DESIGN AND ANALYSIS OF PUNCH AND DIE FOR FORMING TOOL OF THRUST BEARING BOTTOM RACE

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***Abstract*—diverse segments/parts utilized as a part of Mechanical industry are made by sheet metal. They can be created by various cold pressing forms. This paper introduces a configuration of press tool punch and die for the forming operation. Punch is enforced in which, forming is performed in the same single station and finished in the single press cycle. This paper describe methodology to design top forming punch, center forming punch and bottom forming die. The methodology is made to the low carbon steel sheet metal of 1.5 mm thickness as the outcomes and examination of punch and die are shown**

Keywords : forming, punch, die

INTRODUCTION

The advancement of items, managed by the need to get by in the business sector, requires changing in manufacturing process. This requires an incorporated methodology of useful angles, innovative, authoritative and administration of the improvement stages. Keeping in mind the end goal to diminish however much as could reasonably be expected time and cost of the new items. Outline action has an essential part in building up another item. Outline time being all the time definitive as far as the promoting time of the item. Punch are applied to the connected dies in which the more forming operation, are performed the same single station and finished in the single press cycle. There are numerous approaches to outline a press tool die design on, however since there is no spot for the completed part to go amid an intensify pass one's operation, the part should be pushed once again into the scrap web such that it can then be done of the apparatus and removed in some style later in the pass on cutting operation. Focal points of press tool, as a matter of first importance being the high and phenomenal mechanical precision of one step process. A second point of preference of a punch the dies throughput. Since all inside and border components of the part are made in one cycle.

I. DESIGN OF COMPONENT

The bottom race extraordinary is a section used as a part of an automobile part get together. The part should be planned to meet its application. So the collecting strategy of the portion must be taken regulate to the estimations of the part. The material used for the generation of the part is CRCA

Element	Content
Carbon, C	0.12%
Iron, Fe	98.81- 99.26%
Manganese, Mn	0.50%
Phosphours, P	0.150%
sulphur, S	*0.040%*

Mechanical properties	
Tensile strength, ultimate	520MPa
Tensile strength, yield	310 MPa

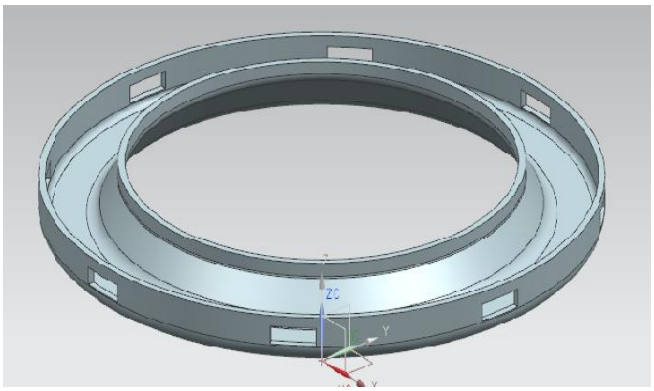


Figure 1: Bottom Race

II. TOOL DESIGN

Before arranging the forming tool assembly, there are certain diagram centers to be taken after. Fragment study, Thickness of the portion, Material, Machine to oblige the method, Critical estimations of the part. On the bases of the study made some basic design thoughts should be taken after to secure the part with the accurate estimations, esteem, sturdiness, utilitarian, quality, economy and appropriateness of the creation process

III MATERIAL SELECTION

On the bases of the study made, hchcr steels are taken as the material for the tooling. These tool assembly steels have high wear resistance with good setting properties. These qualities are seen on account of high proximity of chromium and carbon. Consequent to cementing shapes these instruments steels have low dimensional changes and have medium impenetrability to hot softening. The material endorsed for the illustrating mechanical assembly parts is D2 material. D2 material is air cementing high carbon high chromium gadget steel having to a high degree wear resistance properties. Significant hardening ought to be conceivable on the D2 material, which is in every way that really matters free from size changes under high use of the instrument. D2 instrument steel high substance of chromium gives delicate disintegration contradicting properties in the cemented condition

Element	Contents
Carbon, C	1.50%
Silicon SI	0.30%
Chromium Cr	12%
Molybdenum	0.80%
Vanadium	0.90%

