

The Use of Finite Element Analysis on Bending Radius and Springback Prediction with Practical Application on CNC Press Brakes Programming

Sara Miranda¹, J. A. de Bessa Pacheco¹, Abel D. Santos^{1,2}, Rui Amaral²

¹ FEUP– Faculty of Engineering, University of Porto

² INEGI, Institute of Mech. Eng. and Ind. Management, University of Porto

Rua Dr. Roberto Frias 400, 4200-465 Porto, Portugal

abel@fe.up.pt, www.fe.up.pt

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Abstract

Sheet metal bending is a metal forming process with a simple geometric interpretation, usually a 2D analysis being considered. The bend over a sheet metal blank consists of a V shape forming by using a punch, with a certain nose radius, forcing the sheet plate against an open die, with a V section. The forming result is a part with an angle obtained between the V legs (flanges), which is known as the bending angle. The operation to get the required V angle is called air bending or free bending [1]. The punch penetration inside the die, known as bending depth, is responsible for the bending angle. However the amount of penetration to reach the required bending angle depends both on the inside bending radius, with direct influence on the geometry for the angle evaluation, and on the amount of springback occurring after releasing the tools from the bent plate.

In this paper, results are presented describing the use of finite element analysis as an aid in the prediction of the inside bending radius and the expected springback, both influencing punch penetration for the final bending angle. An optimizing method is presented to write a possible bending depth formulation. Some test results with bent samples are added to evaluate the applicability of the proposed approach.

REFERENCES

- [1] J. Bessa Pacheco, Abel D. Santos, “A study on the Nose Radius influence in Press Brake Bending Operations by Finite Element Analysis”, Trans Tech Publications, Switzerland, Key Engineering Materials, Vols. 554-557, pp. 1432-1442, 2013