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Hydraulic bulge test for stress-strain curve determination and damage calibration for Ito-Goya model

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Abstract

Hydraulic bulge test represents an alternative method to obtain the stress-strain hardening curve for sheet metal materials. When compared to standard uniaxial tensile test it permits higher range of deformation, thus being possible a better material characterization, with less discrepancies when performing data extrapolation by using a selected material model.
This paper presents a numerical study of flow curve determination using bulge test, in parallel with an experimental system development, in order to better understand the behavior of fundamental variables and have the better tuning for stress-strain data determination. Performed sensitivity analysis of such influencing variables used in bulge measurements will give guidelines for the evaluation of the material flow curve from experimental results.
Additionally, bulge test results can also be used for evaluation and calibration of damage models when sheet material is deformed up to fracture. A methodology is presented to be used for evaluation and calibration of Ito-Goya damage model of damage prediction, which is applied to some experimental examples.

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