Blank Part

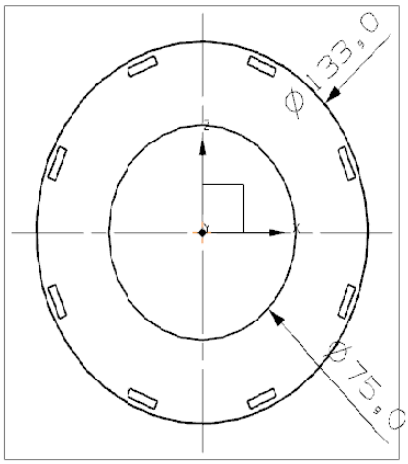


Figure 2: Blank Part

TOOL CALCUATIONS

Forming force = t x h x Us
t = thickness of component t = 1.5mm
h =formed height h = 441.90mm
Us = ultimate tensile strength
= 1.5 x 441.90 x 520
=344689.90N N
Pad Force (P) (P is taken 25% of forming force)
P = 0.25 x 344689.90
= 86172.255N
Total force = Forming force + Pad force
= 344689.90 +86172.255
=430862.15N
Press Capacity Required Forming Tool
Tonnage required = 43.92 tons
Selected press = 50tons

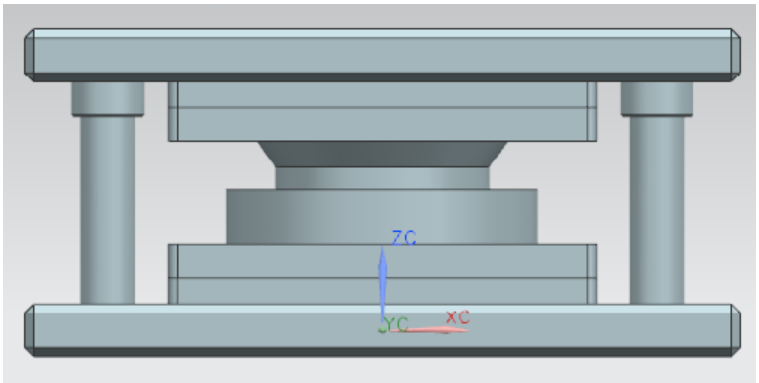


Figure 3: Forming Tool Front View

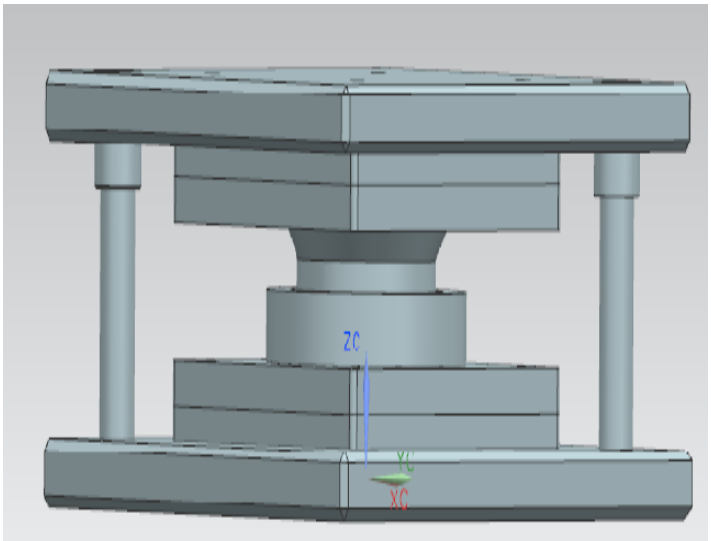


Figure 4: Forming Tool Isometric View

IV PUNCH AND DIE ANALYSIS

The punch and die on examination is finished using the SOLID WORK 2015 programming. Static examination is done to find the stress distribution and displacement and the dislodging on the punch and die.

