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PII: S0924-0136(17)30074-2
DOI: http://dx.doi.org/doi:10.1016/j.jmatprotec.2017.02.021
Reference: PROTEC 15133

To appear in: *Journal of Materials Processing Technology*

Received date: 16-11-2016
Revised date: 21-2-2017
Accepted date: 24-2-2017

Please cite this article as: Milesi, M., Logé, R.E., Pino Muñoz, D., Jansen, Y., Bouchard, P.-O., Accounting for material parameters scattering in rolled zinc formability.Journal of Materials Processing Technology http://dx.doi.org/10.1016/j.jmatprotec.2017.02.021

Accounting for material parameters scattering in rolled zinc formability

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This paper focuses on the importance of taking into account scattering of material parameters (zinc in this example) to perform sheet metal forming simulations. The approach described in this paper is efficiently pragmatic to consider as inputs the material parameters obtained during the industrial quality process. Large amount of collected data enables to obtain statistical evolution of the material law parameters and to determine afterwards the variability domain which is the final goal of this work. In order to get these parameters, an automatic calculation of material parameters (consistency, hardening coefficient and stress criterion for the formability as described by Jansen et al. (2013)) is developed in this work. Tensile tests have been performed in three directions (0°, 45° and 90°) and a Lagrangian interpolation was used for other orientations. In addition, scattering of the entire forming limit diagram is obtained from bulge tests performed for a sufficient statistical number of sheets. Based on this data, a numerical model integrating the scattering parameters was developed to build a statistical prediction of the stress failure criterion. All parameters of the material behavior law can be associated to the local calculations of the stress, strain, strain rate and temperature provided by a standard deterministic FEM