Aggregate particle wear and the tyre / surface interface

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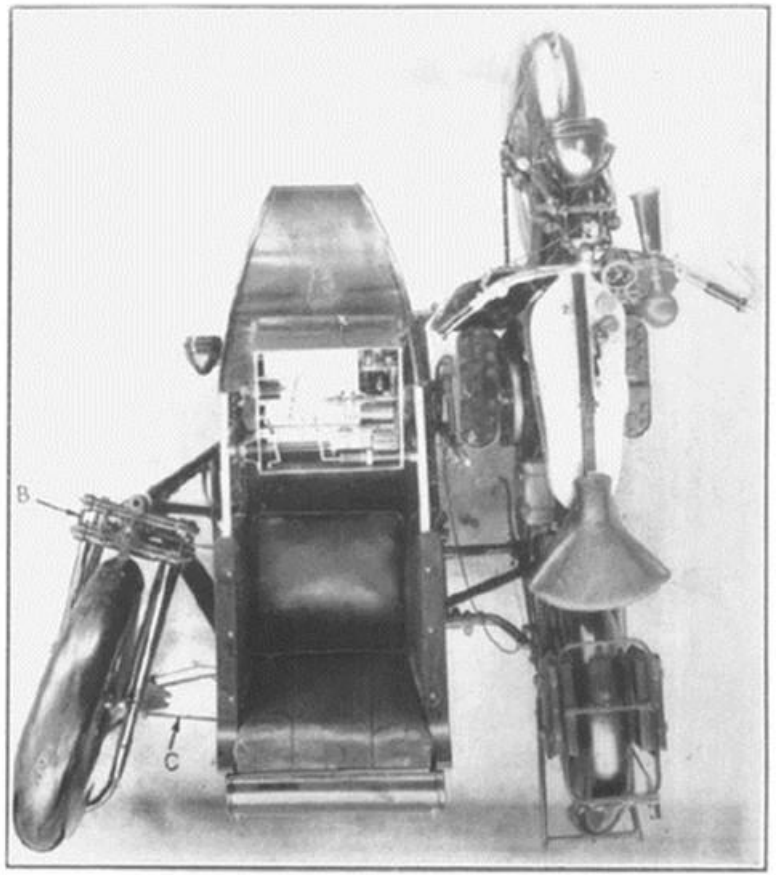
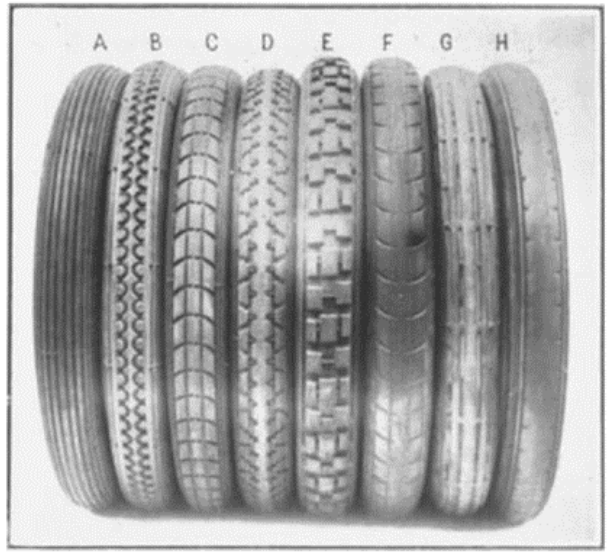
Ulster University

Bradley and Allen (1930) and their sideways force device





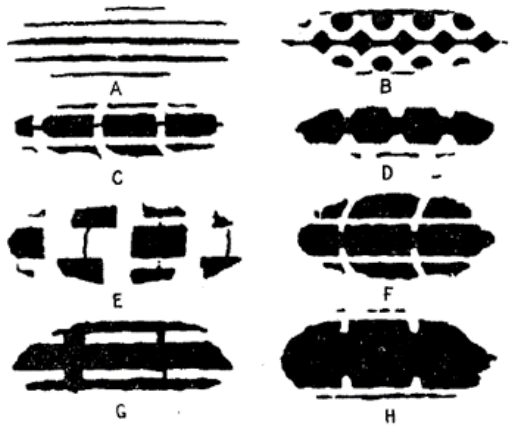
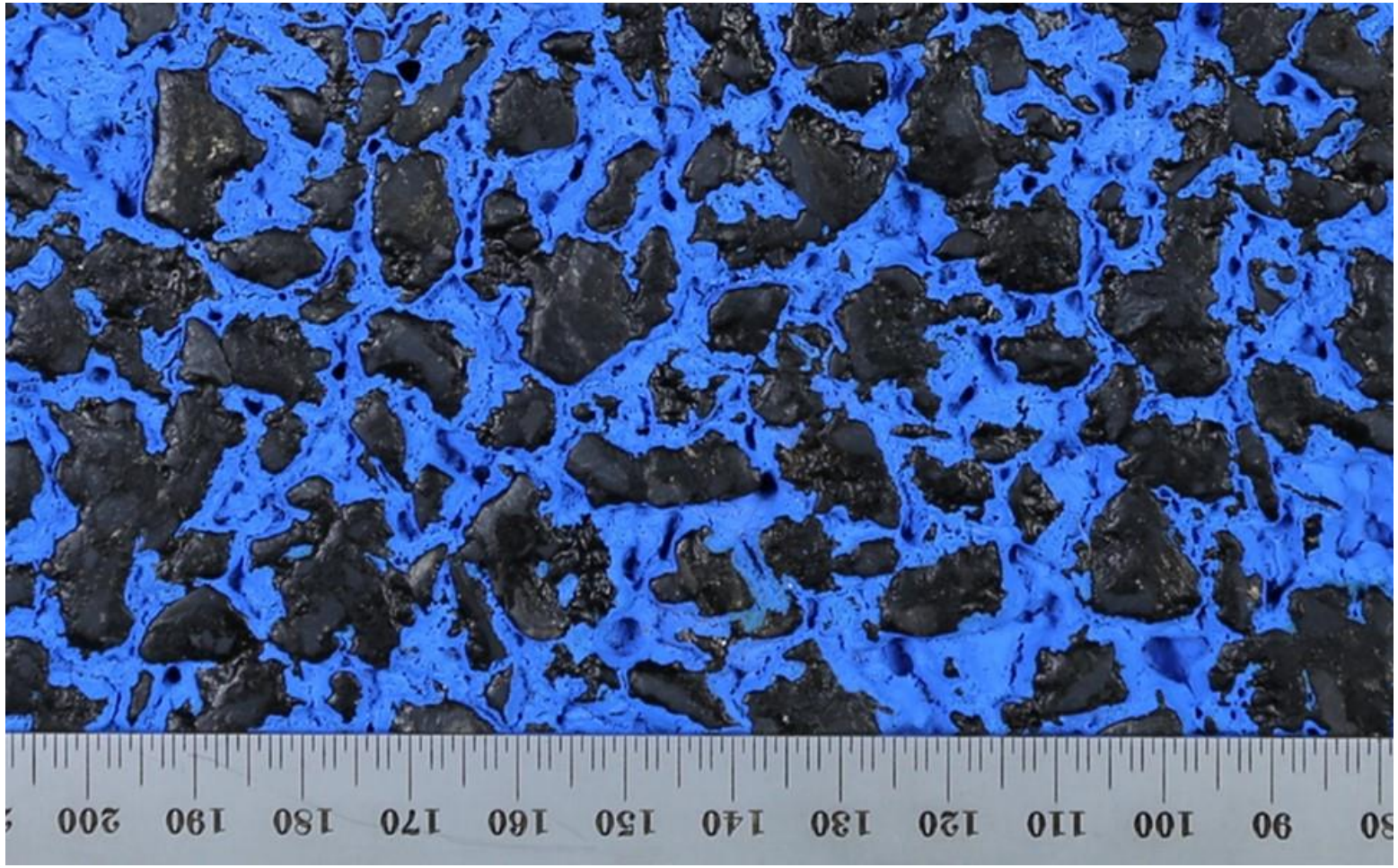


FIG. 11.—Contact Areas of Tyres (710 × 85 mm.).

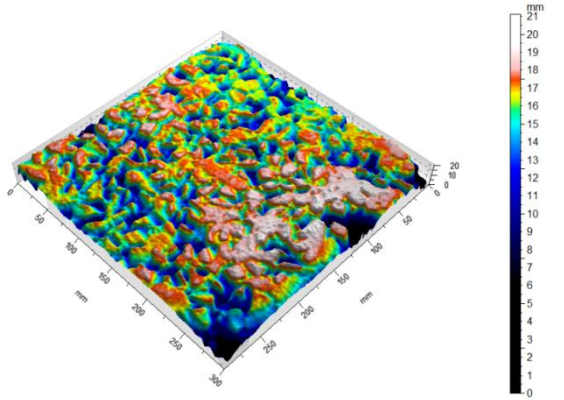
Load, 290 lb. Pressure, 30 lb. per sq. in.

