

Optimization of Surface Roughness and Wall Thickness in Dieless Incremental Forming Of Aluminum Sheet Using Taguchi

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Abstract. Incremental sheet forming is a versatile sheet metal forming process where a sheet metal is formed into its final shape by a series of localized deformation without a specialised die. However, it still has many shortcomings that need to be overcome such as geometric accuracy, surface roughness, formability, forming speed, and so on. This project focus on minimising the surface roughness of aluminium sheet and improving its thickness uniformity in incremental sheet forming via optimisation of wall angle, feed rate, and step size. Besides, the effect of wall angle, feed rate, and step size to the surface roughness and thickness uniformity of aluminium sheet was investigated in this project. From the results, it was observed that surface roughness and thickness uniformity were inversely varied due to the formation of surface waviness. Increase in feed rate and decrease in step size will produce a lower surface roughness, while uniform thickness reduction was obtained by reducing the wall angle and step size. By using Taguchi analysis, the optimum parameters for minimum surface roughness and uniform thickness reduction of aluminium sheet were determined. The finding of this project helps to reduce the time in optimising the surface roughness and thickness uniformity in incremental sheet forming.
