BAE SYSTEMS

Secondary Surface Preparation

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BAE SYSTEMS

Secondary Surface Preparation

- Secondary preparation used to prepare small areas of steel prior to the application of coatings
- Plethora of available techniques, range of preparation standards
  - Survey techniques to assess which is most suitable for use with performance coatings exposed in a simulated aggressive environment
  - Measuring profiles produced on ground and polished steel panels
  - Corrosion testing of painted test panels
- Influence of substrate properties on tool life

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Experimental procedure

- Sa 2 ½ blast using G17/G24 chilled iron, 50-75µm profile – reference
- 2° Preparation Methods
  - Needle gun (Jasons pistol)
  - P60 emery hand preparation
  - Monti MBX bristle blaster
  - Ibix mini-blaster
  - Perago
  - P36 cubitron disc on grinder (used flat and with cross-hatch pattern)

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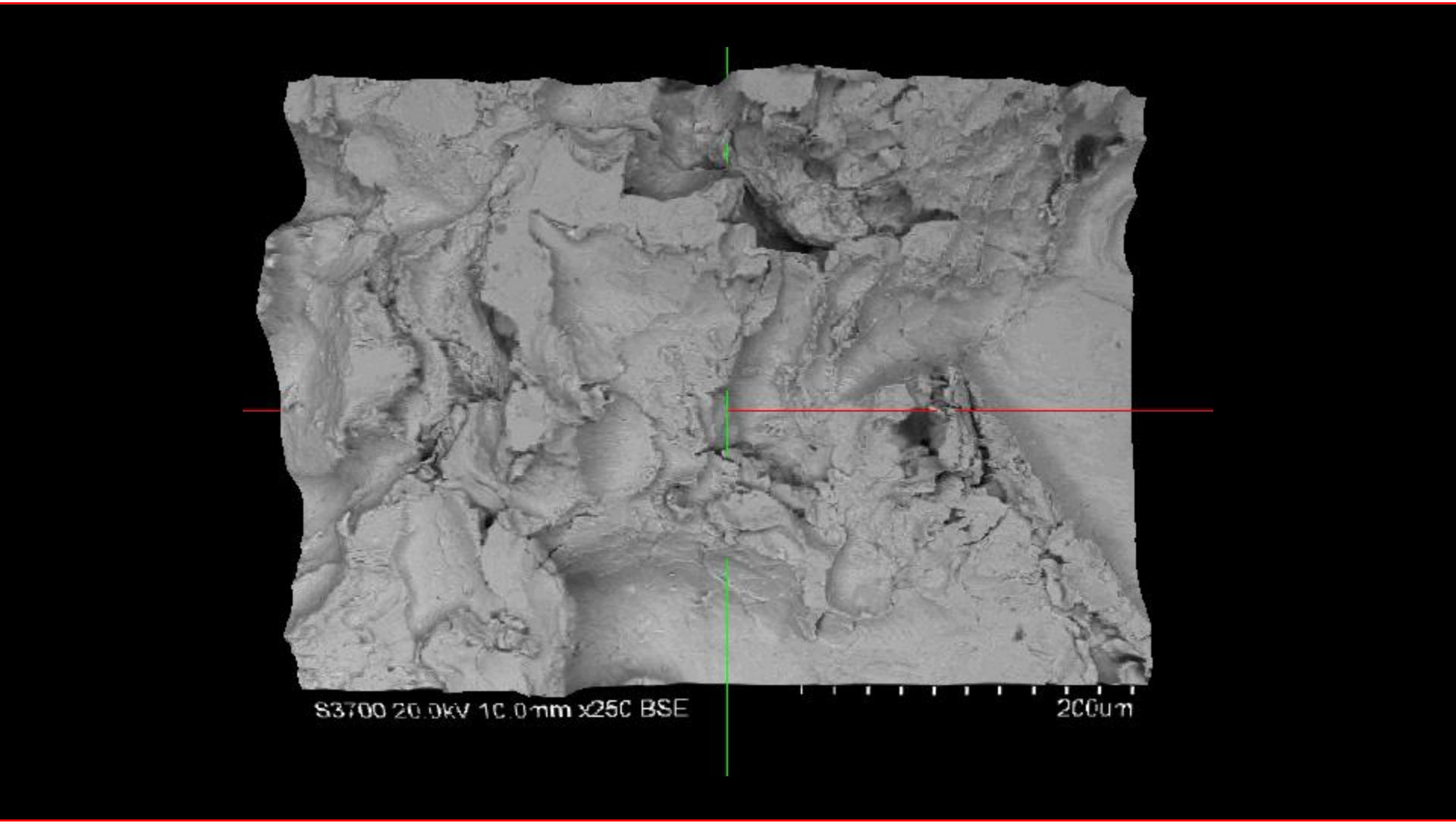
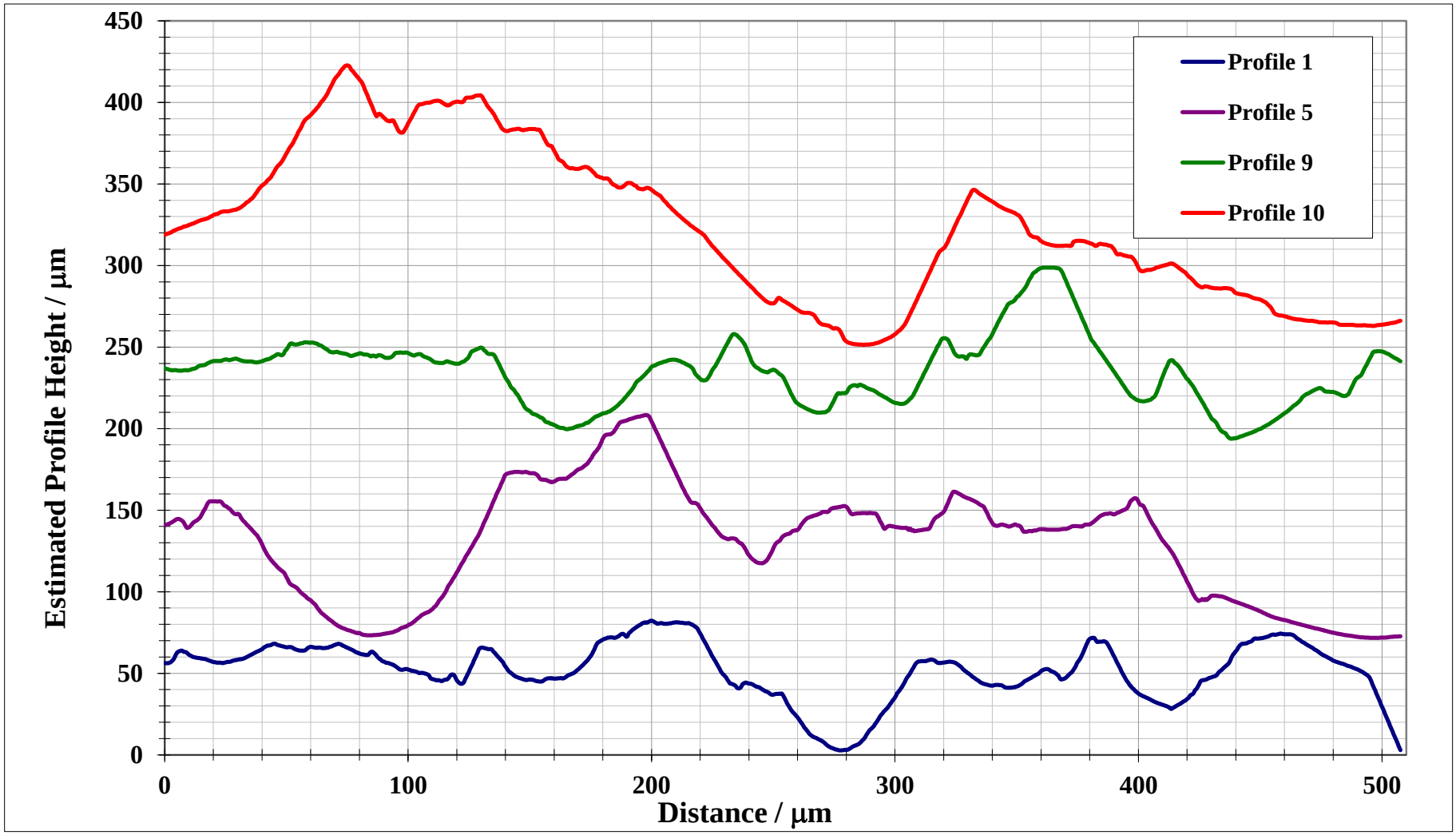
Experimental procedure

