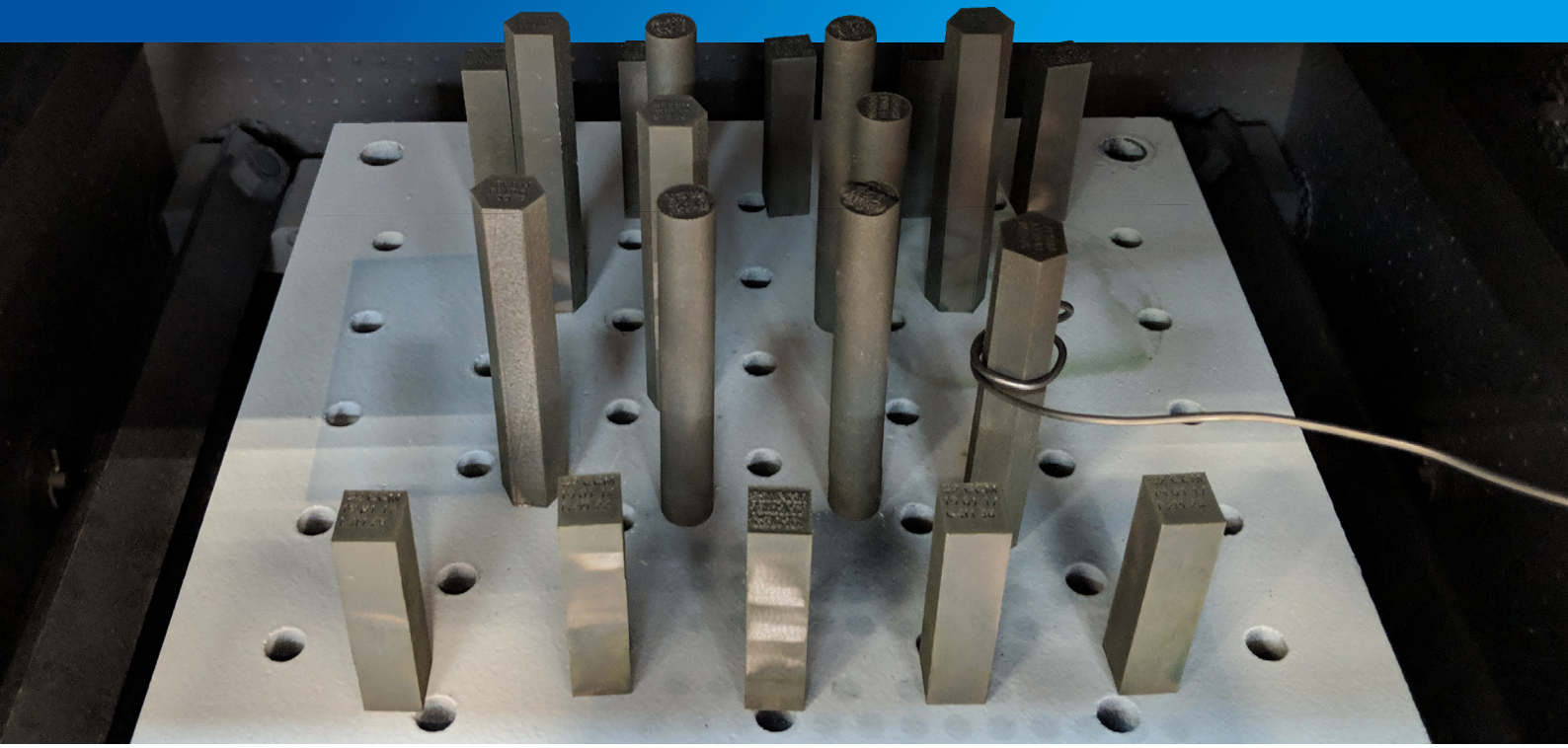
AMRC
ADVANCED MANUFACTURING RESEARCH CENTRE

The University Of Sheffield.

NAMTEC
Case study

Significant savings from new ‘fast cool’ post processing method



An investigation into post-processing methods for a laser powder bed fusion deposited cobalt alloy by the University of Sheffield Advanced Manufacturing Research Centre (AMRC) has discovered potentially significant savings in time and cost while maintaining material properties.

The AMRC worked on the project with Tier Two member Carpenter Technology Corporation whose current standard post-processing regime involves hot isostatic pressing (HIP), followed by vacuum heat treatment.

Engineers from the AMRC’s National Metals Technology Centre (NAMTEC) and Advanced Structural Testing Centre (ASTC) along with the Nuclear AMRC were tasked with establishing whether a new ‘fast cool’ approach to HIP would give equivalent material properties to the standard method. It was anticipated the ‘fast cool’ method could lead to potential savings due to faster cooling time and the elimination of the heat treatment phase.

