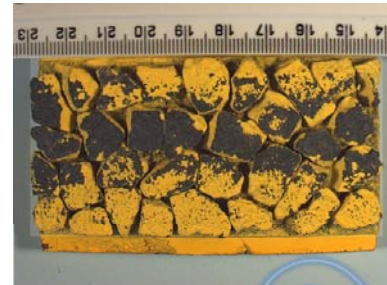
PSV and FAP – do they predict performance?



FAP aggregate testing v. PSV (German data)



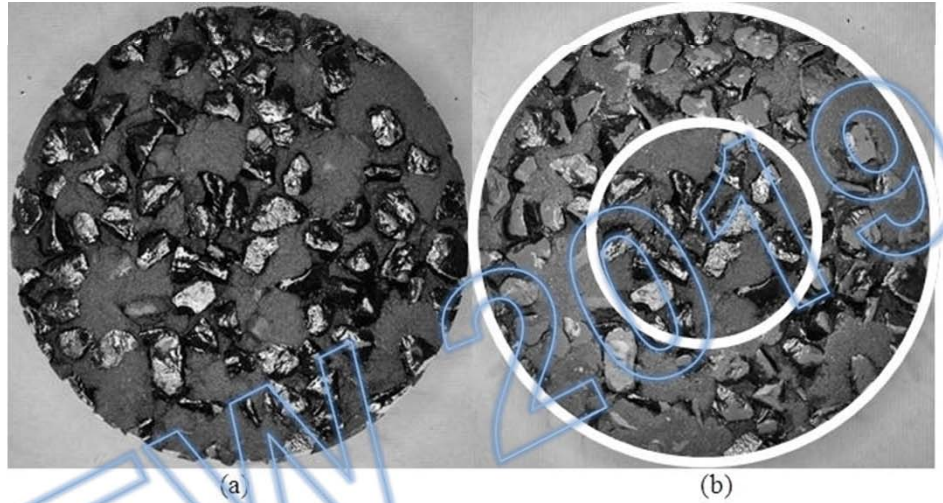
FAP / PSV



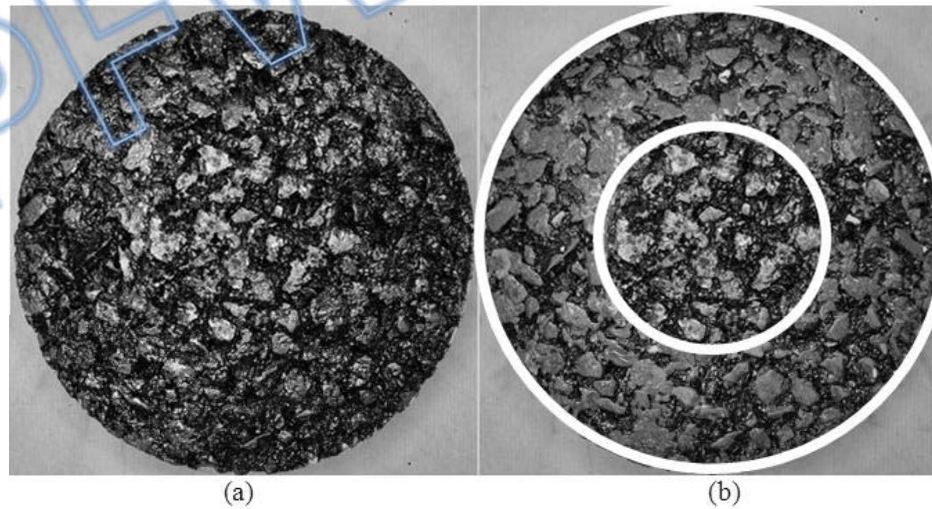
