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Finite element analysis of heterogeneous sandwich sheets during rolling

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Abstract

Three-dimensional DEFORMTM finite element simulations are performed to analyze the plastic deformation of heterogeneous sandwich sheets during rolling. The finite element code is based on a rigid-plastic model and the simulations assume that the rollers are rigid bodies and that the deformation-induced change in temperature during rolling is sufficiently small to be neglected. The rolled product is assumed to comprise a central sheet of either A3003 or A6063 aluminum alloy sandwiched between upper and lower sheets of A1100 aluminum alloy. The simulations examine the effects of the sheet thickness and reduction ratio on the maximum effective stress, maximum effective strain, Y-direction load, and maximum damage induced within the rolled product. The simulation results for the final thicknesses of the three layers in the rolled sandwich sheet are compared with the experimental measurements. Overall, the results presented in this study provide a useful insight into the deformation mechanisms involved in the rolling of heterogeneous sandwich sheets.

Key words: Effective Stress; Finite Element (FE);
Heterogeneous Sandwich Sheets