- Measuring profiles using SEM generated 3d maps
- Samples ground and polished flat prior to preparation
  - 'Background roughness' <5µm

3d surface map



2d Line Profiles – from surface map (G17/G24 grit blast)



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Experimental procedure

- Measuring profiles using SEM generated 3d maps
- Samples ground and polished flat prior to preparation
  - 'Background roughness' <5µm
- 3d surface maps using SEM in backscatter
  - Generate line profiles from surface map
- Estimate profile heights from 2d line profile and visual cue
- Corrosion testing . . . . . .

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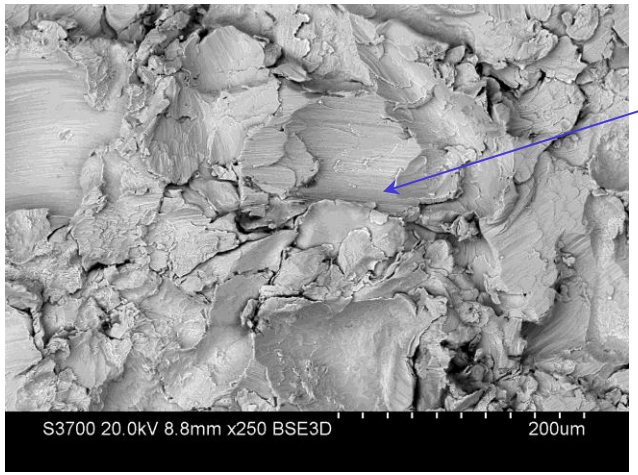
Experimental procedure:- corrosion testing