Area	A = 1·7 sq. in.	D = 3·0 sq. in.	G = 5·8 sq. in.
	B = 1·8 ,,	E = 3·4 ,,	H = 6·7 ,,
	C = 2·7 ,,	F = 4·2 ,,	

Using blue paint to show enveloping




Q1


mm
21
20
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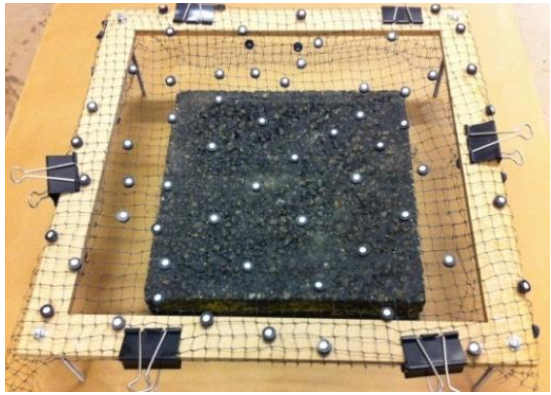
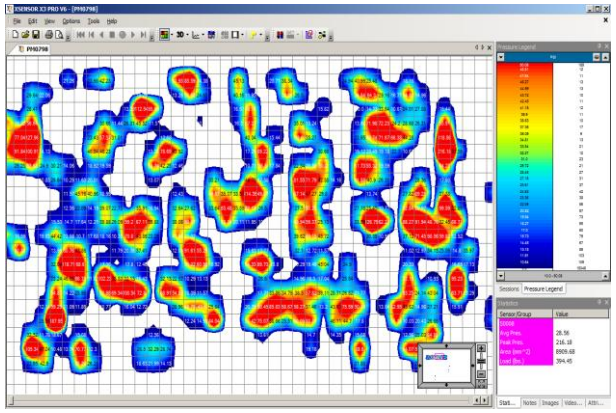
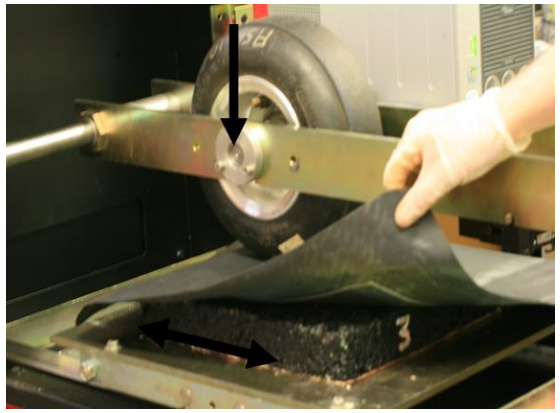
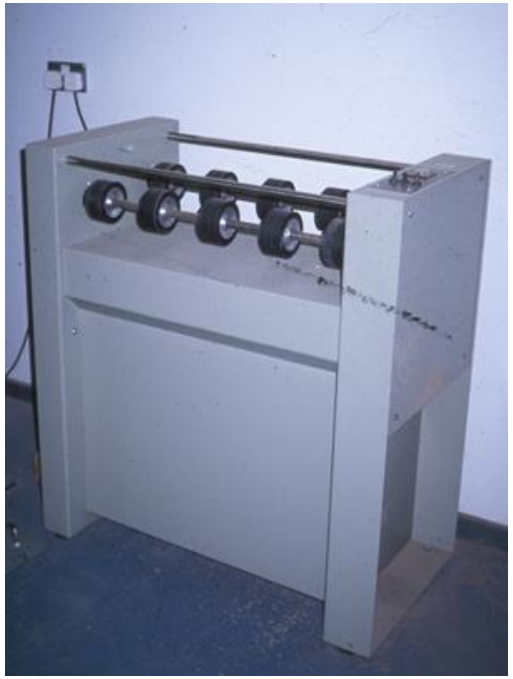


