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A Numerical Study of the Interaction between Residual Stress Profiles Induced by Quasi-Static Plastification

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Abstract : The development of methods for predicting manufacturing phenomena steadily grows due to their high potential to contribute to the component's performance and durability. One of the most relevant phenomena in manufacturing is the residual stress state development through the manufacturing chain. In most cases, the residual stresses have their origin due to heterogenous plastifications produced by the processes. Although a few manufacturing processes have been successfully approached by numerical modeling, there is still a lack of understanding on how these processes' interactions will affect the final stress state. The objective of this work is to analyze the influence of previous stresses on the residual stress state induced by plastic deformation of a quasi-static indentation. The model consists of a simplified approach of shot peening, modeling four cases with variations in indenter size and force. This model was validated through topography, measured by optical 3D focus-variation, and residual stress, measured with the X-ray diffraction technique. The validated model was then exposed to several initial stress states, and the effect on the final residual stress was analyzed.

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