عنوان مقاله:

Analysis of the Rotary-draw Bending Process for Thin-walled Rectangular Aluminum Tube

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خلاصه مقاله:

The Rotary-Draw Bending (RDB) process is a distinguished process employed for the precision cold bending of a hollow tube with small radius bends using Numerical Control (NC) machines. This research presents an analytical model based on the power law hardening model for the RDB processing of rectangular thin tubes. Based on the constraints of the tube in the dies and its thinness, the plane stress assumption in the thickness direction and the plane strain assumption in the transverse direction for all faces of the tube are used. By assuming the proportionality of the process and using the Levy–Mises flow rule hypothesis, the stress filed of the tube is predicted and the balance of the forces in all aspects of the tube is used to identify the position of the neutral axis. Then the bending moment as well as the amount of the spring back is developed analytically. By analyzing the geometry of the tube and the process, a new mandrel is designed and constructed. The process has been modeled and analyzed using the explicit finite element ABAQUS commercial code and also carried out experimentally. Comparison of the analytical, numerical and experimental strain fields shows good agreement.

کلمات کلیدی:

Rotary-draw bending, Rectangular cross sections, Analytical analysis, Power law hardening model

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