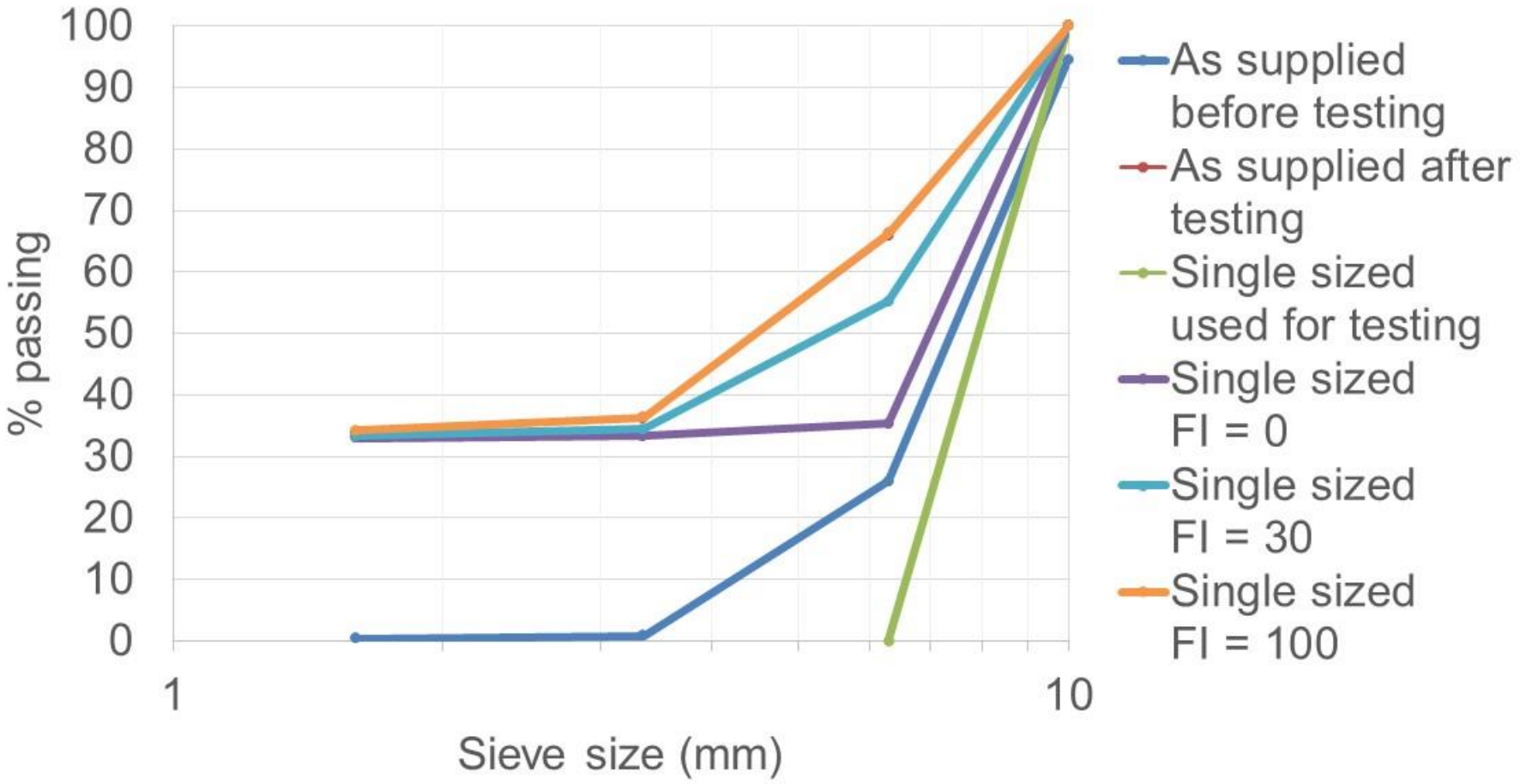




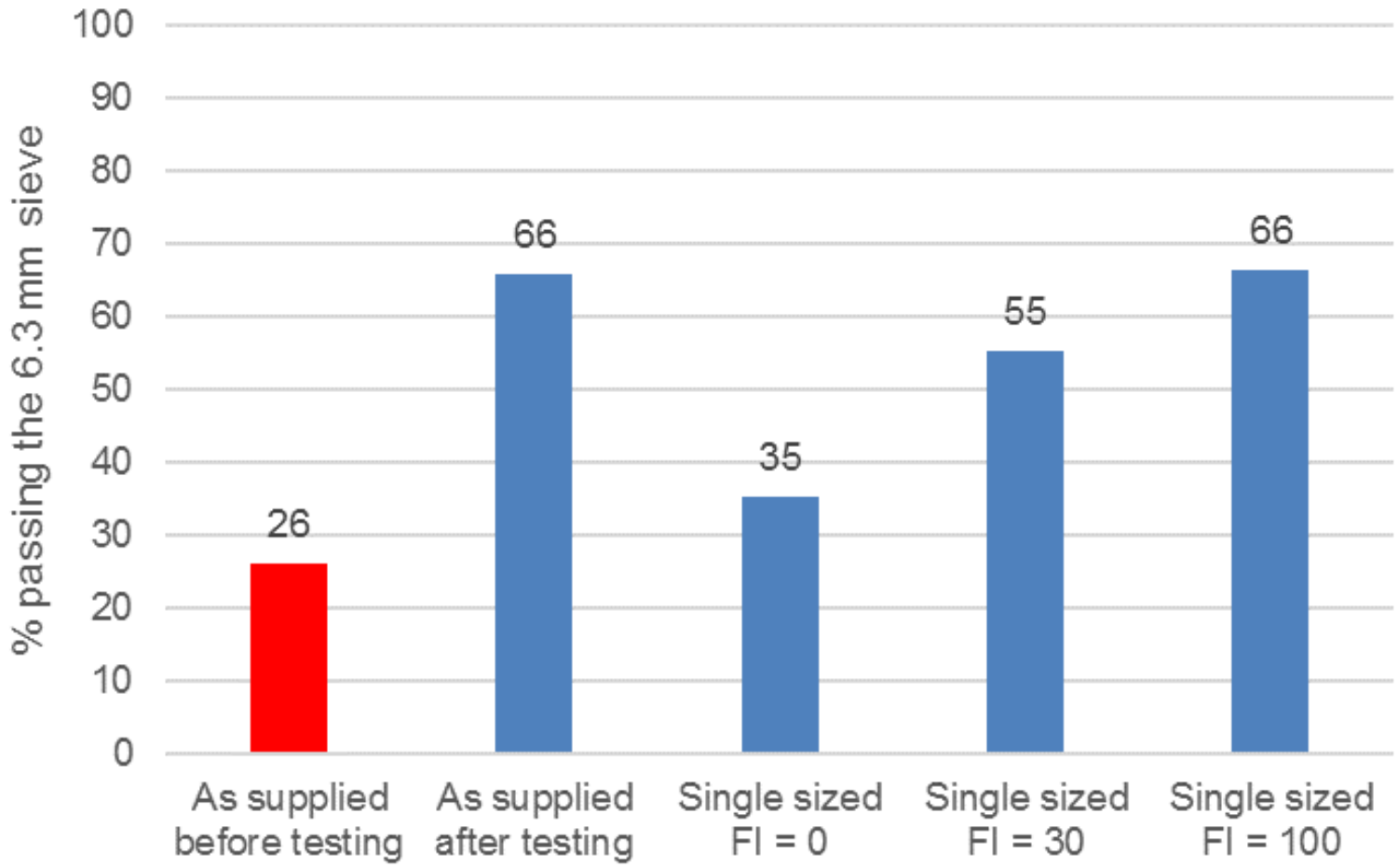
AAV and MDE test methods



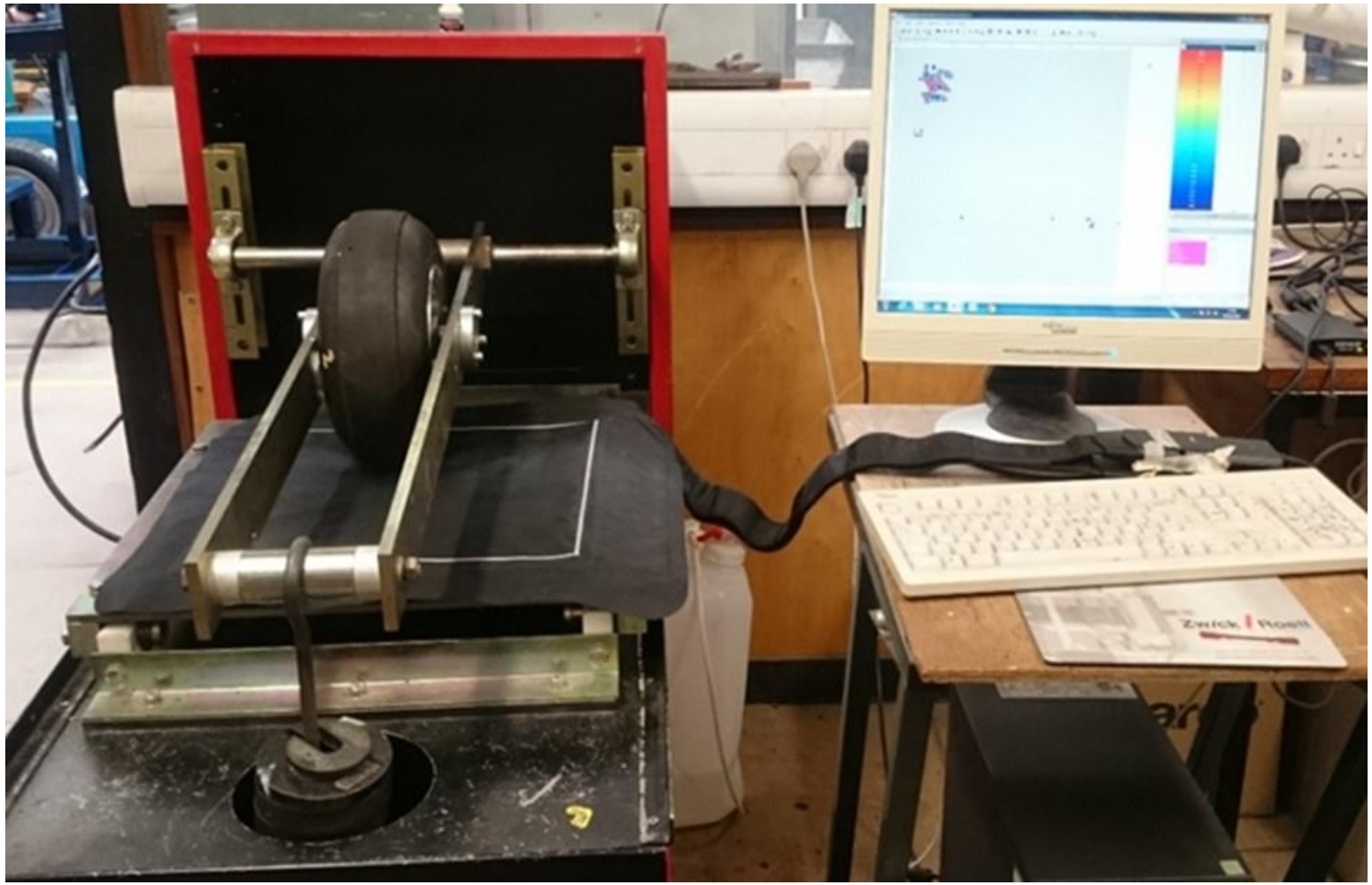
Comparison of MDE test gradings



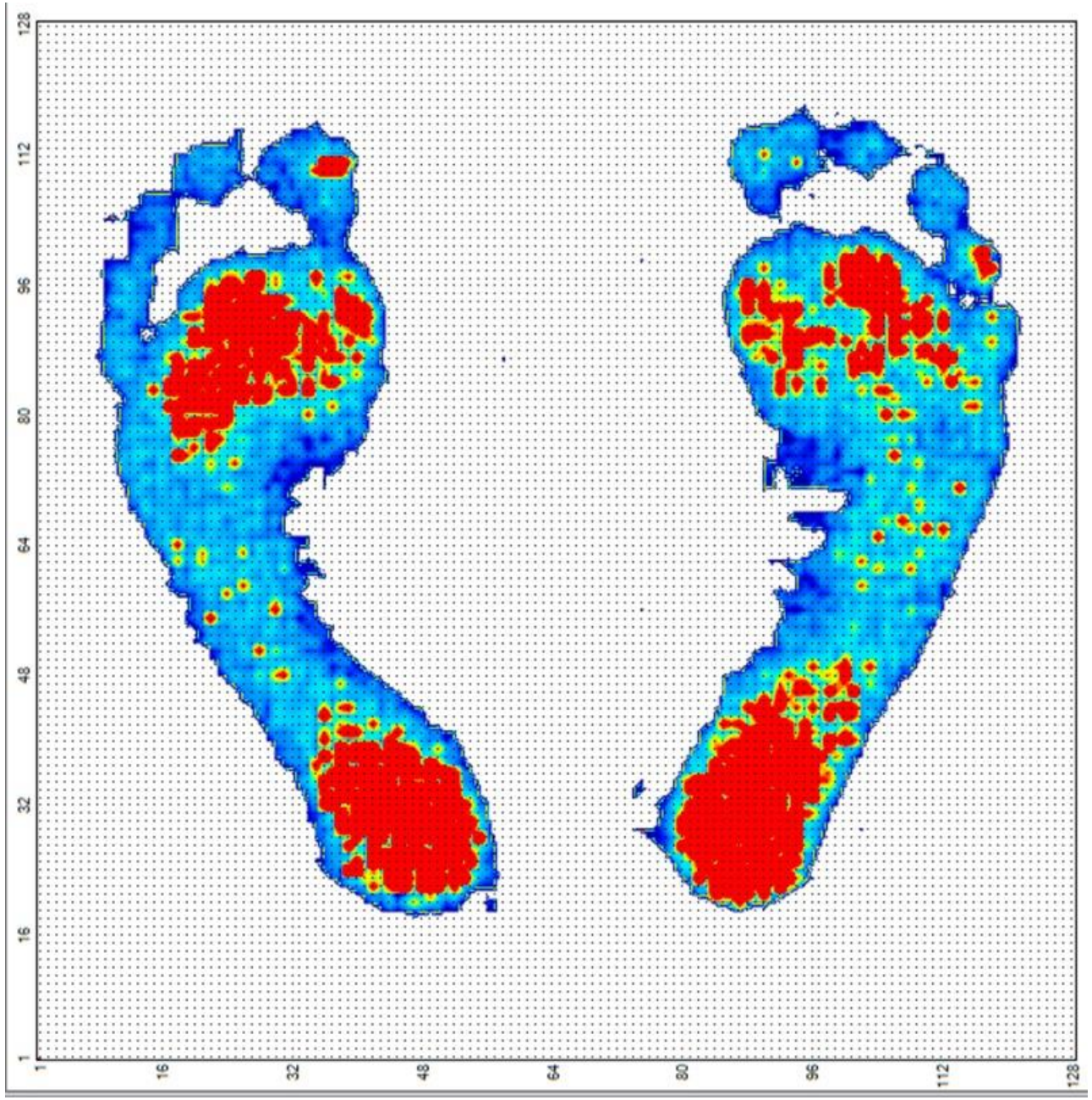
Percentage of aggregate passing the 6.3 mm sieve after MDE testing