EPEN 2019

FAP - before and after polishing

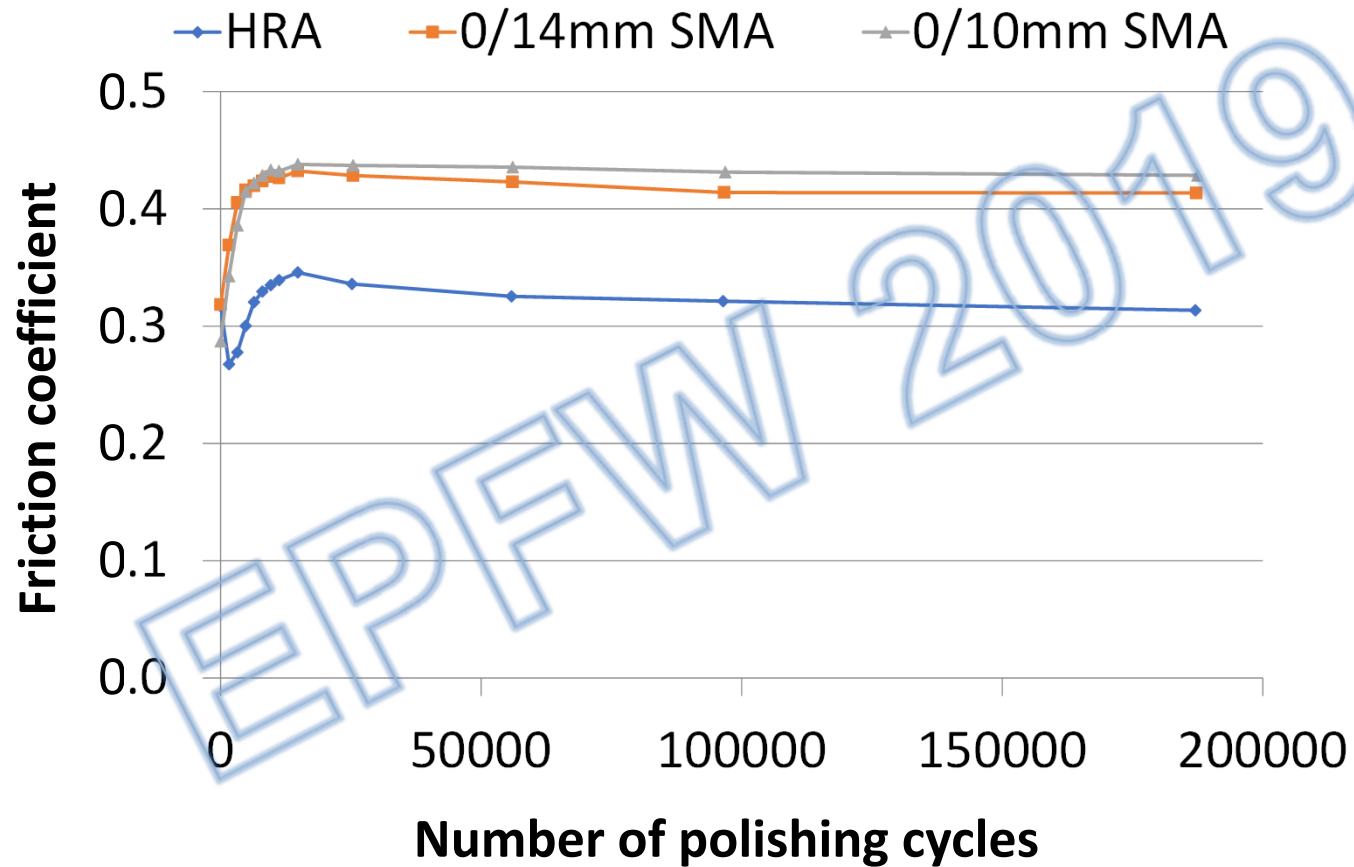
HRA
Positive texture



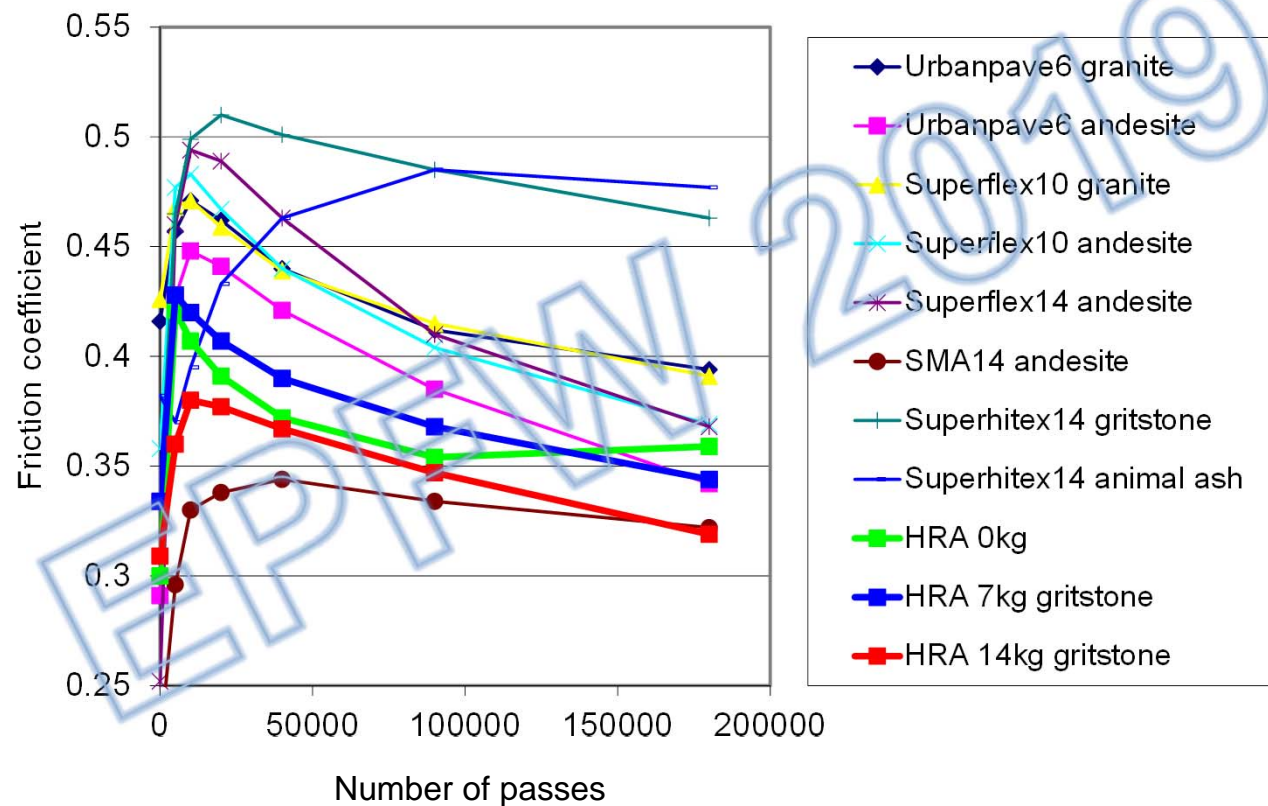
SMA
Negative texture



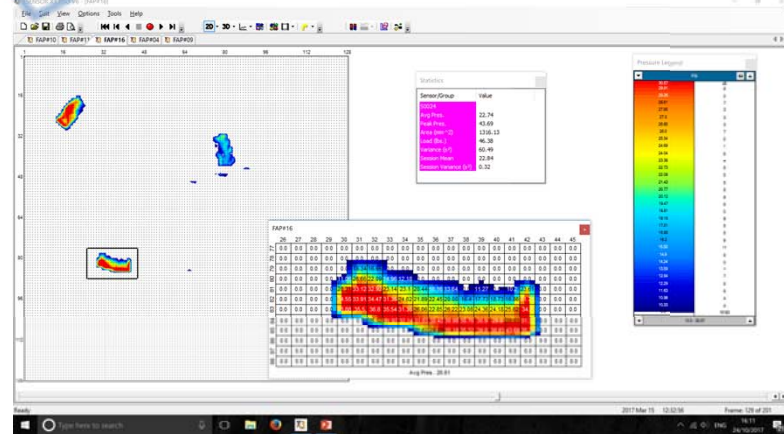
