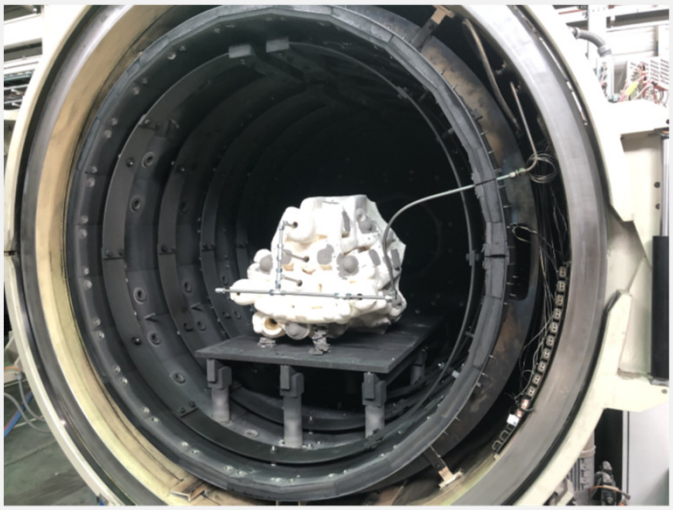
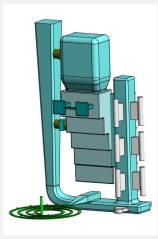
AMRC / ADVANCED MANUFACTURING RESEARCH CENTRE

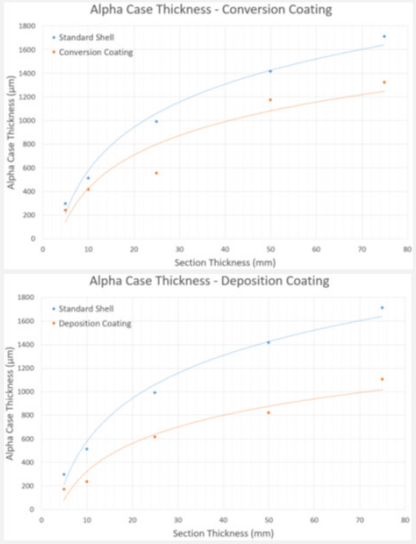
The University Of Sheffield.

Alpha Case Reduction

The formation of an oxygen or carbon stabilised layer on the surface of titanium castings has been well understood since the start of titanium casting production back in the 1950's. Initial strategy's to produce investment castings with a manageable thickness that could be chemically removed involved the treatment of standard casting investment shells to reduce the chemical activity between the liquid titanium and mould refractories.







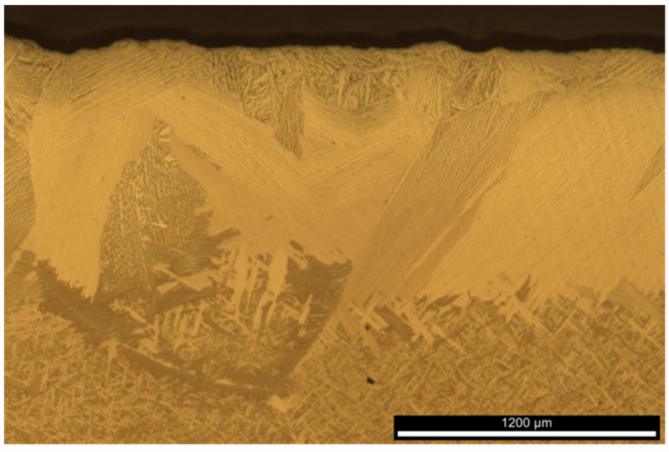
Advances in the investment casting industries has resulted in more developed ceramic moulding systems which yield a more chemically inert surface between the liquid titanium and ceramic mould. These however do still result in a stabilised alpha case layer that requires chemical removal.

The process of alpha case removal results in loss of dimensional accuracy with removal rates being affected by geometry in addition to the environmental and health and safety implications of the chemical removal process, which requires strong acidic solutions containing significant proportions of Hydrofluoric acid.

A review was conducted on the successful historic strategies for mould treatments to reduce the amount of alpha case with the intention of applying some of these to modern ceramic moulds to further reduce the amount of material removal required, thus increasing dimensional tolerance and reducing environmental impact.

Up to 50% Reduction Achieved

Two different coatings were developed and demonstrated on both simple test pieces and complex geometry moulds. This showed that in both cases alpha case was reduced by up to 50%.



Skylight Project Partner:

GKN AEROSPACE

Clean Sky 2

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