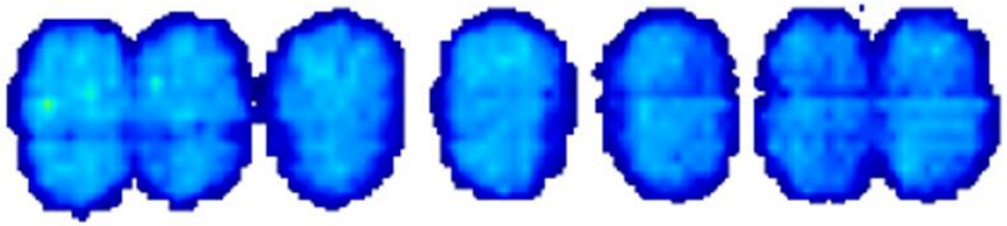
Setup for a small fixed slip friction measuring tire



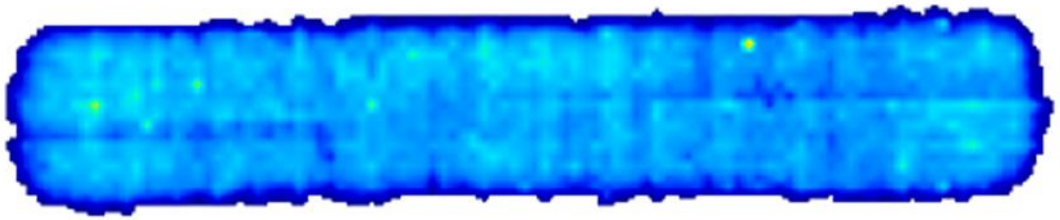
Typical use of a pressure pad



Single frames merged to make a composite contact patch.

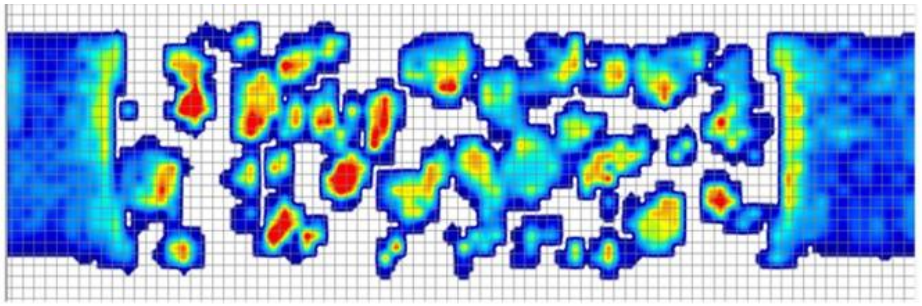


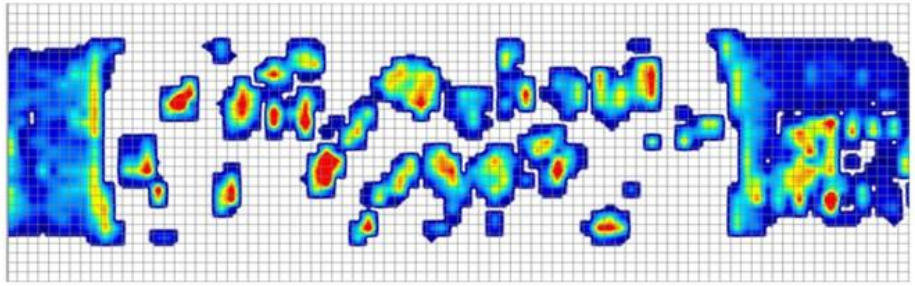
Individual frames

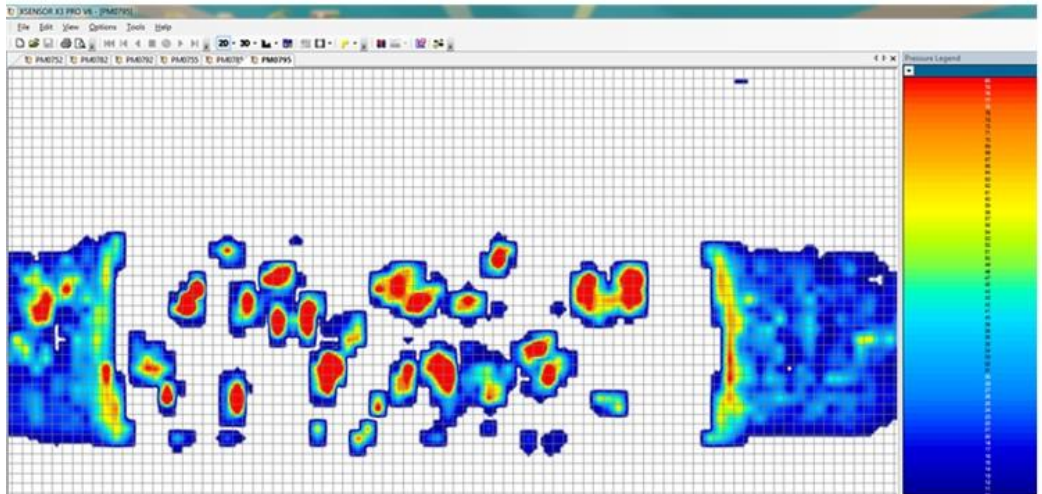


Merged frames

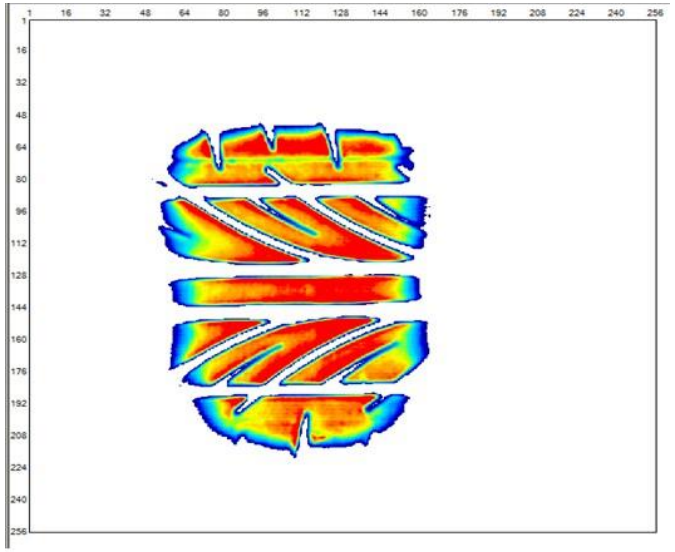
Change in contact pressure distribution for a core due to simulated trafficking