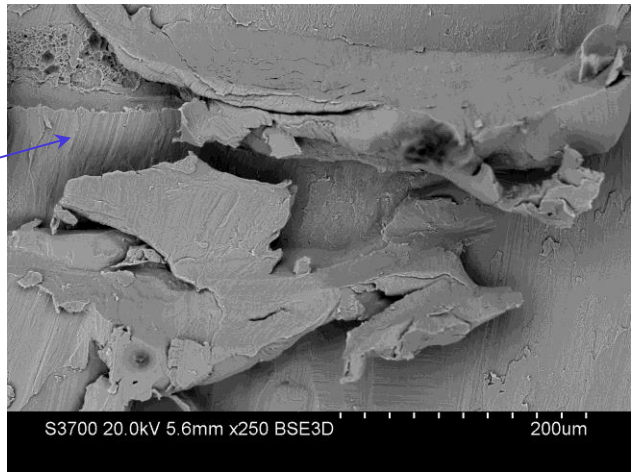
- Flat mild steel panels 3 x 100 x 200mm, taped around edges and "St Andrews cross" prepared defect – painted with 2 pack epoxy barrier system
- Sa 2 ½ blast prepared panels used as reference (G17 / G24 grit working mix, 50-75µm profile)
- Samples submitted in triplicate for
  - ASTM B117 salt spray (1000 hours)
  - BS3900 part F4 cyclic humidity testing (1000 hours)
- Assessed *iaw* BS EN ISO 4628-8:2005

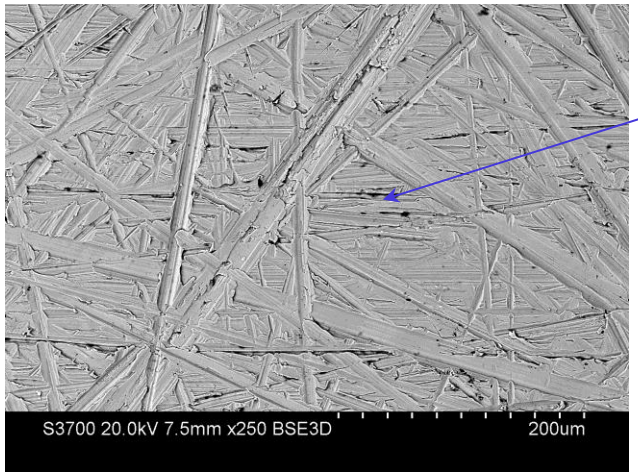
Results:- SEM micrographs UTS 550 Steel



Blast (ref)

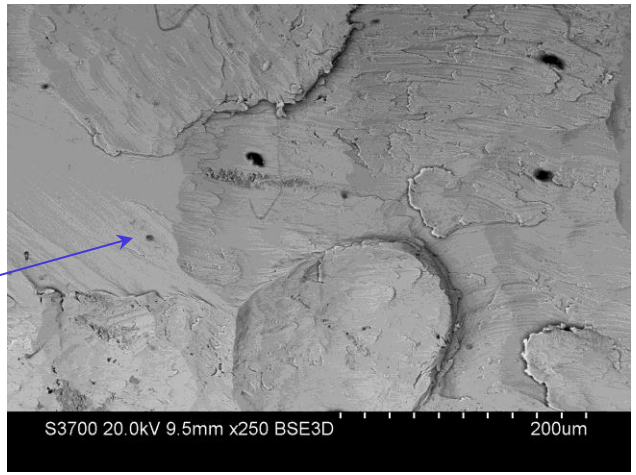
Bristle blaster



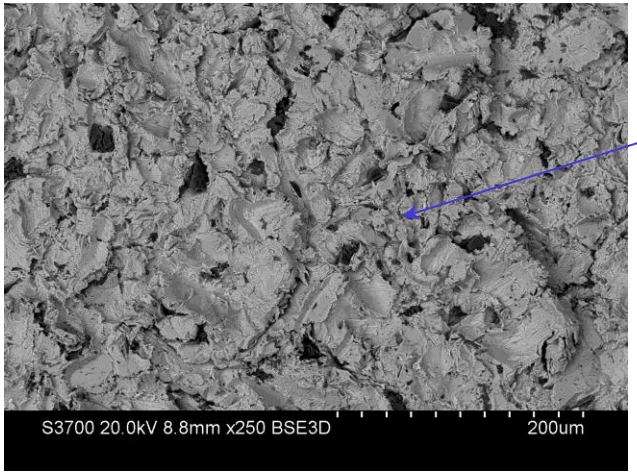


Hand prep

Needle gun
(mild steel)

