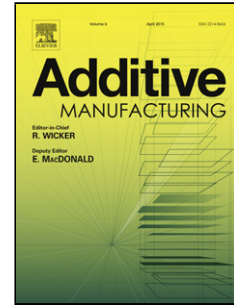


Accepted Manuscript

Title: Laser Peening: A Tool for Additive Manufacturing
Post-processing

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PII: S2214-8604(18)30339-7
DOI: <https://doi.org/10.1016/j.addma.2018.09.013>
Reference: ADDMA 502

To appear in:

Received date: 17-5-2018
Revised date: 6-9-2018
Accepted date: 9-9-2018

Please cite this article as: Hackel L, Rankin JR, Rubenchik A, King WE, Matthews M, Laser Peening: A Tool for Additive Manufacturing Post-processing, *Additive Manufacturing* (2018), <https://doi.org/10.1016/j.addma.2018.09.013>

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Laser Peening: A Tool for Additive Manufacturing Post-processing

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Abstract

Additive manufacturing (AM) is rapidly moving from research to commercial applications due to its ability to produce geometric features difficult or impossible to generate by conventional machining. Fielded components need to endure fatigue loadings over long operational lifetimes. This work evaluates the ability of shot and laser peening to enhance the fatigue lifetime and strength of AM parts. As previously shown, peening processes induce beneficial microstructure and residual stress enhancement; this work takes a step to demonstrate the fatigue enhancement of peening including for the case of geometric stress risers as expected for fielded AM components. We present AM sample fatigue results with and without a stress riser using untreated baseline samples and shot and laser peening surface treatments. Laser peening is clearly shown to provide superior fatigue life and strength. We also investigated the ability of analysis to select laser peening parameters and coverage that can shape and/or correctively reshape AM components to a high degree of precision. We demonstrated this potential by shaping and shape correction using our finite element based predictive modeling and highly controlled laser peening..

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