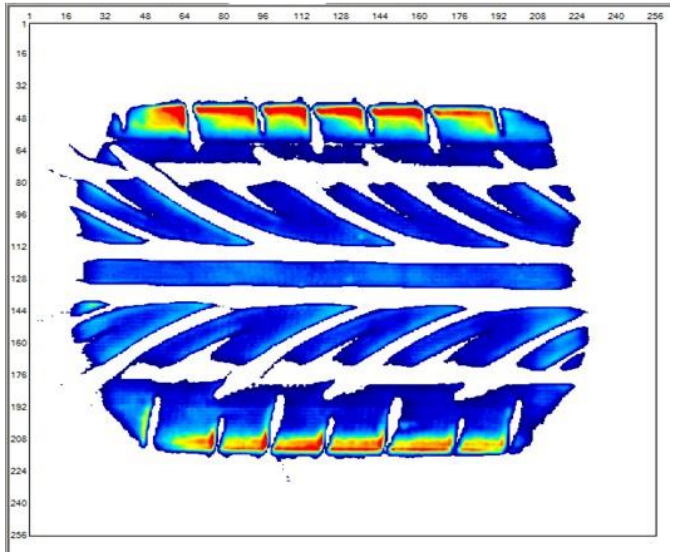




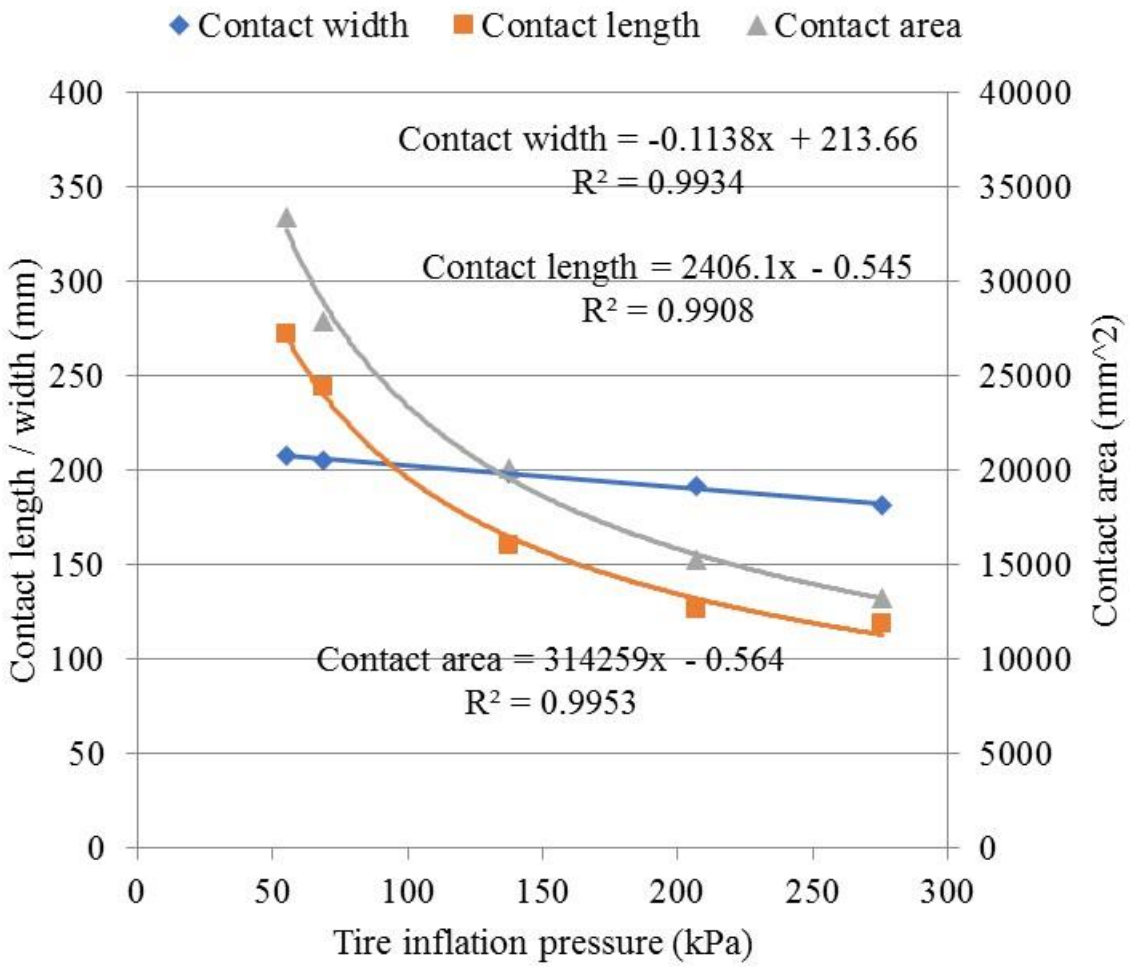


Interface contact

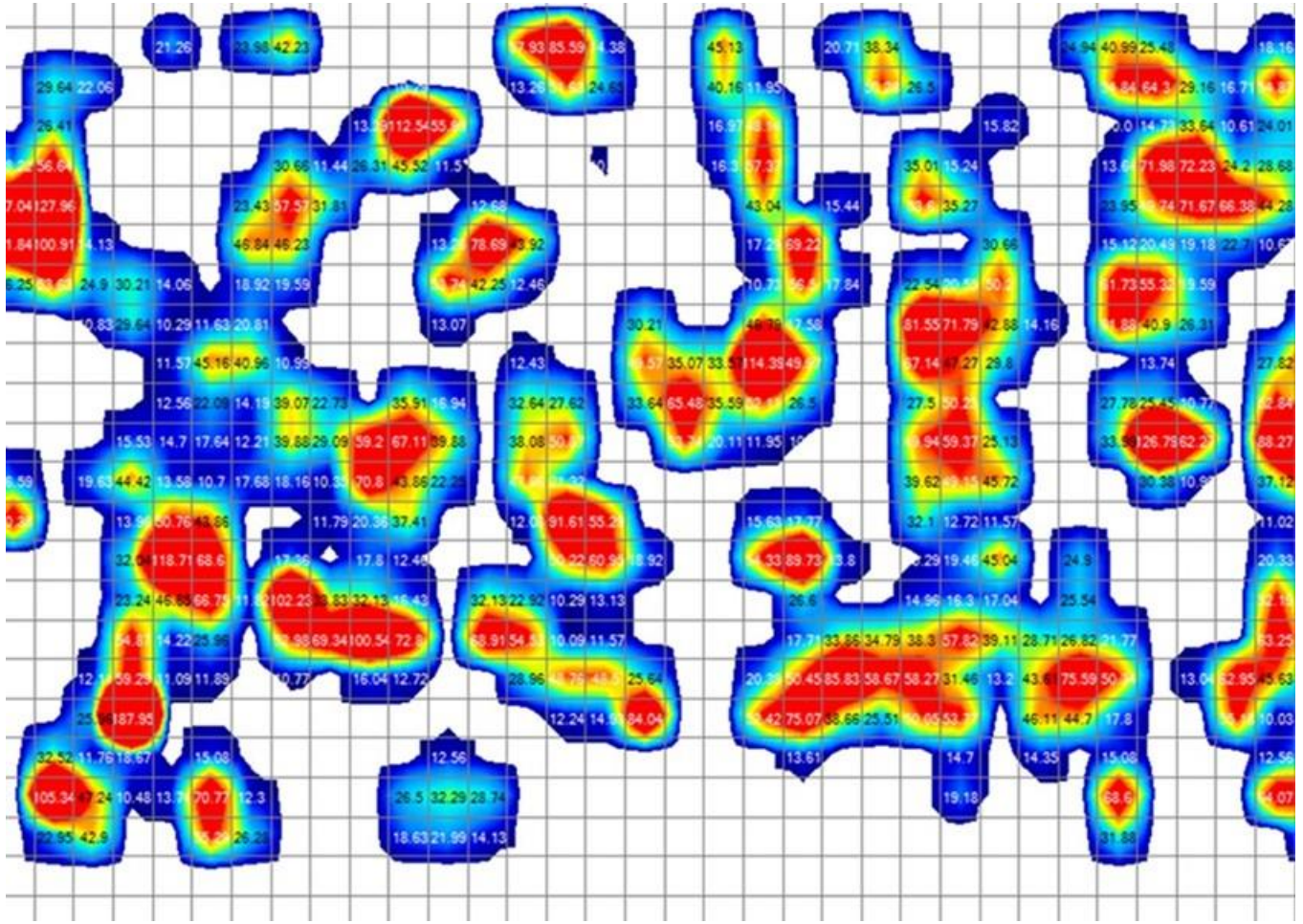




Contact area, length and width for a car tire at different inflation pressures

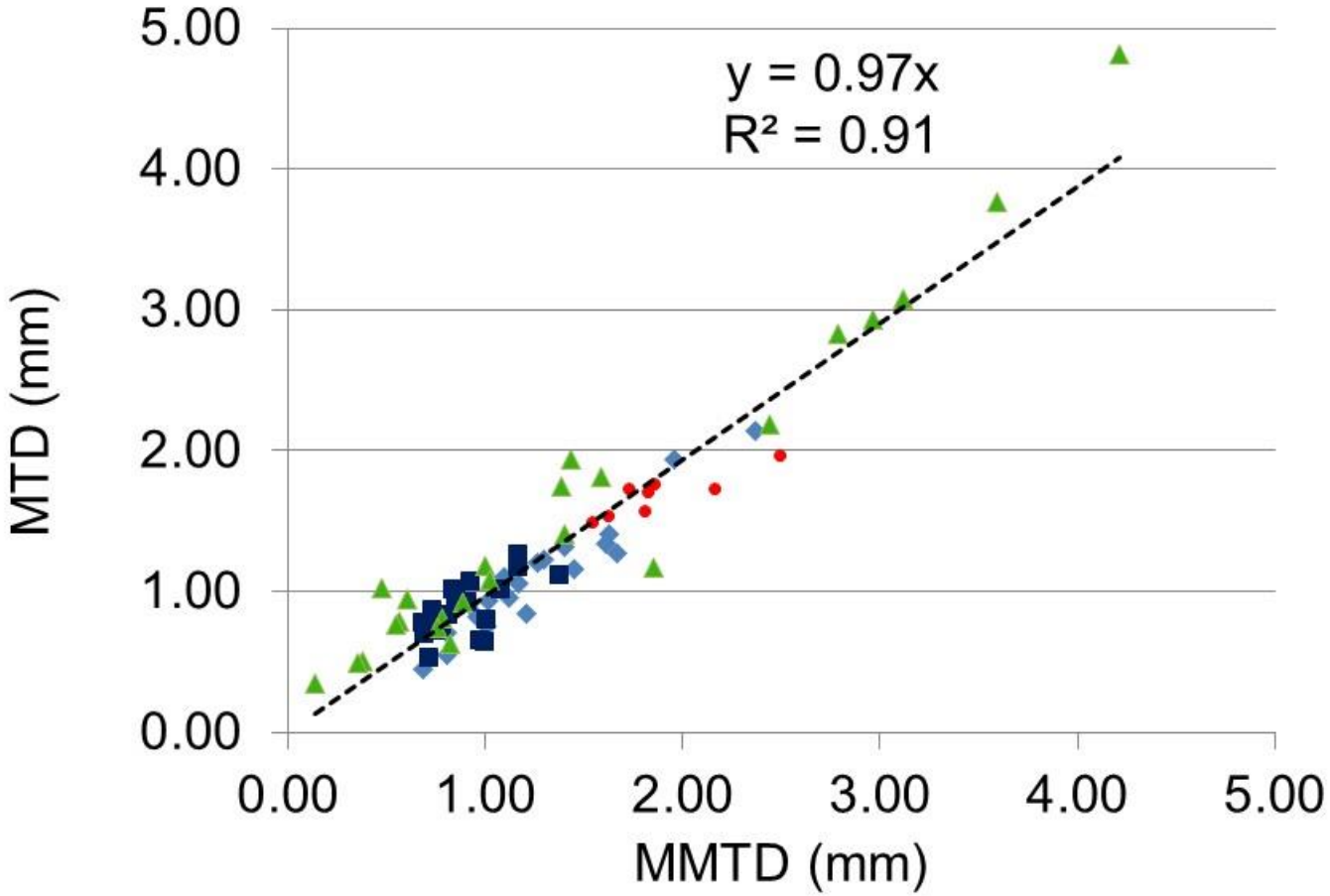


Contact area and z-axis pressure distribution for SMA10
