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Differences in Plasticity due to Curvature in Laser Peened Components

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Abstract

Generating compressive residual stresses at the critical stress locations can result in prevention or delay of structural component failure. Laser peening is a well known method for inducing compressive residual stresses. The plastic deformation created by the planar shock waves near the surface regions is the major cause for the generation of compressive residual stresses. Apart from the planar waves, release waves at the border of impact are generated that act against the plastic deformation created by planar waves. This decrease of plastic deformation reduces the compressive residual stress generated near the surface regions of peened components. Laser peening of curved geometries creates compressive residual stresses—which are dissimilar to flat geometry—because of the influence of release waves on different curvatures. This research investigates the effects of reduction in the amount of plasticity in convex, concave, and flat geometries using plastic dissipation energy as the measure of plastic deformation imparted on the component. Three dimensional finite element models are created in Abaqus to predict the

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