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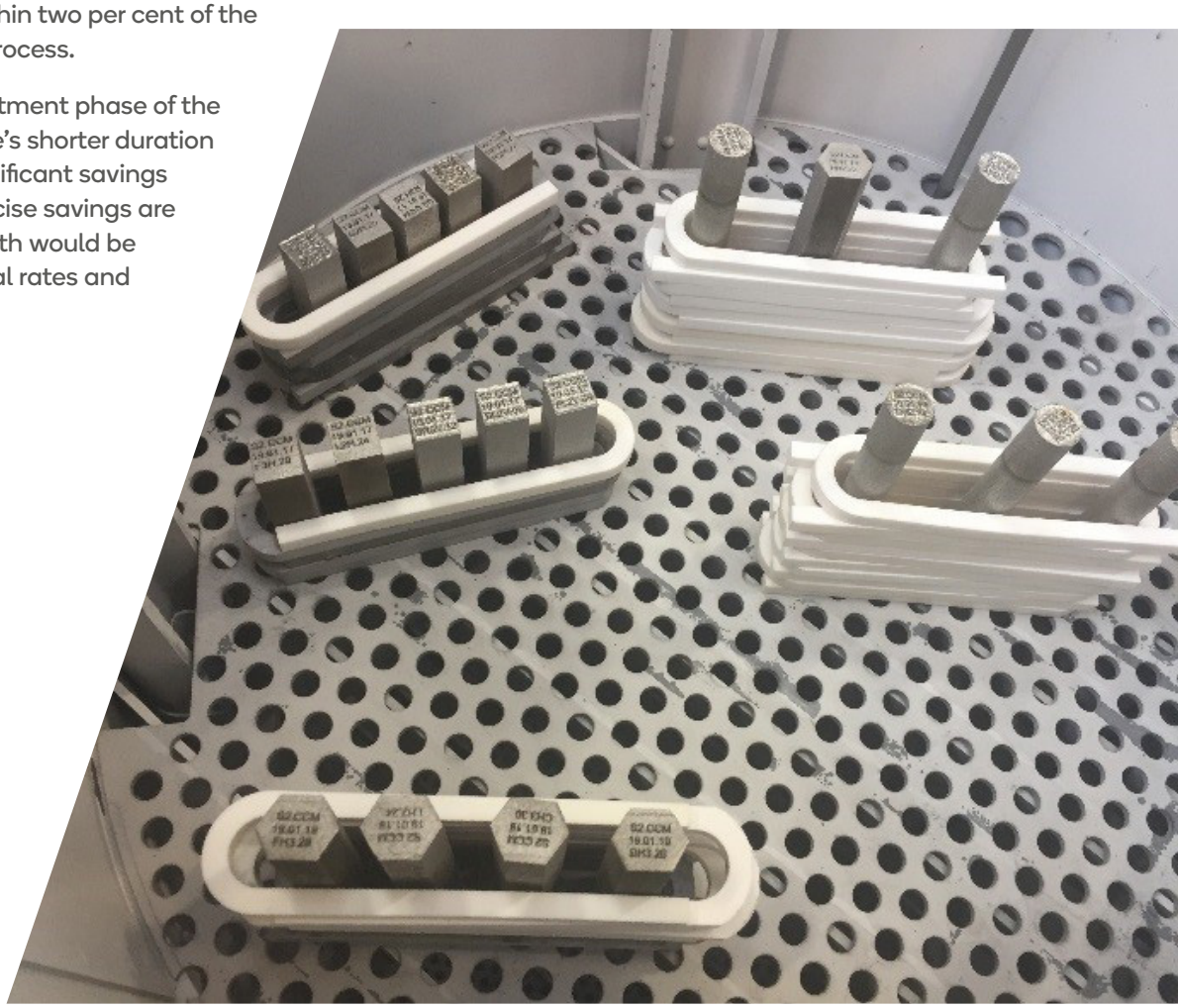
During the project, additively manufactured cobalt alloy test coupons were subjected to two post-processing regimes: a HIP cycle with cooling rate of 20oC per minute plus a separate vacuum heat treatment and the same HIP cycle with a 'fast cool' rate of 100oC per minute. The microstructure and mechanical properties of coupons from the as-built state, the standard method and the new 'fast cool' HIP were then compared.

Following HIP, the anisotropic microstructure of the as-built material was removed by both post-processing routes and the resultant microstructure, porosity and grain size was equivalent between the two methods. Additionally, mechanical properties were comparable between the two post-process routes with yield strength and impact toughness for the new process both within two per cent of the values for the standard process.

Eliminating the heat treatment phase of the process and the HIP cycle's shorter duration produced potentially significant savings in time and cost. The precise savings are difficult to estimate as both would be dependent on commercial rates and production volumes.



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