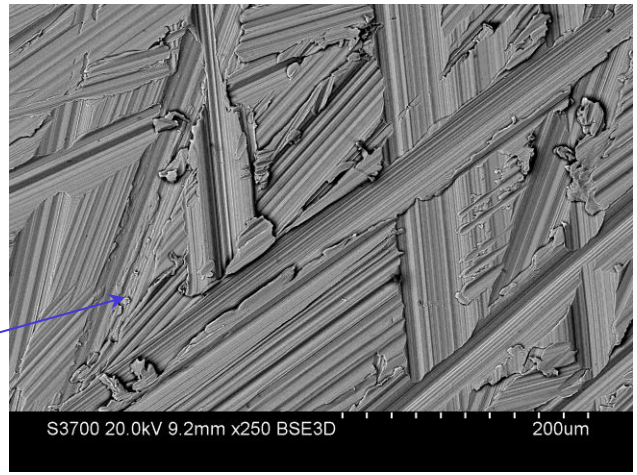


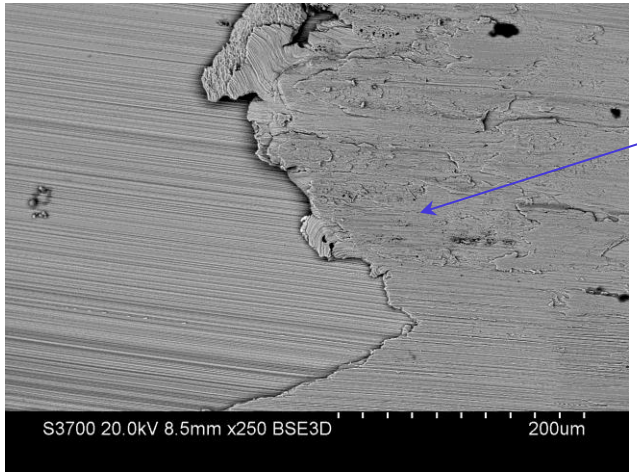
Results:- SEM micrographs UTS 550 Steel



Ibix blaster

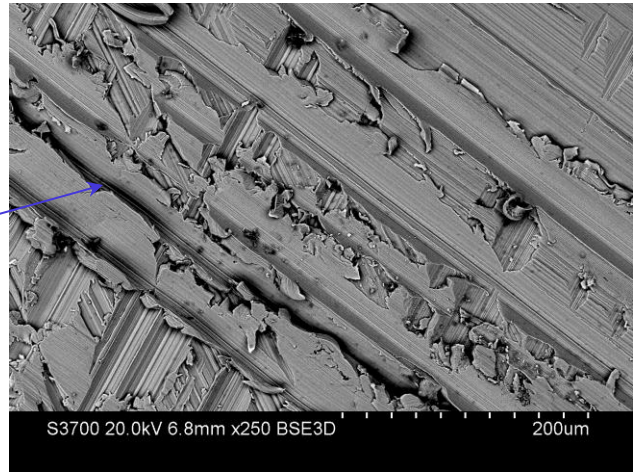
Grinder used flat





Perago

Grinder x-hatch pattern



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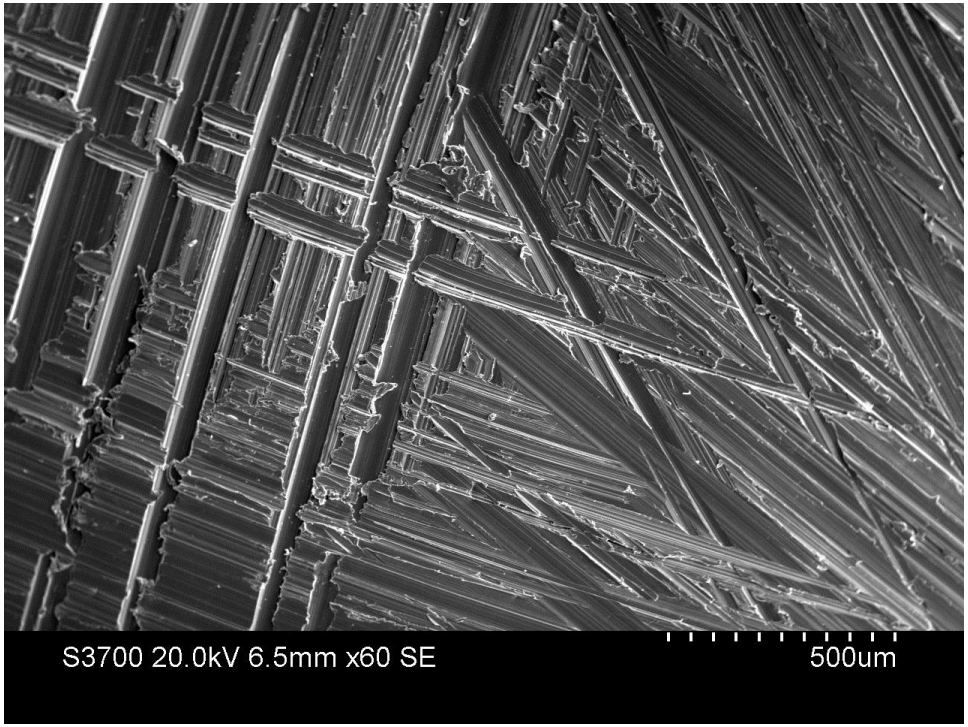
Results:- SEM micrographs

Grinder x-hatch pattern – SE image showing 'layered' effect of repeated passes with grinder



