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Analysis of multi-thickness plates by successive forging

Abstract

The demand of lightweight vehicles is increasing due to environmental issues. To fulfill this demand, tailored blanks are utilized in the production of vehicles. Tailored blanks have been used in car body part such as center pillar and roof rails for the purpose of weight reduction where thickness distribution is being optimized. Tailored blanks are commonly produced by welding and rolling. Tailor-rolled blanks produced by rolling process has continuous thickness transition as compared to tailor-welded blanks and hence stress concentration is reduced. However, the rolling process utilized in the production of tailor-rolled blanks are not commonly available. Hence successive forging process was developed to control the thickness distribution by mean of presses. In this study, successive forging was utilized to control the thickness distribution of a plate by using upper and lower punches. The stroke is constant while the punch was designed to has three different thicknesses to achieve different thickness reduction. The feeding interval was varied for 10 mm and 17 mm. The thickness distribution, material flow and forging load for both feeding interval were analysed and compared with the conventional forging process using finite element analysis.

Keywords

Forging; Process control; Welding