

Simulation of Semi-Active the Blank Holder Force Control to Prevent Wrinkling and Cracking in Deep Drawing Process

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Abstract. This paper presents simulation of drawing force and thickness deformation in deep drawing which employs semi-active blank holder force control system, to solve the problem of cracking and wrinkling. The method of slab with feed back control failure criteria, was employed to make the modeling system and the semi-active blank holder to prevent wrinkling and cracking in forming low carbon steel sheet, without lubrication ($\mu=0.4$). In this study, the mechanical properties of the material were chosen since that they equivalent to those of low carbon steel with its thickness of 0.2 mm, $K = 572 \text{ N/mm}^2$, $UTS = 391 \text{ N/mm}^2$, yield stress = 309 N/mm^2 and $n = 0.2$. The diameter and the depth of the cylindrical cup-shaped product were 40 mm and 10 mm, respectively. Results from simulation have shown that the semi-active blank holder system can control very responsive against changing of deformation condition. The optimum of initial blank holder force is approximately 3000 N up to 4000 N. In the early stages (initial stroke), blank holder force system could be responsive to prevent cracking, and at the end of the punch stroke, it is very effective to prevent wrinkling. Simulation of semi-active blank holder force control system is excellent in model formation to prevent cracking and wrinkling.