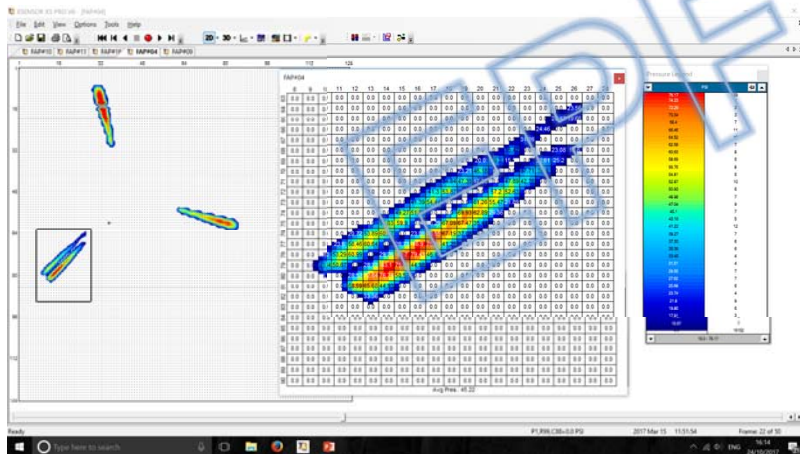
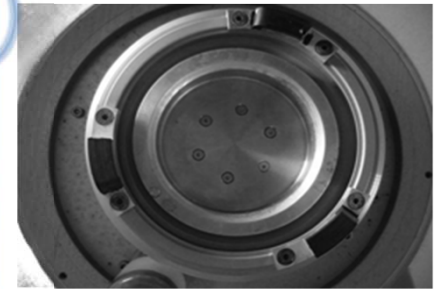
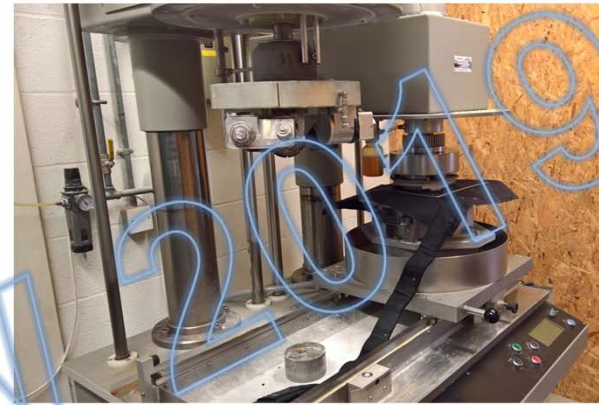
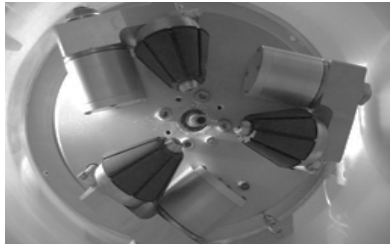
Same PSV aggregate – 3 different mixes

