

Forming Limit Analysis of DP600-800 Steels

Authors : Marcelo Costa Cardoso, Luciano Pessanha Moreira

Abstract : In this work, the plastic behaviour of cold-rolled zinc coated dual-phase steel sheets DP600 and DP800 grades is firstly investigated with the help of uniaxial, hydraulic bulge and Forming Limit Curve (FLC) tests. The uniaxial tensile tests were performed in three angular orientations with respect to the rolling direction to evaluate the strain-hardening and plastic anisotropy. True stress-strain curves at large strains were determined from hydraulic bulge testing and fitted to a work-hardening equation. The limit strains are defined at both localized necking and fracture conditions according to Nakajima's hemispherical punch procedure. Also, an elasto-plastic localization model is proposed in order to predict strain and stress based forming limit curves. The investigated dual-phase sheets showed a good formability in the biaxial stretching and drawing FLC regions. For both DP600 and DP800 sheets, the corresponding numerical predictions overestimated and underestimated the experimental limit strains in the biaxial stretching and drawing FLC regions, respectively. This can be attributed to the restricted failure necking condition adopted in the numerical model, which is not suitable to describe the tensile and shear fracture mechanisms in advanced high strength steels under equibiaxial and biaxial stretching conditions.

Keywords : advanced high strength steels, forming limit curve, numerical modelling, sheet metal forming

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