

Evaluation of Forming Properties on AA 5052 Aluminium Alloy by Incremental Forming

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Abstract : Sheet metal forming is a vital manufacturing process used in automobile, aerospace, agricultural industries, etc. Incremental forming is a promising process providing a short and inexpensive way of forming complex three-dimensional parts without using die. The aim of this research is to study the forming behaviour of AA 5052, Aluminium Alloy, using incremental forming and also to study the FLD of cone shape AA 5052 Aluminium Alloy at room temperature and various annealing temperature. Initially the surface roughness and wall thickness through incremental forming on AA 5052 Aluminium Alloy sheet at room temperature is optimized by controlling the effects of forming parameters. The central composite design (CCD) was utilized to plan the experiment. The step depth, feed rate, and spindle speed were considered as input parameters in this study. The surface roughness and wall thickness were used as output response. The process performances such as average thickness and surface roughness were evaluated. The optimized results are taken for minimum surface roughness and maximum wall thickness. The optimal results are determined based on response surface methodology and the analysis of variance. Formability Limit Diagram is constructed on AA 5052 Aluminium Alloy at room temperature and various annealing temperature by using optimized process parameters from the response surface methodology. The cone has higher formability than the square pyramid and higher wall thickness distribution. Finally the FLD on cone shape and square pyramid shape at room temperature and the various annealing temperature is compared experimentally and simulated with Abaqus software.

Keywords : incremental forming, response surface methodology, optimization, wall thickness, surface roughness

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