ISSN NO:2236-6124

SIMULATION OF DEEP DRAWING PROCESS FOR CYLINDRICAL CUP BY USING ANSYS AND TAGUCHI METHOD

K. KANAKARAO (m.tech) mech dept mallareddy engineering college (autonomous) maisammaguda, dhulapally, kompally, medchal, hydrabad.

DR. G. BIKSHAM associate professor mech dept mallareddy engineering college (autonomous) maisammaguda, dhulapally, kompally, medchal, hydrabad.

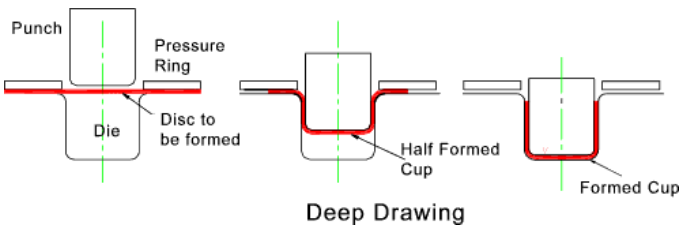
ABSTRACT:

In these theories we clarified around a standout amongst the most utilized Metal Forming Process inside the mechanical field. Diverse investigative, numerical and exact strategies have been produced so as to dissect it. The target of this investigation is to decide the elements impacting an illustration procedure and breaking down the procedure by differing the Die radius5, 6, 7 clear thickness 1mm, connected power and keeping the Friction as consistent. In this paper Punches, clear thickness of same geometry and bites the dust of different geometries were drawn by utilizing CATIA programming. What's more, an exertion is made to think about the reproduction impact of principle process variation in particular kick the bucket range utilizing limited component examination. As the FEM code, the industrially accessible programming ANSYS WORKBENCH is utilized here. Aluminum amalgam 6061 is utilized for profound drawing.Finally displays an examination of the impact of kick the bucket draw range, sheet thickness and connected power on the variety in disfigurement of a profound drawn glass utilizing limited component recreations. In this work, the blend of limited component strategy and Taguchi plan of trials has been connected to examine the affecting procedure parameters on Deep illustration for tube shaped glass part.

I. INTRODUCTION

Profound illustration is a standout amongst the most broadly utilized procedures in sheet metal framing. Aside from its utilization in numerous different divisions, it is connected in the car business for the assembling of auto body parts.

Profound illustration is a sheet metal shaping procedure in which a sheet metal clear is radially drawn into a framing bite the dust by the mechanical activity of a punch. It is accordingly a shape change process with material maintenance. The procedure is viewed as "profound" drawing when the profundity of the drawn part surpasses its measurement. This is accomplished by redrawing the part through a progression of kicks the bucket. The rib district (sheet metal in the bite the dust bear territory) encounters an outspread illustration stretch and a digressive compressive worry because of the material maintenance property. These compressive anxieties (loop stresses) result in rib (wrinkles of the principal arrange). Wrinkles can be anticipated by utilizing a clear holder, the capacity of which is to encourage controlled material stream into the bite the dust range.



Deep Drawing

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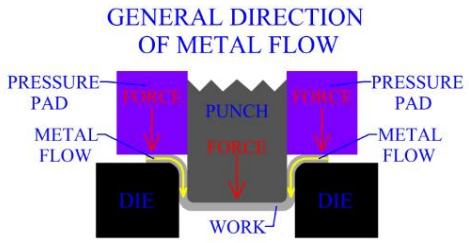
1.2 Process:



The aggregate illustration stack comprises of the perfect shaping burden and an extra segment to make up for grating in the reaching regions of the spine district and bowing powers and also unyielding powers at the bite the dust sweep. The framing load is exchanged from the punch span through the drawn part divider into the disfigurement district (sheet metal spine). In the drawn part divider, which is in contact with the punch, the band strain is zero whereby the plane strain condition is come to. In all actuality, for the most part the strain condition is just around plane. Because of tractable powers acting in the part divider, divider diminishing is conspicuous and results in an uneven part divider thickness, to such an extent that the part divider thickness is least at the point where the part divider loses contact with the punch, i.e., at the punch span.