Figure 5: Bottom Race Die Mesh for 50tons

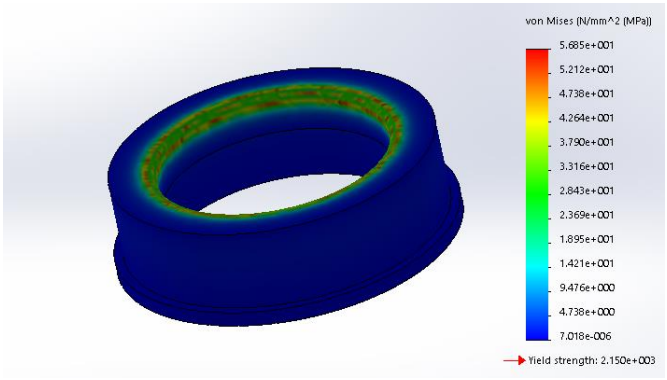


Figure 6: Bottom Race Die Stress Analysis for 50 Tons

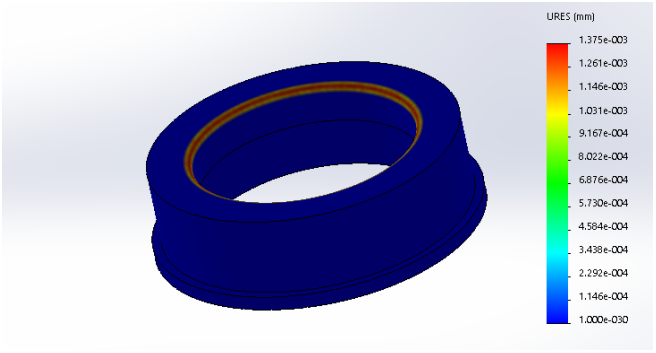


Figure 7: Bottom Race Die Displacement Analysis for 50 Tons

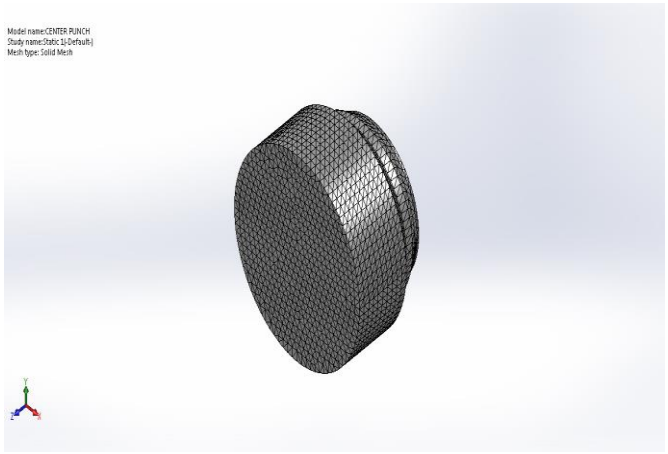


Figure 8: Bottom Race Center Punch Mesh for 50 Tons

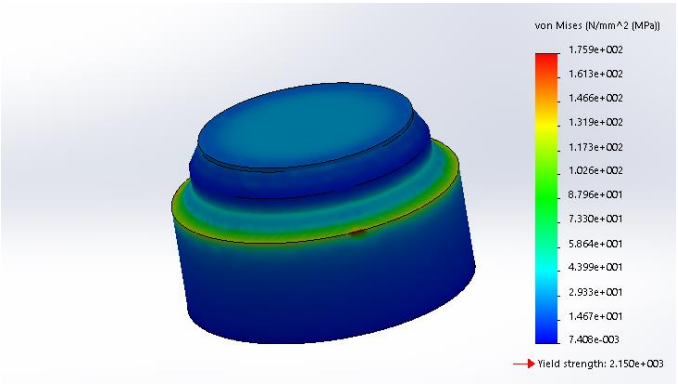
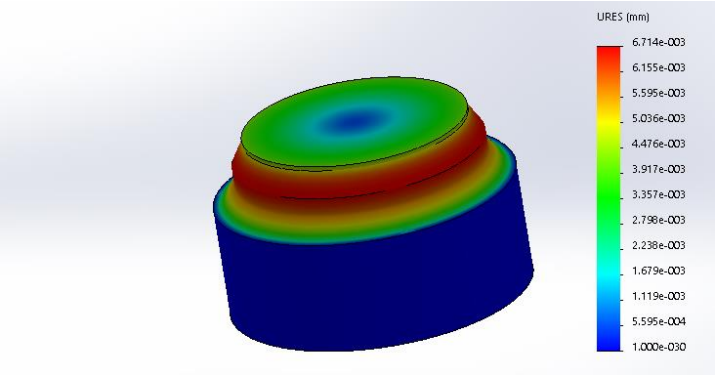


