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Predicting the deep drawing process of TRIP steel grades using multilayer perceptron artificial neural networks

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A B S T R A C T

TRIP (Transformation Induced Plasticity) steels belong to the group of advanced high-strength steels. Their main advantage is their excellent strength combined with high ductility, which makes them ideal for deep drawing processes. The forming of TRIP steels in the deep drawing process enables the production of a thin-walled final product with superior mechanical properties. For this reason, this study presents comprehensive research into the deep drawing of cylindrical cups made from TRIP steel. The research focuses on three main aspects of the deep drawing process, namely the sheet metal thinning, the maximum force value and the ear height as a result of the anisotropic material behaviour. Artificial neural networks (ANNs) were built to predict all the mentioned output parameters of the part or the process itself. The ANNs were trained using data obtained from a sufficient number of simulations based on the finite element method (FEM). The ANN models were developed based on variable material properties, including anisotropic parameters, blank holding force, blank diameter, and friction coefficient. A good agreement between simulation, ANN and experimental results is evident.

A R T I C L E   I N F O

Keywords:
Forming;
Deep drawing;
TRIP steel;
Artificial neural network (ANN);
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