II. LITERATURE REVIEW

- Van Tung Phan (2012) has reproduced the profound illustration process for ferritic treated steel and examined the impact of variety of clear holder weight and contact on earing profiles. The reproduction results contrasted and trial information. Clear holding power and punch speed influence item quality and creation rate.
- Manabe et. al. (2002) has proposed another blend of punch speed and clear holder fluffy control for profound illustration process. The control framework comprises of the fluffy induction and the database. In this examination the examination of five factors like punch stack, punch stroke, most extreme clear thickness (clear holder removal), SPD (punch speed) and clear diminishment proportion have been recorded. The glass tallness change and the handling time lessening have been picked as the question capacities for assessment crack capacities. It has been demonstrated that the new blend of SPD and BHF fluffy control framework has enhanced execution with expanded efficiency with 25% shaping time decrease.
- Wifi et al. (2007) has exhibited a few parts of clear holder constrain (B.H.F.) conspires in profound illustration process in view of limited component evaluation. In all models, ABAQUS-Explicit broadly useful limited component code has been utilized with full 3-D capacities to represent anisotropy of sheet metal and wrinkling of the containers. The clear made of Al 5182 combination has been utilized and thought to be flexible plastic. Grating has additionally been considered in reproduction utilizing a normal generally speaking basic Coulomb contact show with Coefficient of grinding = 0.1 between the clear and the device.
- Gharib et. al. (2006) has built up an expository model for the glass attracting procedure to ascertain the instigated stresses and strains over the distorting sheet at any phase of disfigurement until the point when a full container is shaped. This model has been utilized as the arrangement motor for the enhancement of the clear holder compel for such glasses keeping away from disappointment by wrinkling or tearing. The investigative model has been set up by considering plastic strains, key anxieties, and von Mises stresses. The consequences of the incremental explanatory model for punch travel versus punch compel, and circumferential strain appropriations indicate great relationship with the test results. The present model

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can be valuable in leading parametric examinations on the diverse parameters which are influencing the procedure.

• Volk et. al. (2011) has reenacted profound attracting procedure to research, streamlined clear holder drive (BHF) for a lopsided work piece from family unit apparatuses industry. In this exploration work the particular clear holder powers have been recognized for least wrinkling and for the enhance quality item. It has been proposed that the nature of a work piece can be enhanced with a superior holding framework. It is apparent that even little changes in BHF can prompt disappointment amid the procedure. These disappointments can be maintained a strategic distance from if a variable BHF is connected, however the right directions should be picked.

R. Venkat Reddy et al. (2013) [33] have led a parametric investigation of BHF, sheet thickness, kick the bucket profile sweep, punch profile span, beginning yield pressure, sheet anisotropy and defects. They found that most extreme container stature at the beginning of wrinkling increments with Blank Holding Force (BHF), sheet thickness and an expansion in the kick the bucket profile span too as punch profile sweep. They additionally presumed that bite the dust profile sweep is more critical and protection from wrinkling likewise relies upon anisotropy.

3. procedure:

The exploration technique utilized for the present work is as appeared in the figure 1 beneath.

Figure 3.1: Deep Drawing Simulation Methodology

1. Creation of cad model
2. Importing CAD geometry Into preprossor
3. Preprocessing
4. Simulation Using ANSYS Software

The geometry of the bite the dust and clear is readied utilizing demonstrating programming CATIA and after that is transported in into the preprocessor . There all the preprocessing steps are done and afterward the examination is completed utilizing ANSYS WORKBENCH. The yield of the examination organize is seen utilizing postprocessor. The reproductions are completed in view of full factorial outline of L27 symmetrical cluster and afterward the relative significance of the chose parameters and their ideal qualities are broke down utilizing ANOVA.

The parameters chose for the examination are as per the following:

3.1 process parameters:

Autonomous factors are not subject to some other parameter. These are the contributions to the investigation and for the most part add to estimation of model.