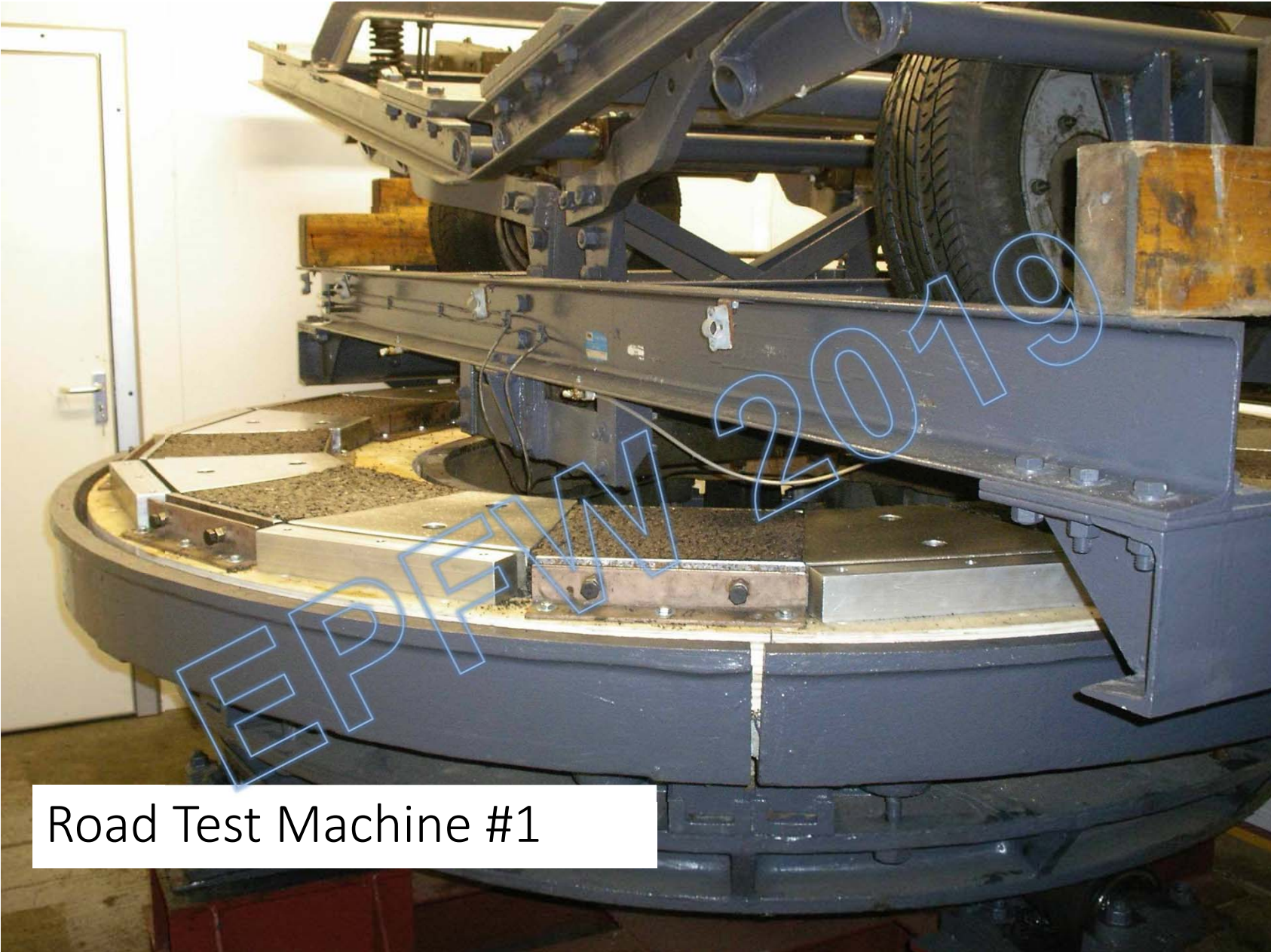


More examples of using FAP for product development

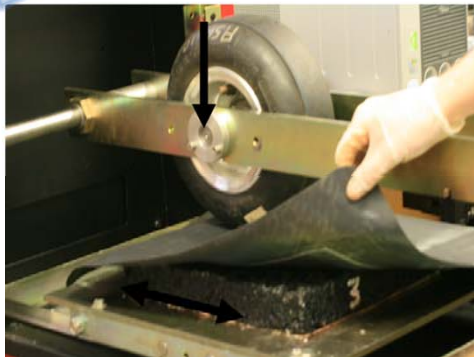
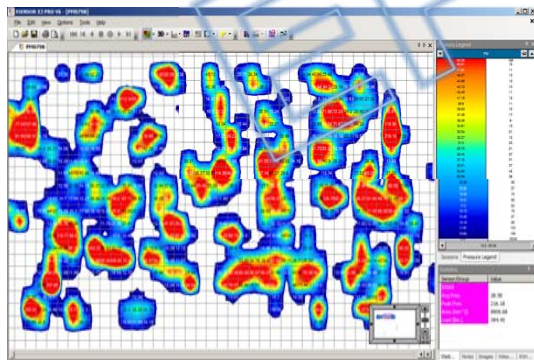
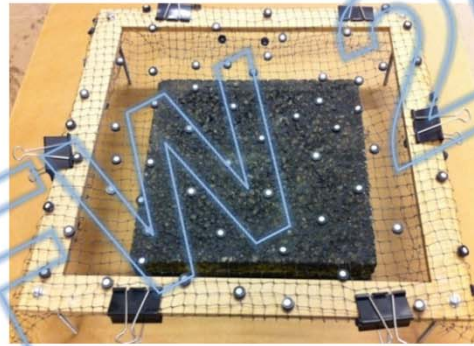
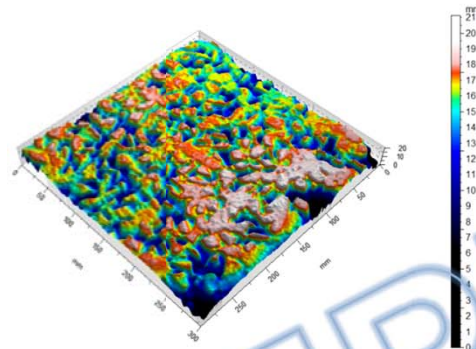