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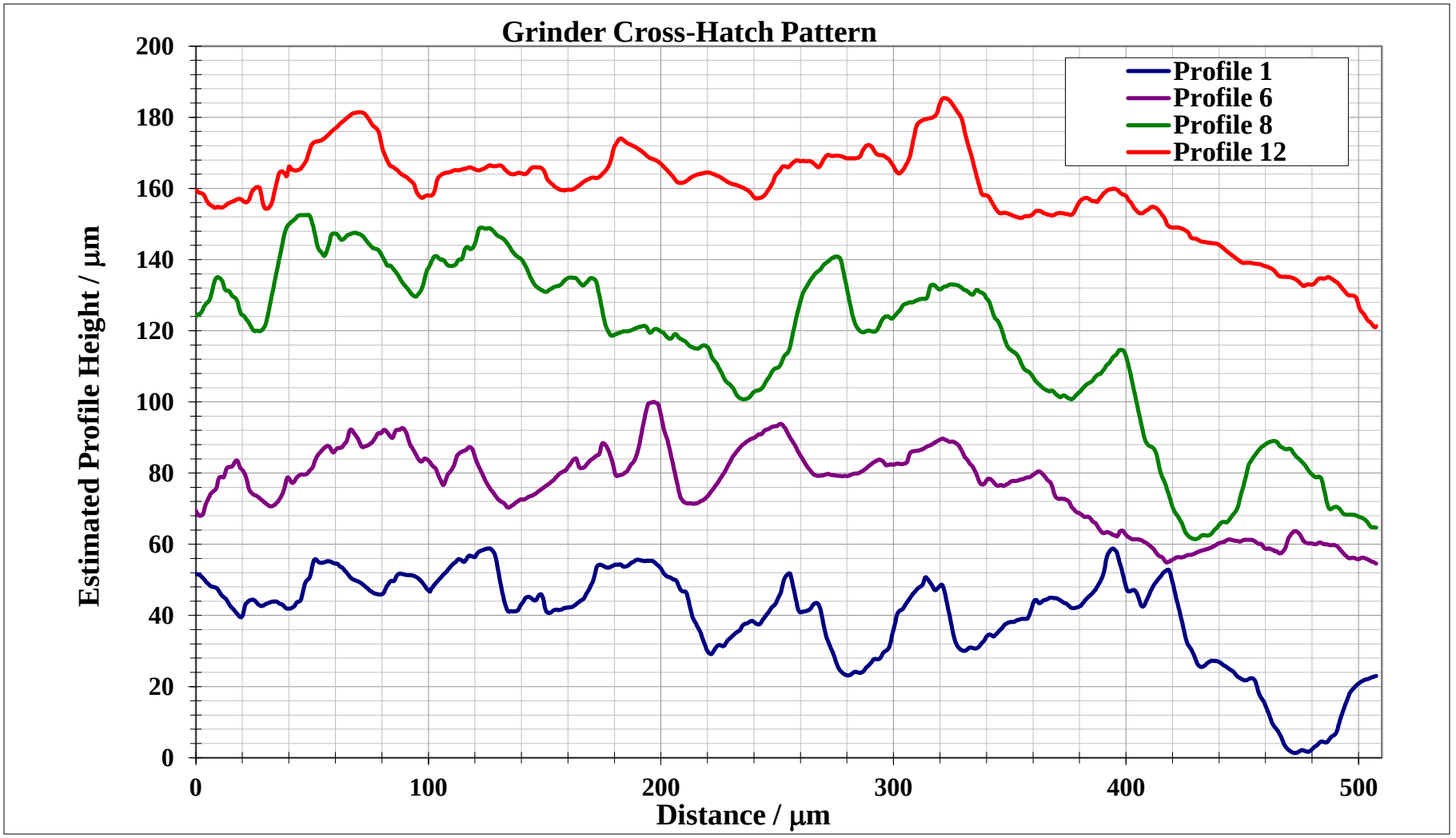
Results:- profile measurements from 3d surface map