In the present work, autonomous factors chose are as per the following:

- Die draw radius
- Blank thickness
- Blank holder force

Factors		Levels		
		1	2	3
A	Die Draw Radius(mm)	5	6	7
B	Sheet Thickness(mm)	1	1	1
C	Applied Force (N)	800	900	1000

Table 3.1

3.1 DESIGN:

CATIA offers an answer for shape configuration, styling, surfacing work process and

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representation to make, adjust, and approve complex imaginative shapes from mechanical outline to Class-A surfacing with the ICEM surfacing advancements. CATIA bolsters numerous phases of item outline whether began starting with no outside help or from 2D portrays. CATIA can read and create STEP design documents for figuring out and surface reuse

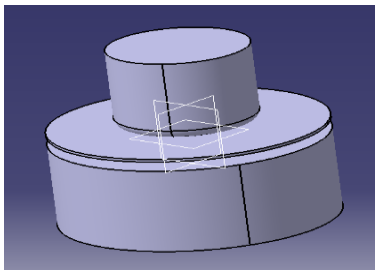


Fig 3.1: 3d model

4 Ansys:

ANSYS is broadly useful limited component investigation programming, which empowers architects to play out the accompanying errands:

1. Build PC models or exchange CAD model of structures, items, parts or frameworks

2. Apply working burdens or other plan execution conditions.

3. Study the physical reactions, for example, feelings of anxiety, temperatures conveyances or the effect of electromagnetic fields.

4. Enhance an outline right off the bat in the advancement procedure to diminish generation costs.

5. A common ANSYS investigation has three particular advances.

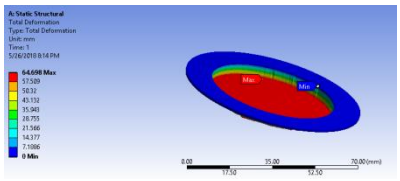
6. Pre Processor (Build the Model).

Material properties: aluminum 6061

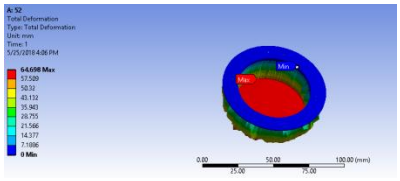
Density	Young's Modulus Pa	Poisson's Ratio	Bulk Modulus Pa	Shear Modulus Pa
2700 kg m^-3	6.89e+013	0.33	6.7549e+013	2.5902e+013

5th radius:

Total deformations 1st draw:



Total deformations 2nd draw:



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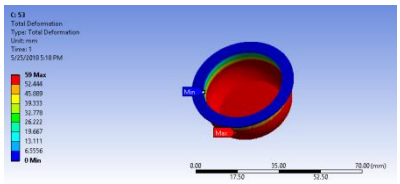
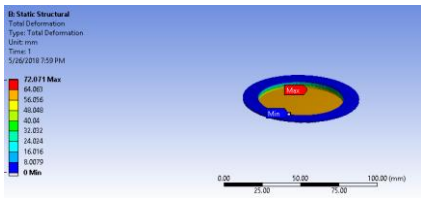


6 radius:

Total deformations 1st draw:



Total deformations 2nd draw:

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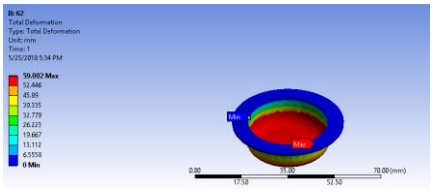

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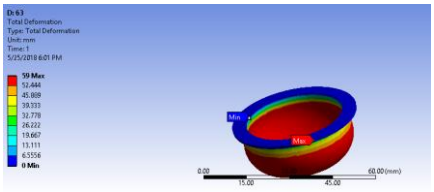
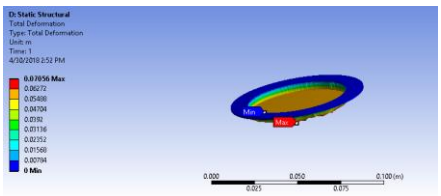


7 radius:

Total deformations 1st draw:



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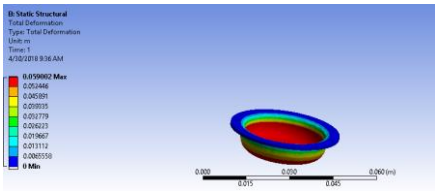

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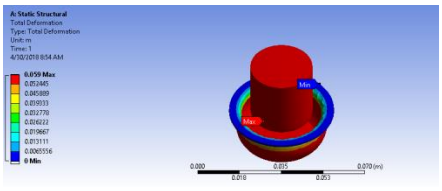