(flexible pressure pad with individual cell size of 2.54 x 2.54 mm).

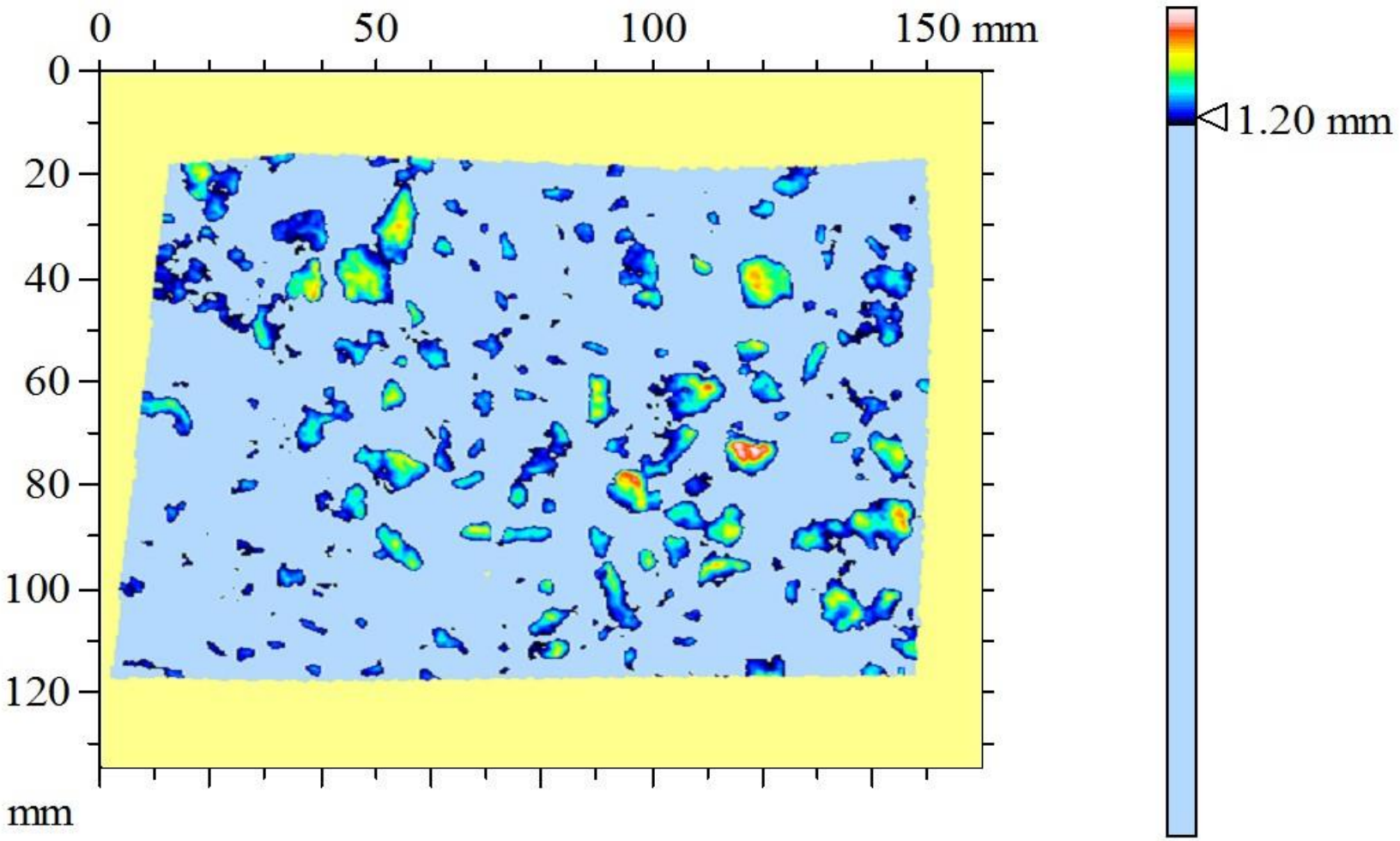


3D model of a dirty road surface based on 2 photographs

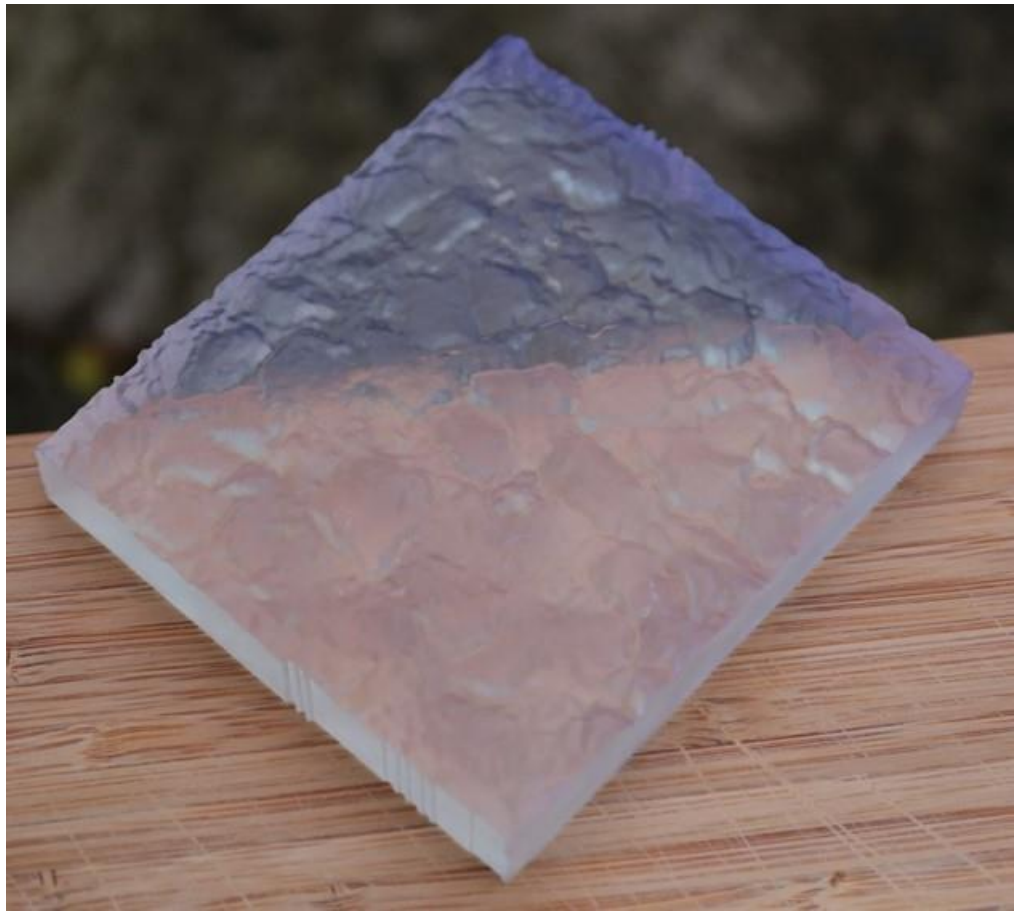
Comparison of texture depth data using photographs and sand patch



