



Industrial Member Report Summary – Key Findings for Industry

Development and Understanding of Wire-Fed Electron Beam Additive Manufacturing

TWI Core Research Programme

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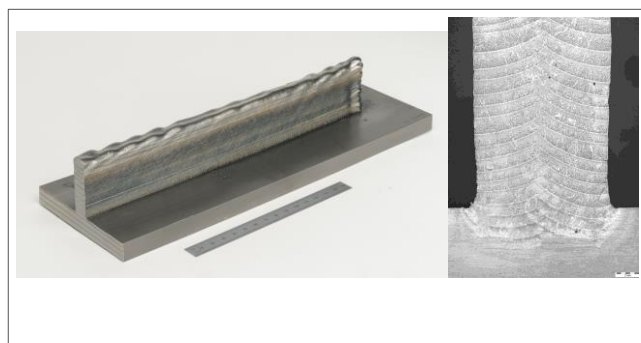
Industrial need

Wire-fed electron beam additive manufacturing (W-EBAM) and other wire additive processes enable a large volume of material to be deposited rapidly, but require a final machining operation to reach final dimensional tolerances. The aerospace community is focussing on these high deposition rate technologies, in a drive to reduce material usage and scrap. However, in order for W-EBAM to provide an industrially viable solution, distortion issues require control.

Key Findings

Type the Key Findings of this project here – use the Content Text KFI Style, up to 6 bullets demonstrating the value of this project to Industrial Members

- W-EBAM deposits of up to 50mm have been built in Ti-6Al-4V at a rate of 0.5kg/hr.
- A stiffening effect is observed as the height of the deposit increases; however, the rolling direction does not have a significant effect on the distortion of the plate.
- An FEA model of distortion in the W-EBAM process has been developed and validated and used to investigate distortion mitigation strategies. Preheating the substrate provides the best benefit – 45% reduction in distortion.
- Improvements in processing quality were achieved through reducing the processing power as the build height increased.
- A demonstrator aerospace wing rib post was fabricated to promote the process and a zircaloy deposit was made to show the potential for power sector applications.
- Basic calculations suggest a 40% reduction in cost over machining from solid.



Photograph of a W-EBAM deposit in Ti-6Al-4V and a micrograph of a section through the deposit

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
- Read more: TWI Report No. 24033/1/15 "Wire Fed Electron Beam Additive Manufacture – A state-of-the-Art Review", M.E.Nunn and G.Miles

"Achieving the benefits of electron beam wire-fed additive manufacture", N M Bagshaw, A L Buxton, T P Mitchell, V Jefimovs, M E Nunn, Proceedings of 10th International Conference on Beam Technology, April 2016, Halle, Germany.

CRP Project 2017-2019 JF-16-EBD-J Advancement of Wire-Fed Electron beam Additive Manufacture

- Contact joining@twi.co.uk to learn more



Photograph of the wing rib post demonstrator showing a region of the original deposit surface