

# Parametric Optimization of Deep Drawing Process for Cylindrical Cups of Al-7075

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## **ABSTRACT**

Deep drawing is one of the important processes for forming sheet metal parts. Parametric optimization of deep drawing is widely needed for mass production of cup shapes in aerospace, automobile and packaging industries. Designing a tool requires many trial and error steps, to reduce number of costly trials the process can be simulated with the help of finite element analysis. This work is relevant in the context of developing a cost-effective component with lower manufacturing lead time. In this project work, the significance of three important process parameters namely punch force, coefficient of friction, distance per step on the deep drawing characteristics were determined. Taguchi design of experiments and ANOVA has been applied to analyse the influencing process parameters in deep drawing of cylindrical cup component. The analysis and simulations were done using D-FORM software. The results obtained from D-FORM were validated experimentally. The simulation results show that the major parameters which influenced damage of the cup were Distance per step and Sheet Thickness. Effective stress was found to be increasing with increase in coefficient of friction and is most influenced by sheet thickness. Aluminium alloy 7075 material is used for deep drawing.

## **CONCLUSIONS**

In the present work, Aluminium Alloy-7075 was used for analysis. The investigation was focused on the process parameters such as punch velocity, coefficient of friction, distance per step and sheet thickness.

(i) The major parameters which influenced damage of the cup were Distance per step and Sheet Thickness.

(ii) The damage was found to be least when punch velocity, sheet thickness and distance per step are 5m/s, 1.0 mm and 1.0 mm respectively.

(iii) Effective stress was found to be increasing with increase in coefficient of friction and is most influenced by sheet thickness

(iv) The major parameter which influenced surface expansion ratio is the sheet thickness and found to be increased with sheet thickness values from 0.8- 1 mm.

(v) The cup of Trail 7, with punch velocity 5m/s, coefficient of friction 0.1, displacement per step 1.0 mm and sheet thickness 1.0 mm was found to be best drawn in terms of damage and effective stress

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