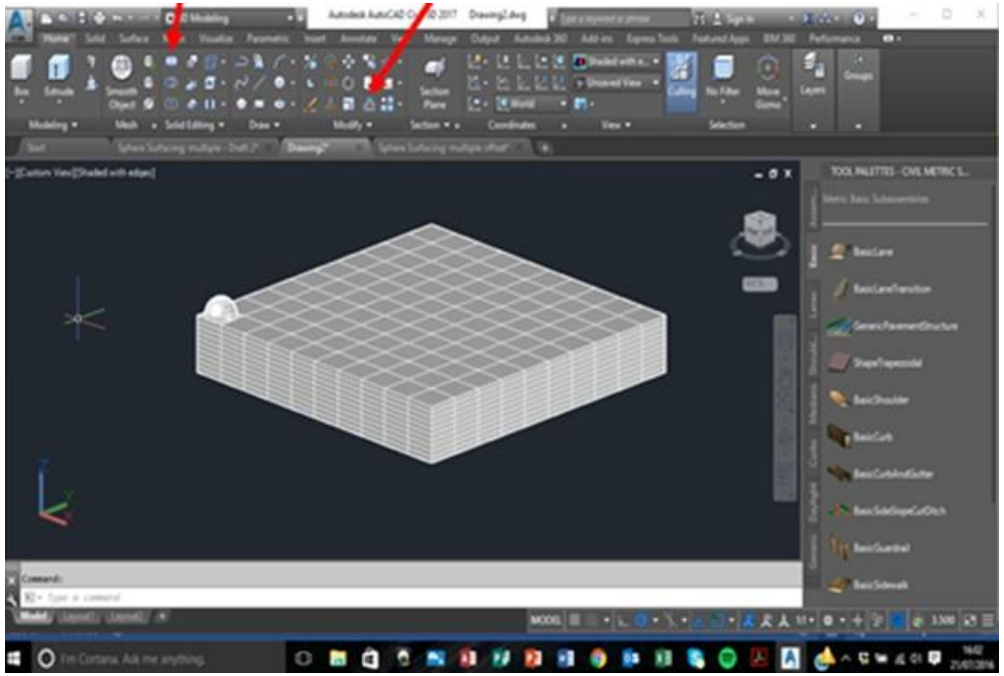
Use of 3D model to evaluate tyre/surface interaction at a depth of 1.20mm

