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Integrated Framework for Design for Additive Manufacturing and Metrology: An Industrial Overview

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Integrated Framework for Design for Additive Manufacturing and Metrology: An Industrial Overview

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Abstract:

Over the last decade, there have been rapid developments in the metal additive manufacturing processes, particularly with respect to Powder Bed Fusion-Laser Beam/Metal (PBF-LB/M) . These developments and leveraging the ability of PBF-LB/M process to produce complex geometries with intricate features led to the widespread utilization and implementation in the gas turbine industry. However, a critical challenge in this context lies in evaluating critical internal geometrical features to correctly asses the component quality, functionality and provide feedback to evaluate the fabrication process stability. This work highlights the importance of a feature based assessment to precisely evaluate quality of the part produced in PBF/LB-M with the aid of industrial case study. Furthermore, the criticalities in selection of an adequate measurement system according to the design features are underlined by comparing dimensional measurements on the case study using state-of-the-art X-Ray Computed Tomography (XCT) and optical scan techniques to evaluate the wall thickness of critical internal structures and mechanically compliant features. Conclusively, an integrated framework from an industrial perspective combining the essentials of Design for Additive Manufacturing and Metrology is proposed not only to assess the part quality but also correctly evaluate the PBF/LB-M process stability.

***Keywords*:Powder Bed Fusion-Laser Beam/Metal, Internal geometrical features, X-Ray Computed Tomography, Integrated Framework, Process Stability**

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