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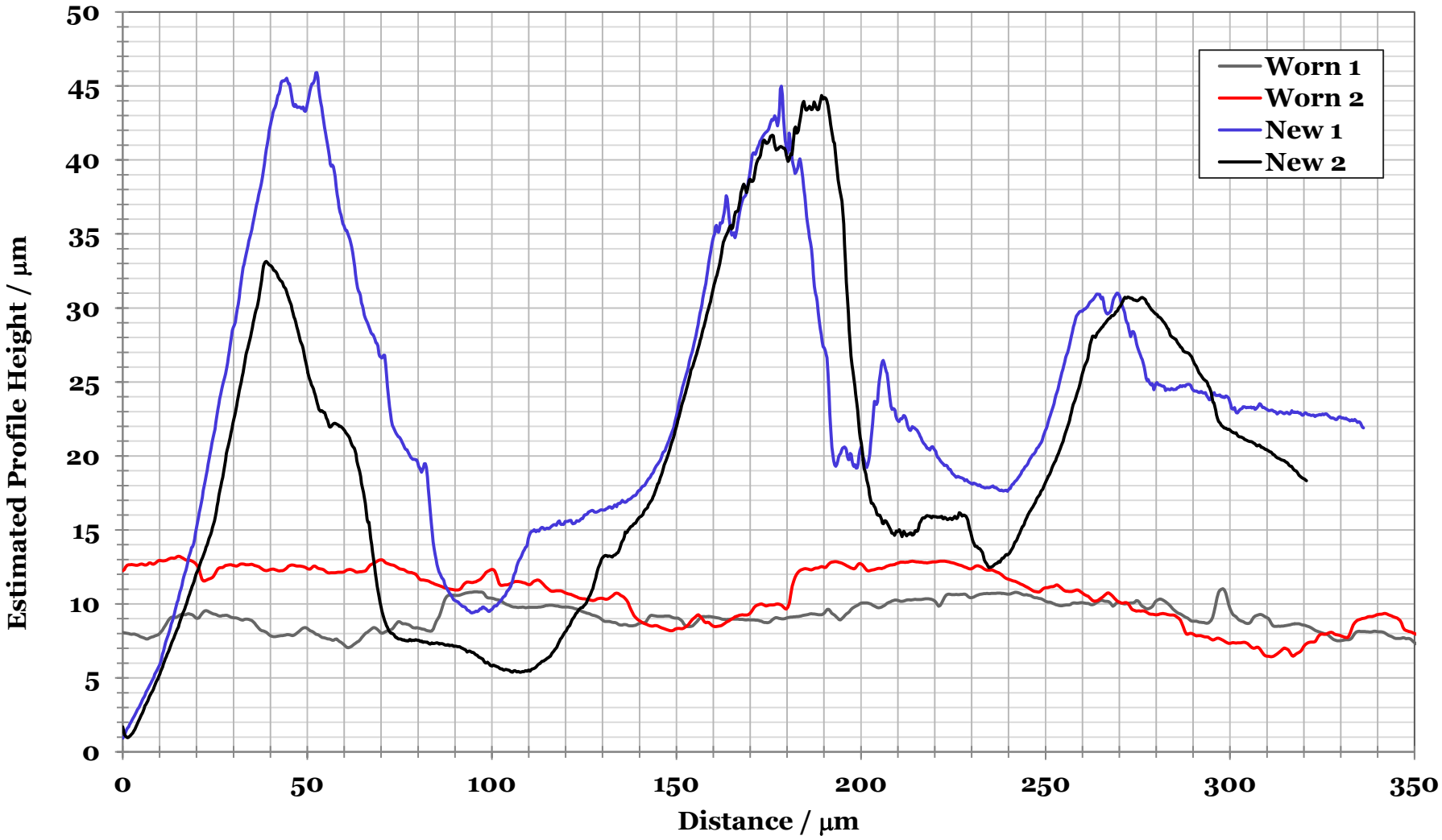
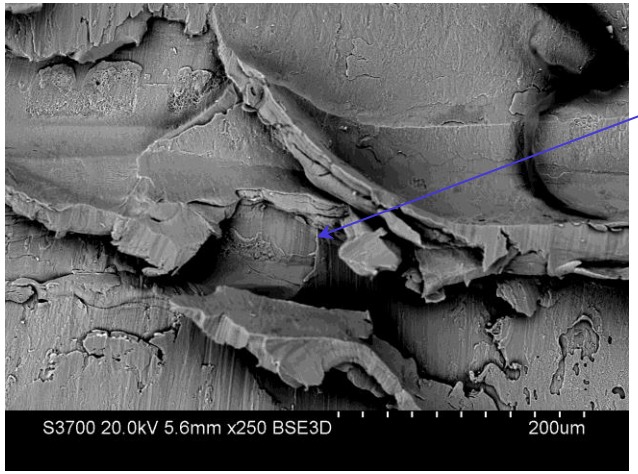
Results:- profile measurement on UTS 600

