

Industrial Member Report Summary – Key Findings for Industry

Topographic Analysis of Surfaces Prepared by Mechanised Grit Blasting

TWI Core Research Programme

Author: Henry Begg and Melissa Riley

Industrial need

Prior to the application of coatings and paints, substrates are often grit blasted to roughen the surface and provide a mechanical key with which the coating can bond. The strength of the bond is highly dependent on cleanliness and roughness. This surface is generally prepared by grit blasting, which is often a manual process with little process control/monitoring and relies heavily on operator skill and judgement. Recent mechanised blasting operations at TWI have indicated that measurement and control of blasting parameters are vital to coating performance.

Key Findings

A large-scale parameter study was undertaken encompassing:

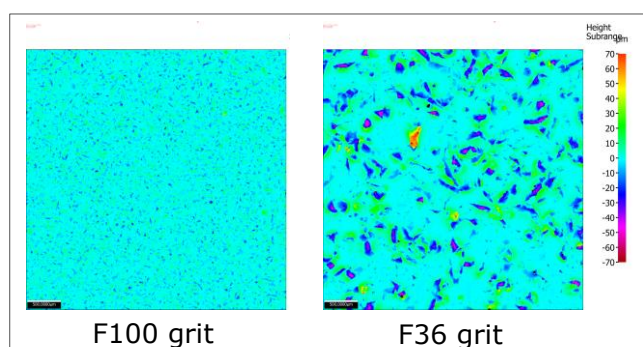
- Seven metallic substrates (CoCr alloy ASTM F75, Ti-6Al-4V, UNS N07718 Ni alloy 718, UNS S30400 304-grade stainless steel, BS EN10025 S355 steel, AA 6055-T4 Al alloy and copper),
- Eight blasting variables (grit size; blast pressure; media feed rate; stand-off distance; blast angle; number of passes/scanning increment/robot traverse speed).
- Over 35 surface profilometry parameters with 7 selected for more detailed analysis including peak height (S_a , S_z , R_a), peak distribution and shape (S_{sk} , S_{ku}), a peak spacing (R_{Sm}) and a peak slope (S_{dq}) parameters

Some key findings of the work include:

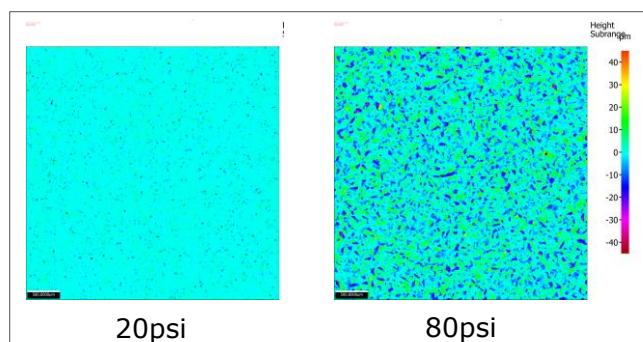
- Changes to blast media size and blast pressure have a strong influence on substrate roughness.
- Standoff distance and blast media feed rate have a more limited effect on substrate profile than expected.
- Grit blasted surface profile is strongly affected by substrate alloy composition, with Ti-6Al-4V exhibiting anomalously high levels of embedded alumina abrasive.
- Standard average roughness profilometry parameters (R_a and S_a) are recommended for providing consistent, repeatable information on profile heights.
- More advanced profilometry parameters such as S_{sk} , S_{ku} and S_{dq} can provide valuable information on characterisation of under and over-blasted surfaces.

How to benefit from this work:

- As an Industrial Member of TWI, you have free access to the [full report](#)
- If you are not an Industrial Member of TWI, find out how your company could benefit from Membership www.twi-global.com/membership
- Contact surfacing@twi.co.uk to learn more



False-colour height maps illustrating the effect of increased blast media size on surface profile.



False-colour height map illustrating the effect of increased blast pressure on surface profile.