Synopsis

Title of Document: **Characterisation of Selectively Laser Melted Dissimilar alloys for Remanufacturing applications: Inconel 625 over Cast Iron**

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Additive Manufacturing technologies are becoming a standard technique for the repair and remanufacture of industrial components cutting across various industries. A case study to investigate the suitability of Selective Laser Melting based Additive Manufacturing technique for remanufacturing of a typical automotive-grade cast iron component was done using Inconel 625 superalloy. Inconel 625 superalloy was printed onto the cast iron test coupons by using a Renishaw AM 250 SLM machine. The emphasis of this study was to understand the microstructure evolution at the interface during the Selective Laser Melting process. The structural features of the processed sample interface were characterised by Optical and Scanning Electron Microscopy and compositional evolution was evaluated using Energy Dispersive X-Ray Spectroscopy. Equilibrium thermodynamic calculations were carried out using FactSage® simulation software to predict the phases that would be formed at the interface. The mechanical property of the sample was measured across the processed region by micro-hardness measurements. These results provide valuable insight into the strong interdependence of process parameter, interfacial microstructure evaluation and mechanical response of

the processed material. The results obtained point to a stable interface with all the properties of an AM process including high strength due to fine-grained microstructure, smaller processed zones and small dilution length. It is believed to be one of the first studies to investigate the microstructural evolution during remanufacturing of cast iron component using Inconel 625 superalloy.

Keywords: Additive Manufacturing, Selective Laser Melting, Remanufacturing, cast iron, Inconel 625