ANOVA

TAGUCHI's primary thought was to control the clamor factors by implication by investigative how they are influenced by various settings of the control factors. He recommended dissecting the consolidated impacts of control and commotion factors, and for this reason, proposed an execution standard called motion to-clamor ratio(S/N).Defects, for example, wrinkles, cracks and intemperate diminishing change the item geometry from the planned one, causing challenges in joining and get together of sheet items, and constraining the item usefulness. Subsequently, thickness of the profound drawn glass area ought to be as uniform as could reasonably be expected, i.e. the ostensible qualities are supported all through the segment. On the off chance that the ostensible incentive for a trademark is the best, at that point the fashioner should take most noteworthy the S/N proportion, as needs be the S/N proportion picked is given [1]

$$(S/N) = 10ln10\frac{1}{n}\sum_{i=1}^{n}\frac{\mu^2}{\sigma^2}$$

Where

n = Total number of trials at the ith setting,

μ= Mean and

σ = standard deviation.

Expt No	Die corner rad (mm)	Thickness (mm)	Force (N)	Deformation (10^{-2}mm)	Stress (10^{15}Pa)	Strain (10^{7} J)
1	5	1.00	1200	6.3885	6.7485	4.788
2	5	1.00	1200	5.786	6.7389	4.8671
3	5	1.00	1200	5.876	6.9375	4.6728
4	6	1.00	1200	7.965	6.8542	6.8662
5	6	1.00	1200	5.986	6.8645	6.8672
6	6	1.00	1200	6.875	6.7542	6.7623
7	7	1.00	1200	5.6745	6.85642	4.7684
8	7	1.00	1200	6.7753	6.75722	4.7868
9	7	1.00	1200	5.8763	6.8652	5.8649

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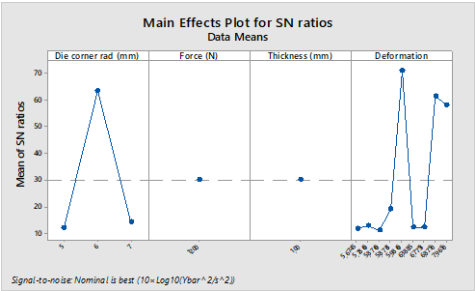

Fig 7.1: main effects plot sn ratios

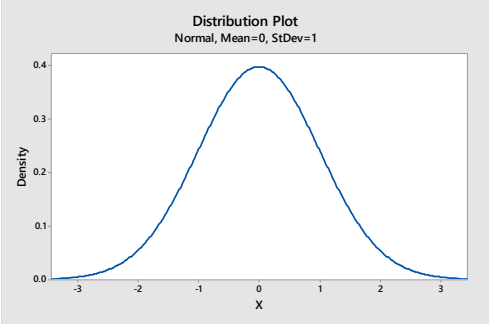

Fig 7.3: distribution plot

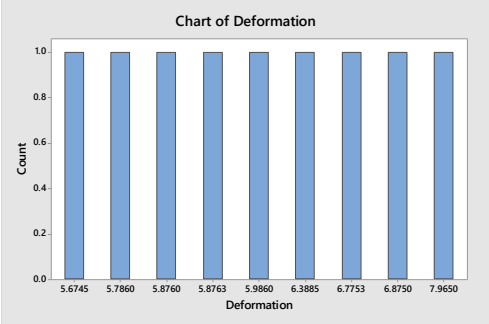

Fig 7.4: chart of deformation

Factor	Name	Levels
A	Die corner rad (mm)	5 6 7
B	Force (N)	1200
C	Thickness (mm)	1.00
D	Deformation	5.6745 5.7860 5.8760 5.8763 5.9860 6.3885 6.7753 6.8750 7.9650

Responses: C6 C

Signal to Noise Ratio: Nominal is best

Formula: 10×Log10((YBar^2)/s^2

CONCLUSION:

To finish up, in the present paper the impact of kick the bucket draw span, sheet thickness and connected power on the material diminishing in profound illustration, independently and associations is investigated by utilizing limited component examination combined with plan of trials. Ideal blend of the parameters is recommended in view of ANOVA of the outcomes got.

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