Identification of material parameters using inverse analysis of bending process

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ABSTRACT

In order to obtain highly reliable results from numerical simulations of sheet metal forming processes, the accurate mechanical characterization is one of the important factors.

During the bending process it is not always possible to obtain information about the mechanical characteristics of the materials that are used during the operation, leading to a high number of attempts to obtain the desired results [1]. This problem occurs in large part in plastic forming processes and therefore it is extremely important to use methods for predicting the behaviour of materials.

The inverse analysis problems are centred on the development of methodologies to determine the parameters of constitutive models used to describe the plastic behaviour of sheet metal [2]. The parameters are identified by comparing experimental and mathematical results, and the difference between them is evaluated by a specific function, the objective function.

Based on the concepts derived from in-process control techniques, this paper describes a material behaviour identification procedure using bending models. The procedure is to be implemented on a standard press brake, without the aid of laboratory testing equipment. In order to determine the different material properties, the punch force–displacement curve is acquired. Based on this curve, and on fundamental knowledge of the air bending process, values for the material properties are deduced.

ACKNOWLEDGEMENTS: Authors gratefully acknowledge the funding of SciTech, R&D project co-financed by "NORTE2020", through FEDER and the financial support of the Portuguese Foundation for Science and Technology under project POCI-01-0145-FEDER-016876 and PTDC/EMS-TEC/6400/2014. The last author is also grateful to the FCT for the Doctoral grant SFRH/BD/119362/2016.

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