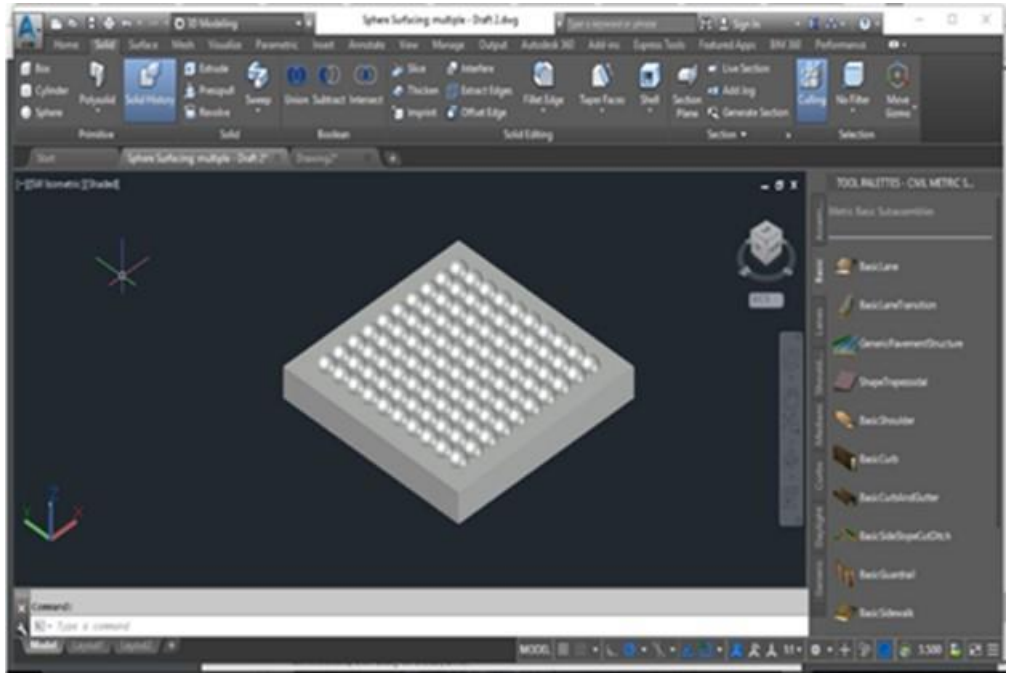


3d model made from photographs taken in France and printed in 2 types of media

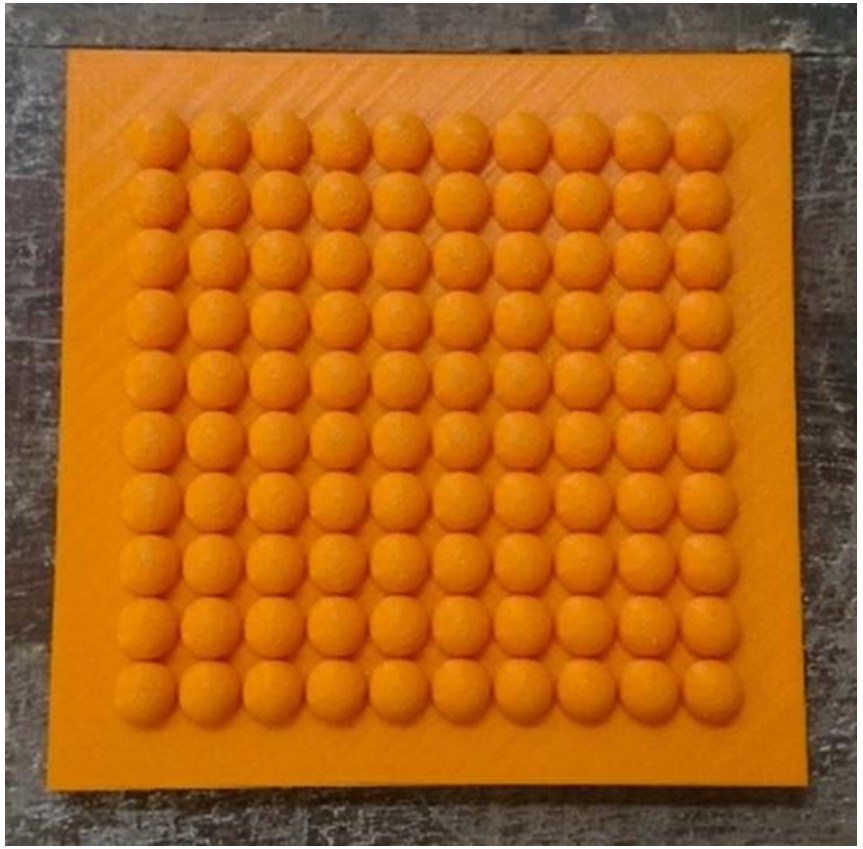


Screenshots showing the creation of an idealised worn 10mm SMA surface in CAD

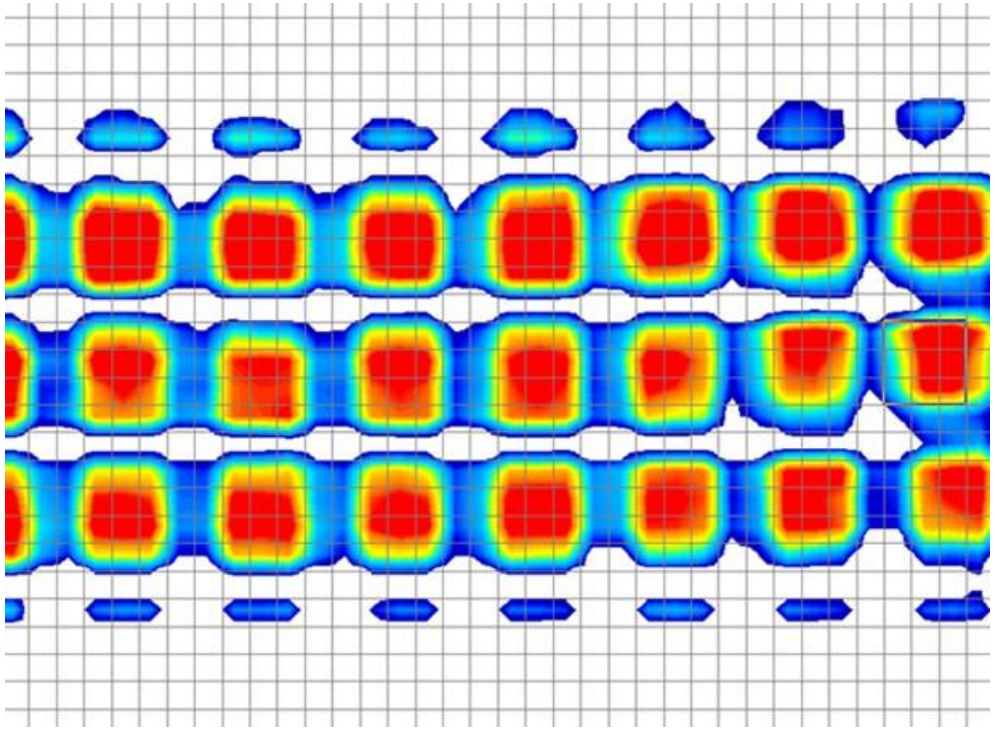


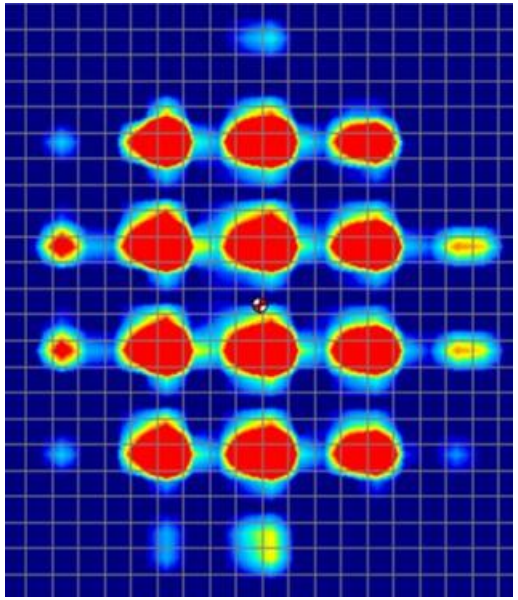


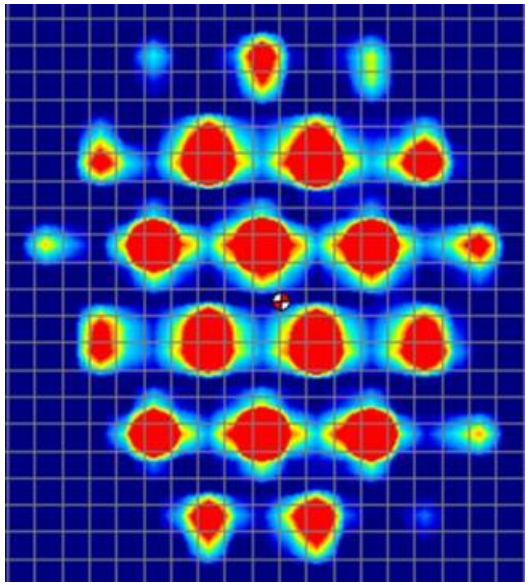
3d printing any type of idealised surface model



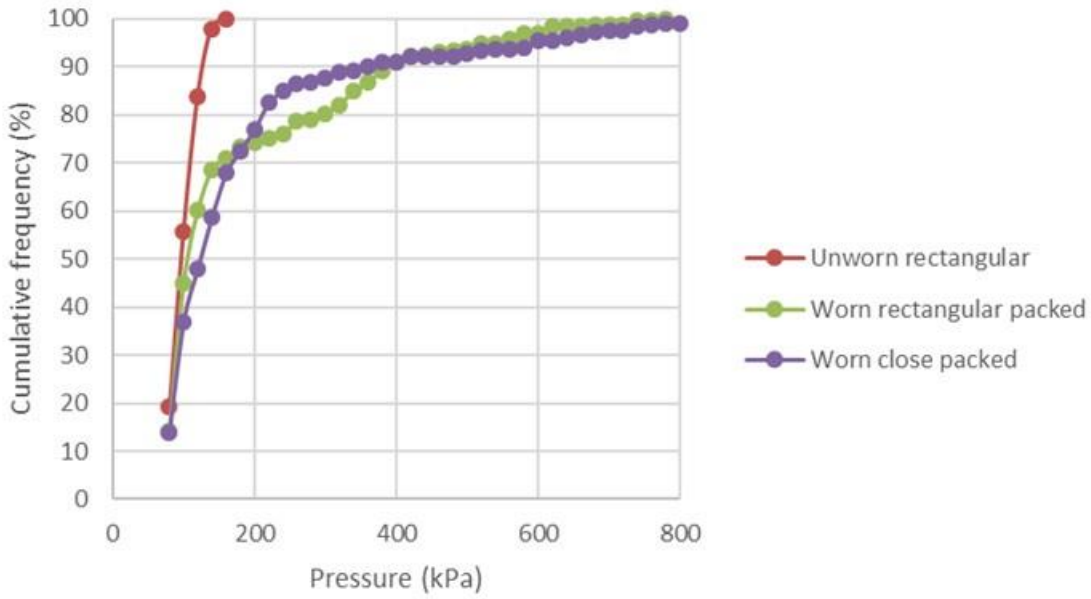
Variation in z-axis contact for idealised unworn (merged frames) and worn 10mm SMA rectangular and close packed (single frames)

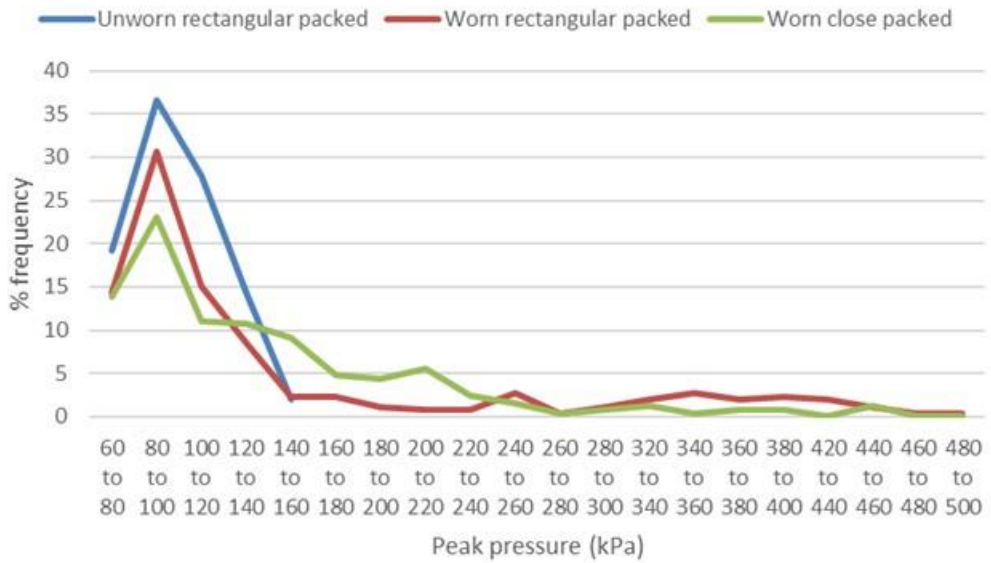






Comparison of unworn and worn peak pressure distributions





Conclusions

- The tire / road surface interface is very complex place.
- The paper has brought together two different studies.
- They try to compliment each other.
- Offer a means most people can understand.
- Change in original aggregfate particle size and shape relates to surface texture retention.

Conclusions (2)

- 3d modelling based on some photographs gives new ways to visualise things.
- 3d printers can create test specimens of:
  - any road surface anywhere around the world.
  - any idealised road surface texture.
- Flexible pressure pads give real-time measurement of tire / test specimen contact phenomena.
- These simple examples illustrate new developing areas of performance prediction.