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FLANGE FORMING SIMULATION USING FINITE ELEMENT ANALYSIS

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Fineblanking is a manufacturing process able to produce in one step, high quality parts that often require multiple operations. Flange forming is one the most complex sub processes due to the specifications of geometry demanded by client. This paper introduces a simulation of flange forming process in JIS G3101 steel, using finite element analysis (FEA). It is well known that with high thickness materials, flange forming process requires great loads to deform the metal. A part of this applied load is stored in the material structure in form of residual stresses. In this work, the value of such stresses into the formed material is presented, in order to know the load that remains when forming has finished. The strain due to these stresses is obtained and it allows observing an elastic recovery effect of the material, better known like springback. In addition, an important factor as a function of geometry terms is the maximum material displacement. The quantity of displaced material is considered and reported in this work.

A finite element analysis of the flange forming process was performed in parallel with the experimental tests. Because non-linearities are presented in the simulation, such as material, geometry and contact, an explicit analysis was carried out with the purpose to observe the plastic material behavior. Since the analysis is focused to metal forming, a meshing method based on hexaedrical elements was assigned to the model; to avoid great element distortion, a size control was used. The correlation between the FEA and experimental data obtained in this research show that the applied method is useful and allow us to determine several parameters for flange forming that could impact in the effectiveness of the process and increase the productivity.