Is This the Largest 3D Metal Piece Ever Made?

RESEARCHERS AT CRANFIELD UNIVERSITY have unveiled what they believe is the biggest metal 3D part ever made in one piece, using Cranfield's Wire + Arc Additive Manufacture (WAAM) process.

The six-metre long, 300-kg, double-sided spar is made from aerospace-grade aluminium on Cranfield's new 10-metre metal printer. Cranfield's researchers are already upgrading it to make it suitable for production of titanium parts with the addition of a local shielding device which the University has also developed.

The 3D printing, also known as additive manufacture (AM), enables the production of metal parts at significantly reduced time and cost when compared to existing methods. Virtually any shape can be created and it enables an increase in design freedom by using the process of adding successive layers of material in different shapes. Traditional machining techniques mostly rely on the removal of material through cutting or drilling, thereby creating more wastage and at higher cost.

WAAM is the most suitable candidate AM process for the manufacture of large structural components, especially for the aerospace sector, but also for the oil and gas, automotive, marine and energy industries.

Professor Stewart Williams, Head of Cranfield's Additive Manufacture programme, said: "Hundreds of millions of pounds are spent on medium to large-scale components by the aerospace industry each year. There is great potential for significant cost savings in terms of waste and production efficiency if we can transform the way these parts are manufactured."

He continued, "This demonstration clearly shows the potential of the WAAM process with this newly-acquired machine for changing future manufacturing processes."

The huge spar was designed by Cranfield MSc students to test the capability of the new WAAM machine and to assess the challenges of building a structure of such size with all the necessary steps in the manufacture of real aerospace components of similar dimensions. The team estimate that WAAM can enable substantial cost savings, as much as 70% compared to the traditional machine-from-solid approach, as well as large lead time reduction—from well over a year to just a few weeks.

The University leads the WAAMMat consortium, which comprises 20 industry partners and 13 further universities, targeting the maturation and commercial exploitation of the WAAM process. Cranfield's team comprises 30 people and a portfolio of 70 projects.

Recent research has proved the possibility of achieving even better mechanical properties compared to the equivalent wrought alloys, and the team is supporting the qualification programmes of large aerospace original equipment manufacturers (OEMs) to enable a more sustainable future for aviation.