Understanding the FAP interface

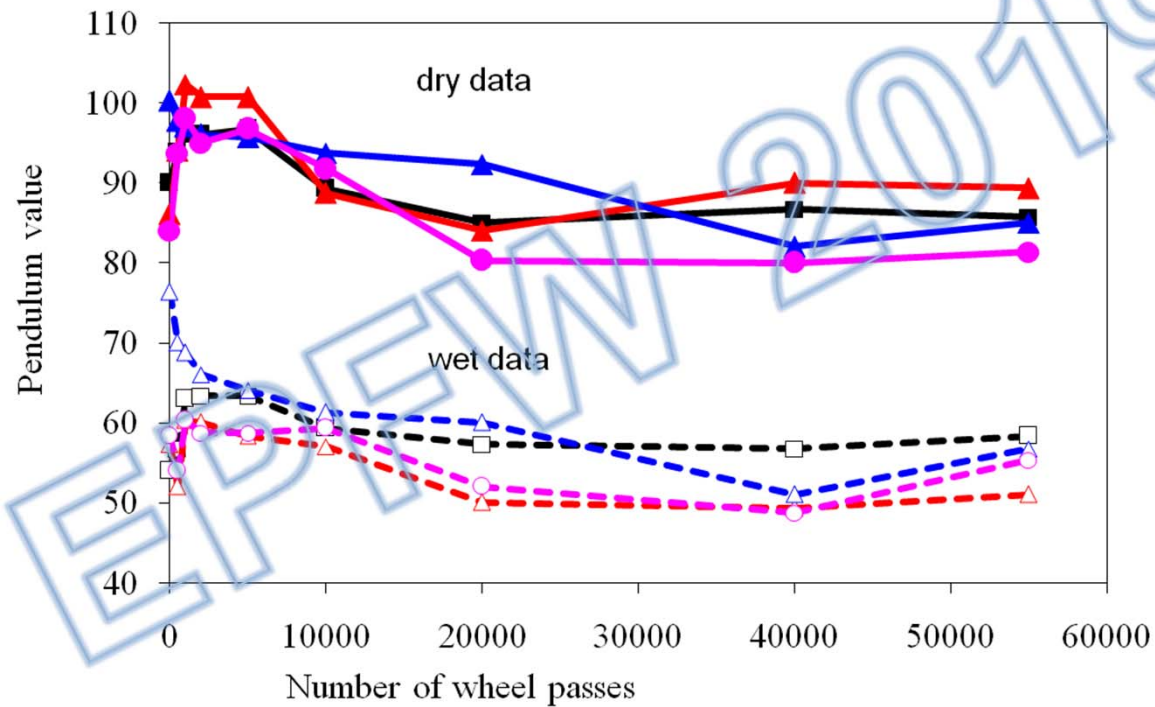




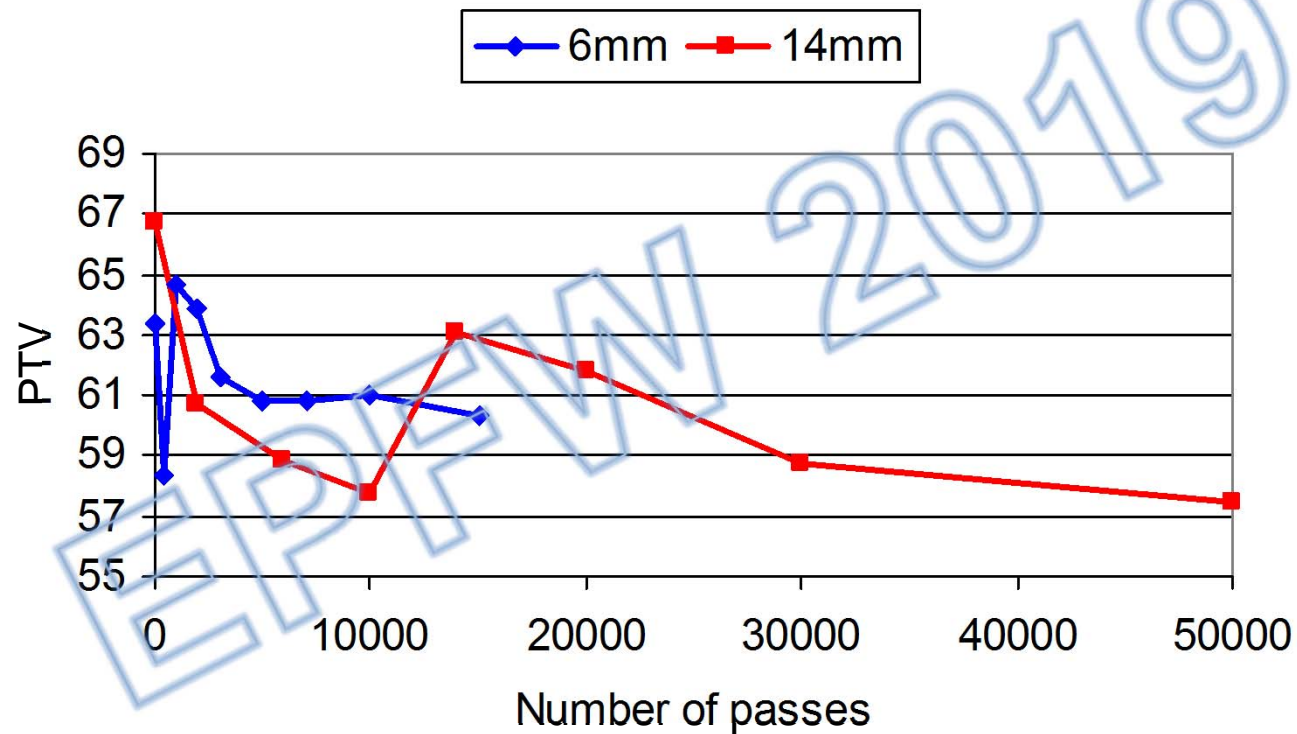
Road Test Machine #1



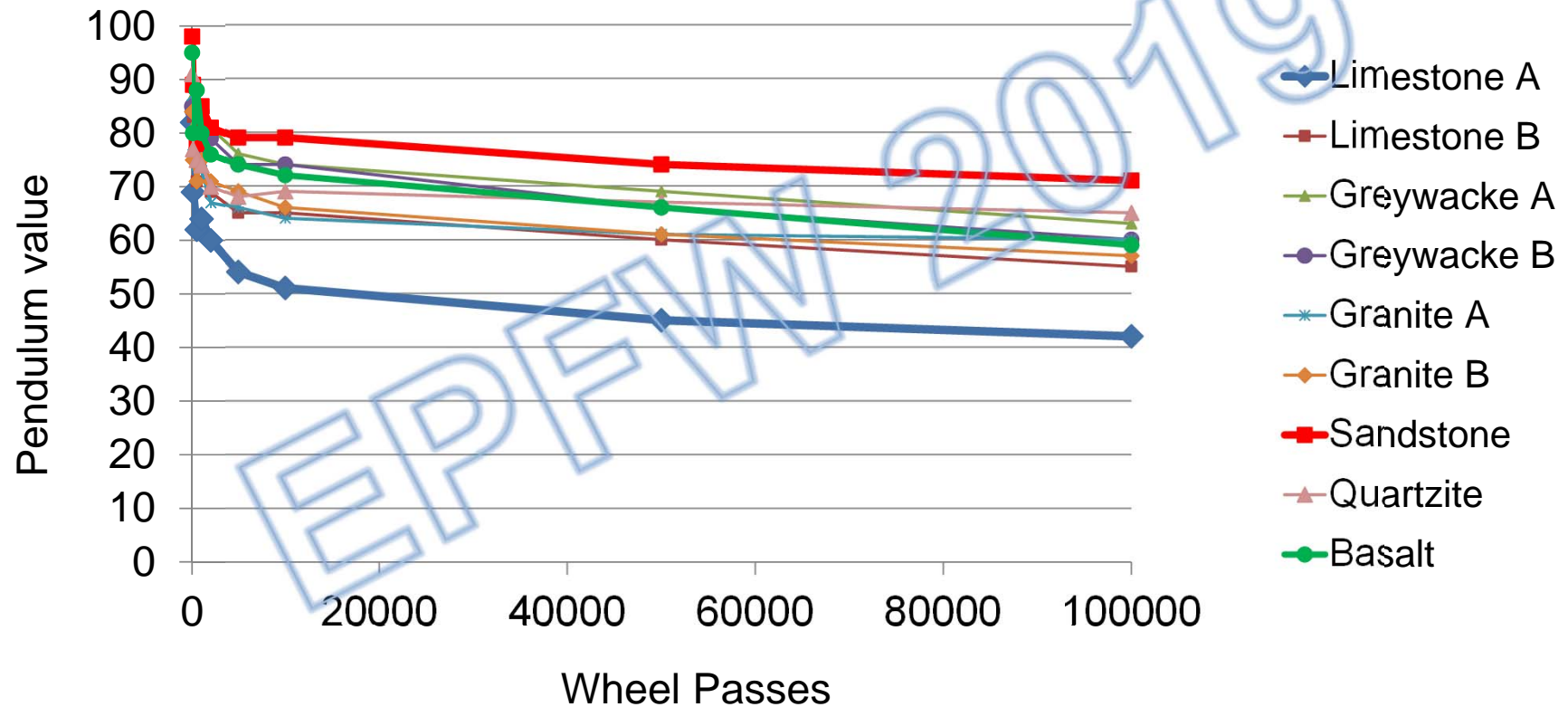
RTM data - four types of asphalt



