

Obtaining Constants of Johnson-Cook Material Model Using a Combined Experimental, Numerical Simulation and Optimization Method

Authors : F. Rahimi Dehgolan, M. Behzadi, J. Fathi Sola

Abstract : In this article, the Johnson-Cook material model's constants for structural steel ST.37 have been determined by a method which integrates experimental tests, numerical simulation, and optimization. In the first step, a quasi-static test was carried out on a plain specimen. Next, the constants were calculated for it by minimizing the difference between the results acquired from the experiment and numerical simulation. Then, a quasi-static tension test was performed on three notched specimens with different notch radii. At last, in order to verify the results, they were used in numerical simulation of notched specimens and it was observed that experimental and simulation results are in good agreement. Changing the diameter size of the plain specimen in the necking area was set as the objective function in the optimization step. For final validation of the proposed method, diameter variation was considered as a parameter and its sensitivity to a change in any of the model constants was examined and the results were completely corroborating.

Keywords : constants, Johnson-Cook material model, notched specimens, quasi-static test, sensitivity

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