FUSION FOR ENERGY

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3Dprinting know-how for stainless steel components

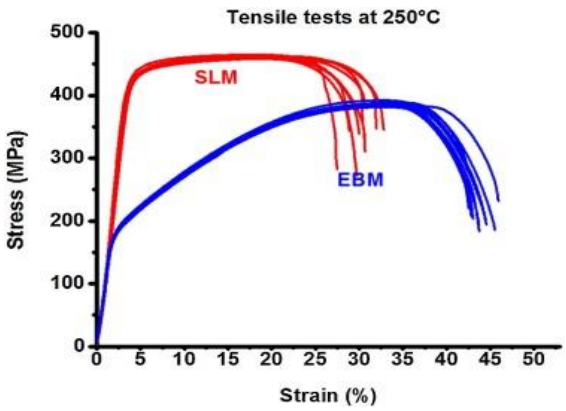
F4E, Stockholm University and Mid Sweden University have investigated two methods of 3D printing in order to evaluate their feasibility of manufacturing ITER's First Wall Beam. Providing high density and stress tolerances with the possibility to design and manufacture complex components, these AM technologies can find many applications in healthcare, automotive, nuclear or space industries.

The technology

Based on the data from a CAD file, additive manufacturing consists in, depending on method, laying downs or adding successive layers of liquid, melted powder, or sheet material, in a layer-upon-layer fashion to fabricate a 3D object. F4E and its partners have been carrying out mock 3D printing of the First Wall Beam using a metal powder form of the 316L (N) ITER grade stainless steel and investigating two different methods of 3D printing :Selective Laser Melting (SLM) conducted by Stockholm University and Electron Beam Melting (EBM) conducted by Mid Sweden University. 316L was prepared to study by both SLM and EBM processes after selecting optimized parameters.

A fast, one-step building process for resistant and complex components

3D printing can save time and money especially when we need to manufacture components that are a non-conventional shape or which have complicated internal geometry. Results show that components produced by SLM and EBM have comparable density to conventional material as forging, as well as high stress tolerances due to its interesting microstructure (smaller grains within larger grains of the steel that strengthen it significantly).



Skipping manufacturing complexity and exploring new solutions in many spin-off applications

Additive manufacturing allows to explore new design solutions. This 3D printing know-how can be used in space, nuclear or health applications (surgical implants) or, in a near future, to build advanced bigger structures suitable for power plants and car engines with the goal of simplifying the manufacturing process.

Collaboration opportunities

The technology package is available through feasibility studies to fabricate specific components by one of the metal additive manufacturing methods. Design and manufacturing of prototypes as well as characterization of powder materials to be used can also be offered.

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