Effect of nominal size on the development of early life skid resistance for SMA



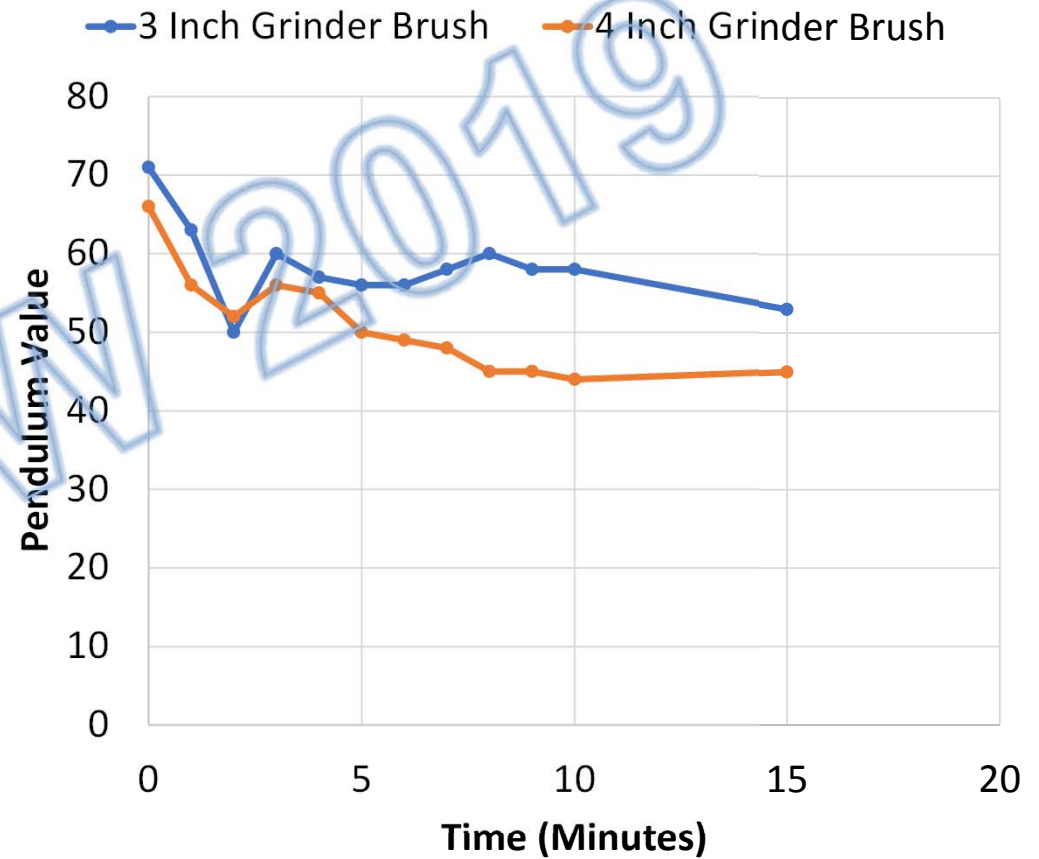
Evolution of wet skid resistance for same type of asphalt surfacing made with different rock types



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

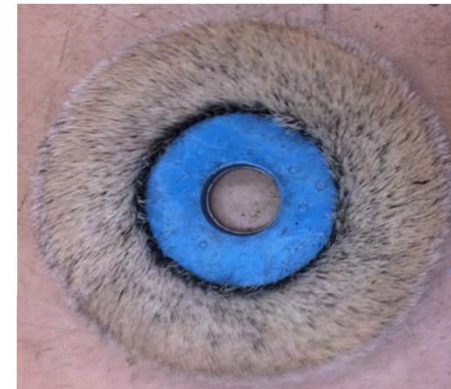
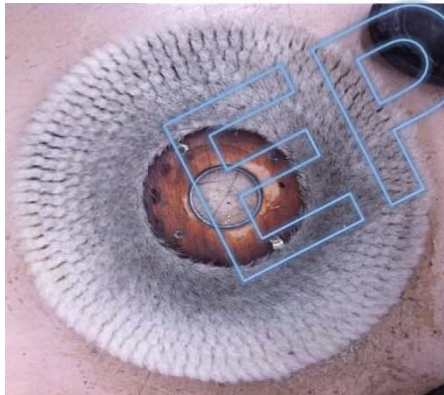
Use of a hand grinder to simulate a FAP



