Simulation for Additive Manufacturing
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The Effects of Loose Powder on the Results of the Temperature and Distortion Simulation for Laser Powder Bed Fusion

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The warping of parts during Laser Powder Bed Fusion deposition presents a significant challenge to the process becoming an economically feasible method of component production. Component warpage frequently leads to part failure, resulting in expensive experimental trial-and-error iterations. This study shows that finite element modeling performed using Autodesk® Netfabb Simulation® can be used to quickly and accurately predict the distortion of part-level components and to indicate likely failure modes, thus circumventing costly failed builds. The simulation methodology will be described and extended to cases requiring the simulation of the full build plate, including the un-melted powder and multiple parts. It will be shown that the inclusion of the unmelted powder in the simulation leads to a significantly more accurate temperature distribution prediction (Figures 1 – 2). The effect of part interaction and placement location on the build plate will be demonstrated for both the thermal and mechanical response. Model predictions will be compared to experimental distortion measurements.

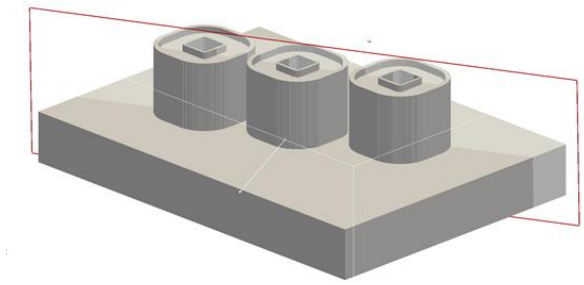

Figure 1. CAD model of the AM parts on the build plate

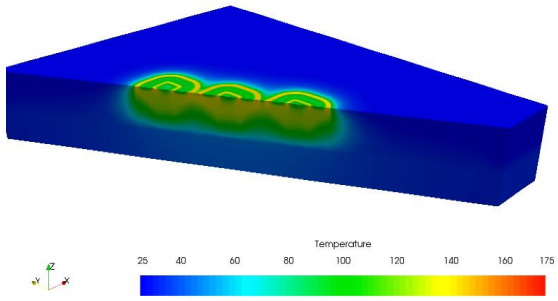

Figure 2. Simulated temperature distribution in powder bed (including the temperature in loose powder)

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