OPTIMIZATION OF PROCESS PARAMETERSIN DEEP DRAWING OF MONEL-400 CONICAL CUP.

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ABSTRACT

Objective of this current work was to optimize the process parameters in the deep drawing of MONEL-400 conical cup. The design procedure for finite element analysis was carried out as per Taguchi's techniques using DEFORM software code. Stresses induced in the cups are within the limit of ultimate strength of MONEL-400. The sheet thickness and step depth had influenced the reduction of sheet thickness during the cup formation.

The present project work was carried out in two phases. Initial phase is numerical simulation of physical process with finite element analysis and the final phase analysis of results for understanding its formability. The finite element analysis was carried out using DEFORM software.
Experiments of the current work were designed using the Taguchi technique and ANOVA method was employed to estimate influence the of process parameters punch velocity, coefficient of friction, sheet thickness, number of steps on stresses and strains developed in the sheet and to find significant process parameters affecting the formability. Thickness variation along the wall and flanges of cups and forming limit diagram were presented for all the cups.

The process parameters which majorly influence formability of conical cups were coefficient of friction and the step depth of forming process. The majority of the thickness reduction takes place in the middle part of wall of the cup but not in the flange or bottom part of walls of the cup. Stresses induced are lower than ultimate tensile strength of the material.

The following are the conclusions that are drawn from the current work:

• It was observed from present work that the process parameters, which had greater influence on the formability of deep drawing of conical cups of Monel 400, were the coefficient of friction and the blank thickness.
• The damage of the cups was lower in trial7 when the thickness was high and coefficient of friction was low.
• Damage of the cup decreased with increase in thickness.
• Surface expansion ratio was higher for trial 2, when coefficient of friction was high.

• Higher the coefficient of friction higher the surface expansion ratio.
• Height of the cup was closer to the desired height in trial 5, when displacement per step was low.
• Displacement per step was the major parameter that influenced the height of the cup.

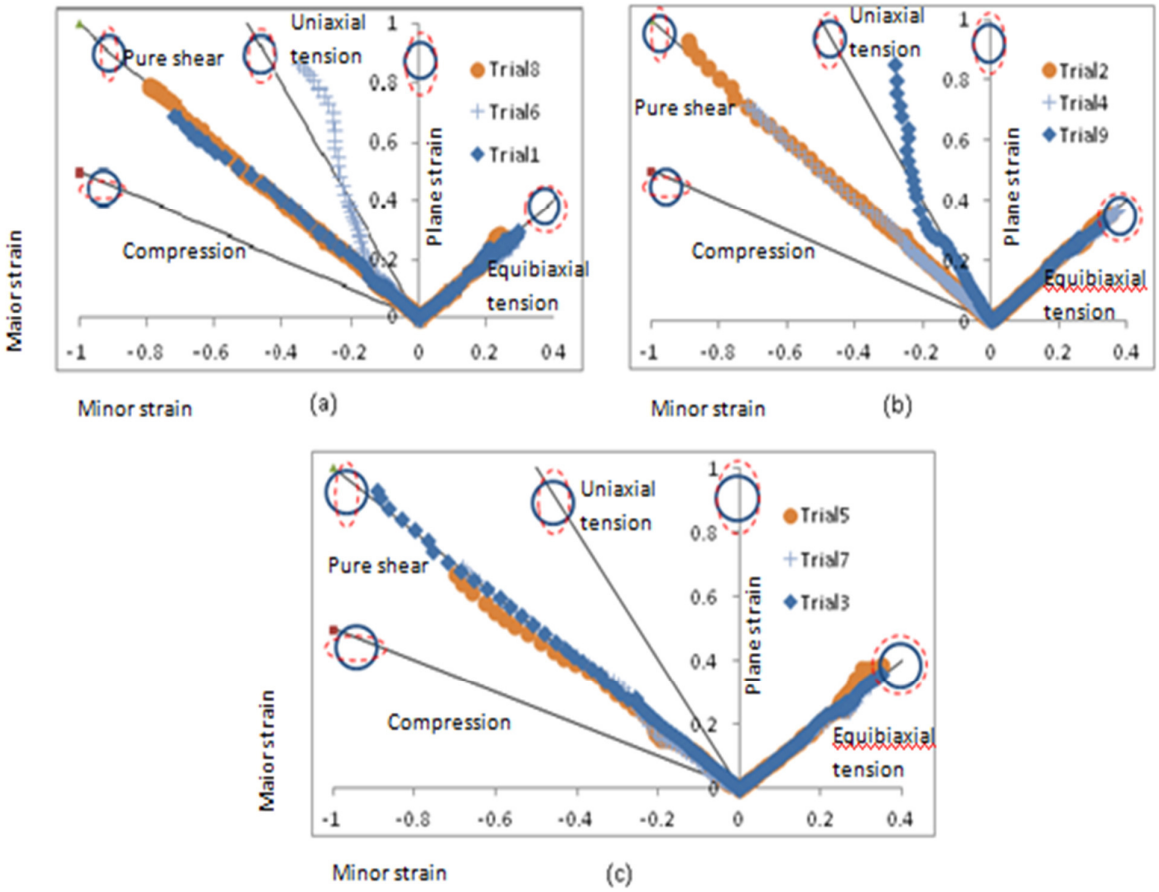

Figure: forming limit diagrams with damages for different blank thickness

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