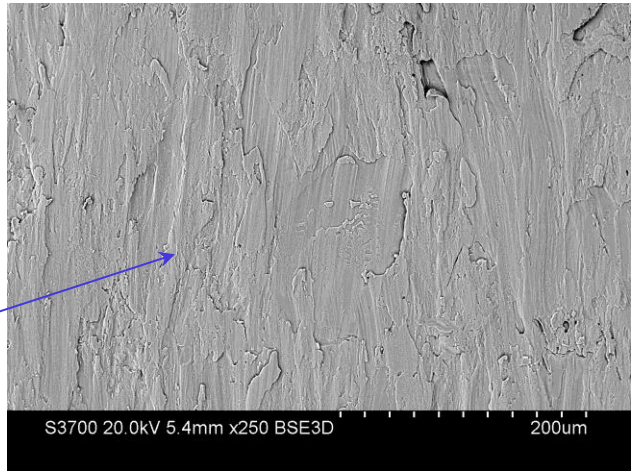


Results:- correct use of MBX BB

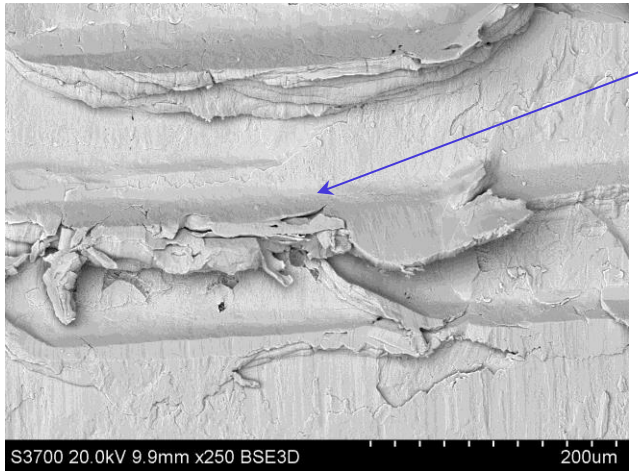


Correctly used BB

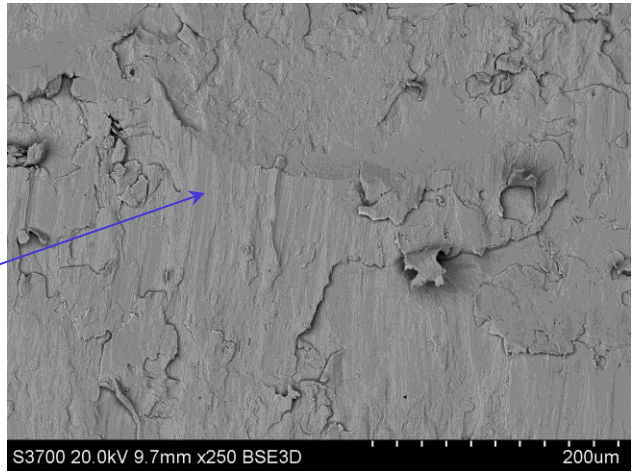
Effect of repeated passes



Correctly used BB on UTS 600



Following preparation of ~0.5m²



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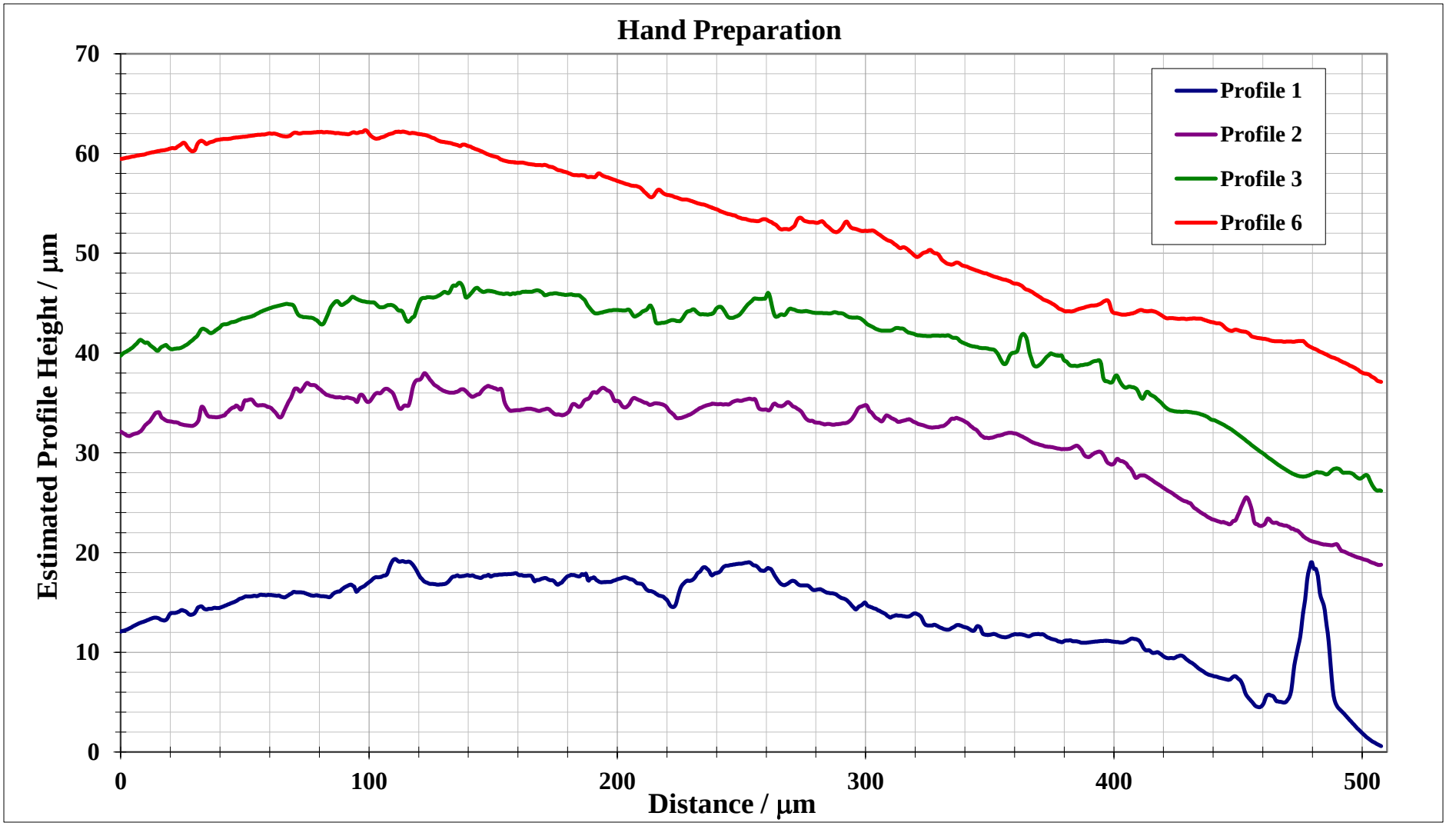
Results:- profile measurements from 3d surface map