The FAST
test method



Examples of brushes and pads evaluated

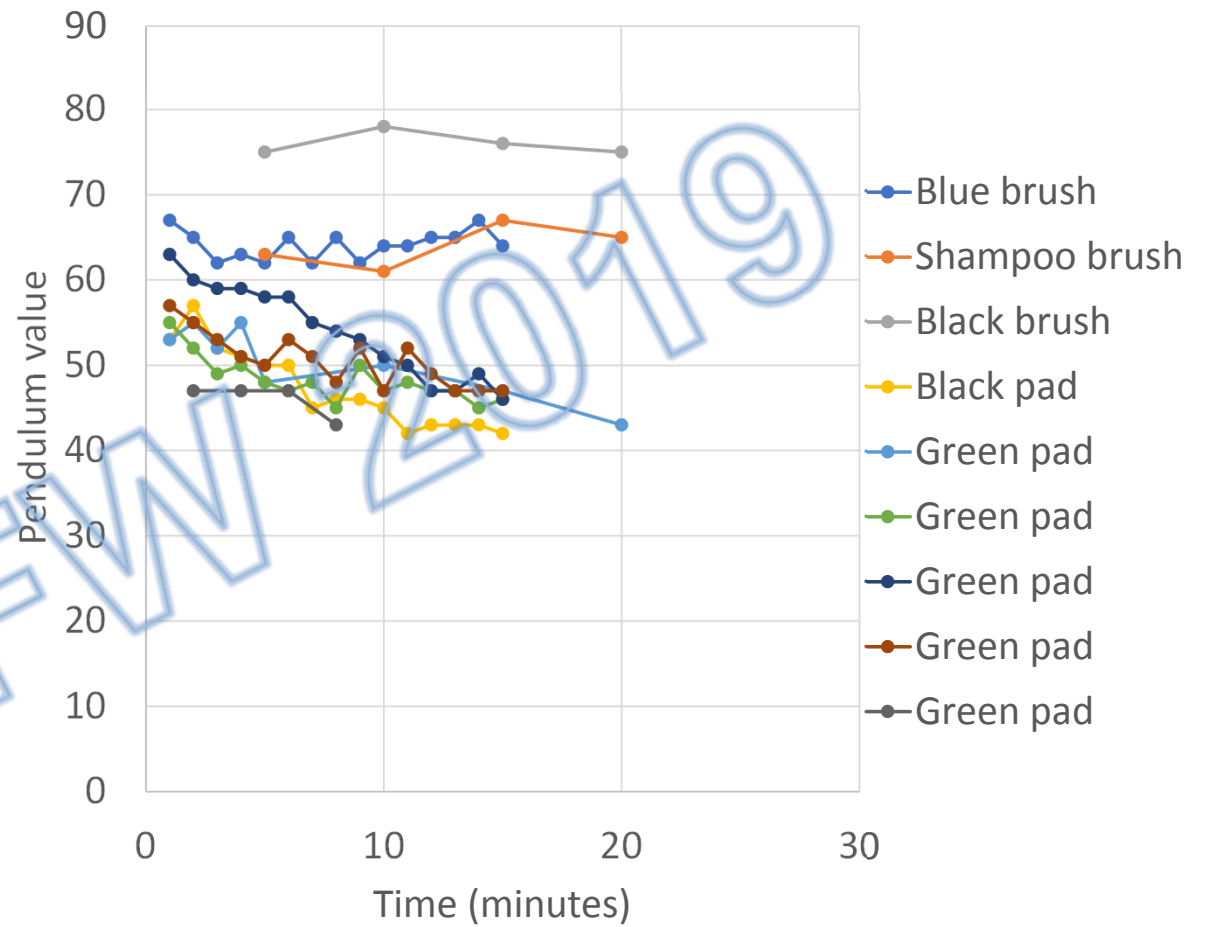




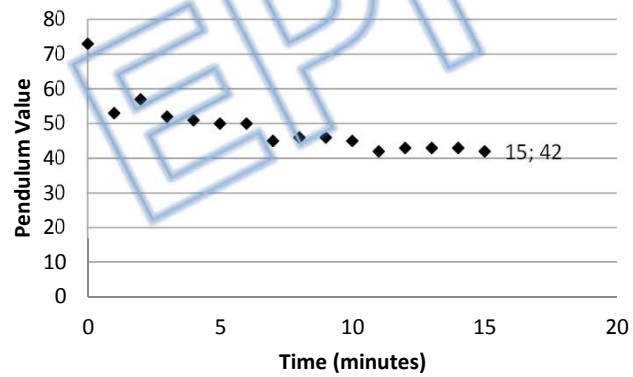
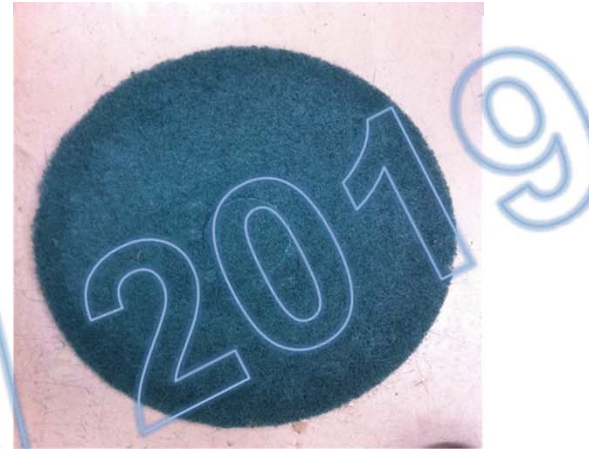
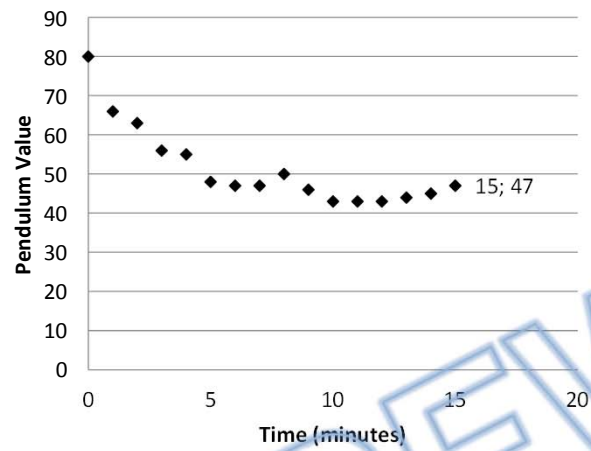
A simple test method

- 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



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.