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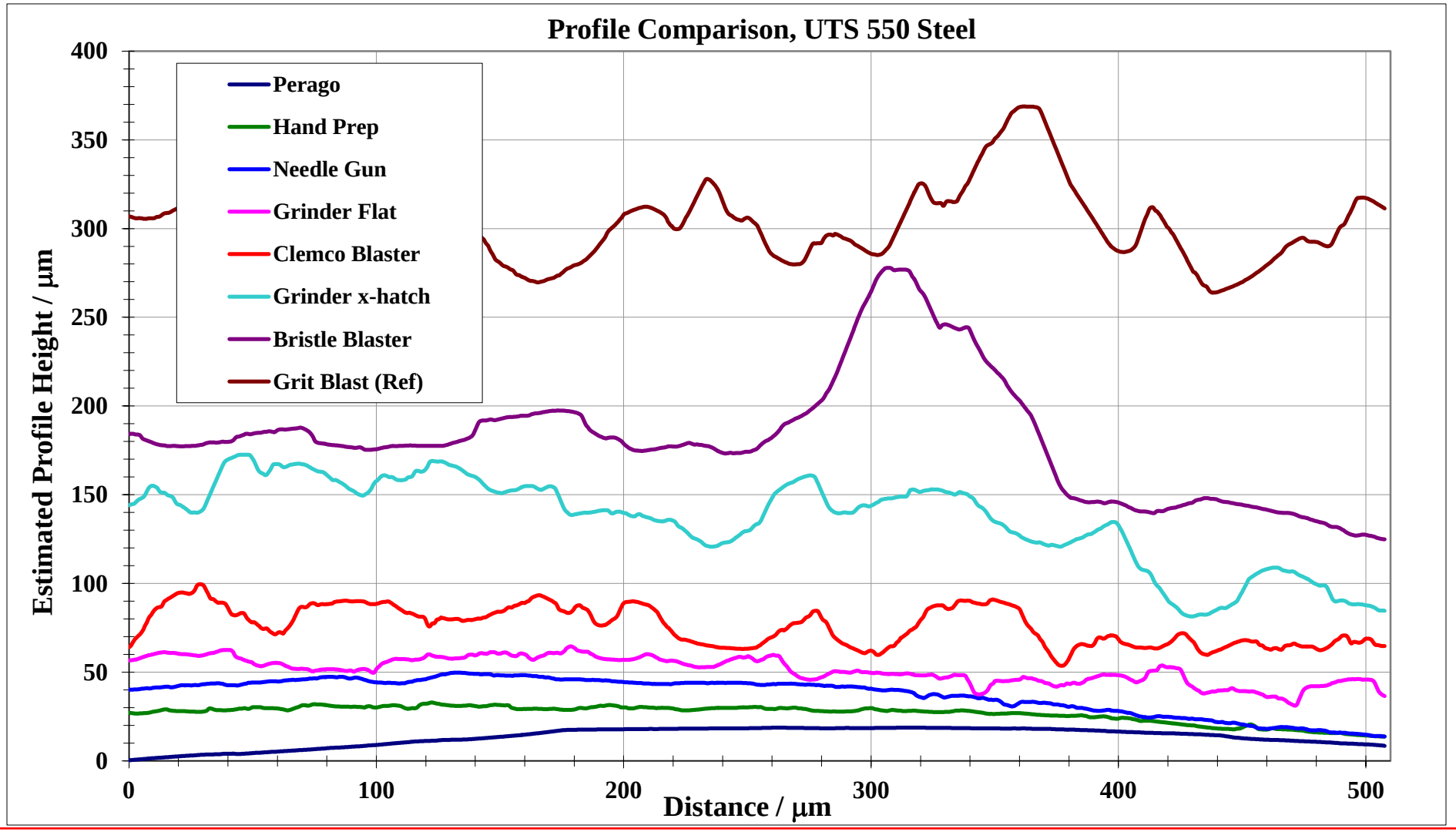
Results:- profile measurements, comparative



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Profile measurements . . . .

- SEM technique in good agreement with conformal tape measurements
- Two techniques give profiles similar in complexity and depth to blast reference
- Majority of prep methods produce shallow / regular profiles
- Conformal tape alone not suitable for assessing mechanical preparation

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Results:- salt spray testing

Cubitron abrasive disc used to produce x-hatch pattern – 1000 hours B117 salt spray

BAE SYSTEMS

Results:- salt spray testing

Cubitron abrasive disc used flat – 1000 hours B117 salt spray

Results:- BS3900 Cyclic humidity

Grinder x-hatch

Grinder flat

Bristle blaster

Hand prep (P60)

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Results:- corrosion testing, obs. 1000 hour salt spray

Preparation Method	Corroded area*	Delamination
	c-mm	d-mm
Grinder x-hatch	0.6	0.4
Bristle Blaster	0.4	5.4
Clemco blaster	1	7.9
Needle gun	0.4	9.9
Grinder flat	0.8	Complete delamination
Hand abrade	1	Complete delamination

* Mean value measured from scribe mark

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Results:- corrosion testing, summary

- Test data are unequivocal and show very clear differences between techniques
- Corrosion test data indicate that majority of secondary techniques assessed are unsuitable either for wet or (nominally) dry spaces
- Both Monti MBX bristle blaster and x-hatch grind pattern give comparable results with blast reference in both test environments considered

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Reliability and repeatability. . . . . ?

- Preparation carried out by SQEP'd operators / downhand / lab etc
- Results represent the best that can be achieved
- Effective tool life dependent on material properties
- Effective preparation dependent on operator

- 6 P rule – training and education?

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Acknowledgements . . . .

- Jamie Gallagher / Cactus Industrial
- Marine Painting Forum
- BAE Systems Marine