Figure 9: Bottom Race Center Punch Stress Analysis for



50Tons

Figure 10:Bottom Race Center Punch displacement Analysis for 50 Tons

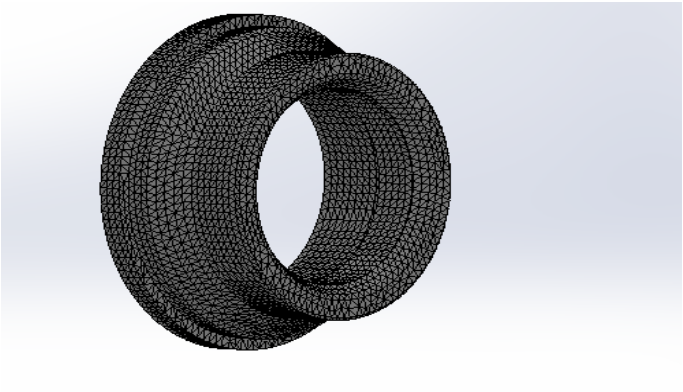


Figure 11: Bottom Race Top Forming Punch Mesh for 50Tons

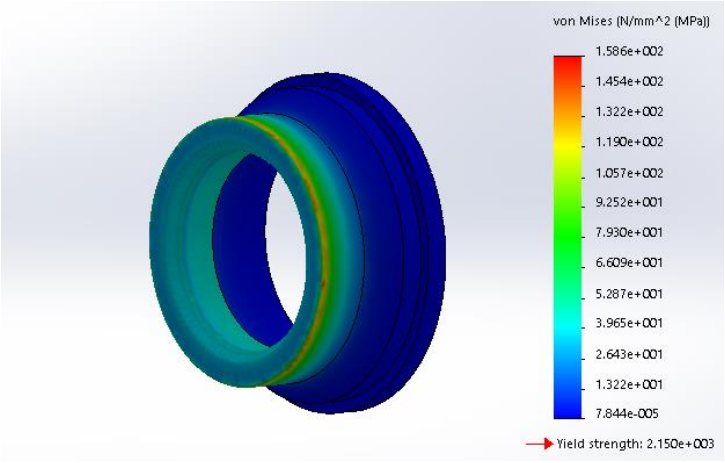


Figure 12 :Bottom Race Top Forming Punch stress Analysis for 50 Tons

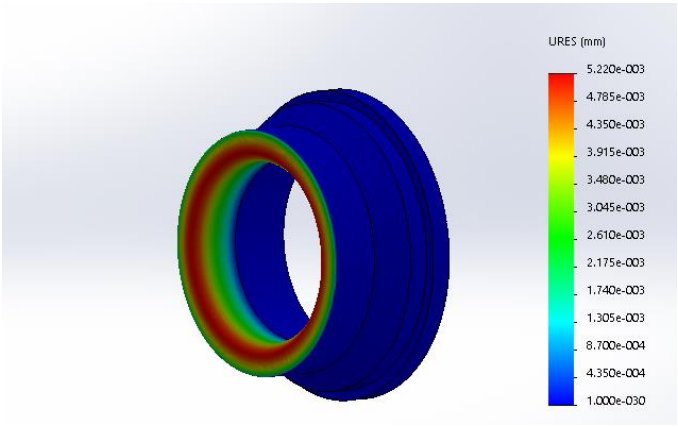


Figure 13 :Bottom Race Top Forming Punch displacement Analysis for 50 tons

V STRESS ANALYSIS RESULT

Type	Observed limit	Limit value	units
Bottom forming die	$5.685*10^1$	$2.15*10^3$	N/mm^2
Center punch	$1.759*10^2$	$2.15*10^3$	N/mm^2
Top forming punch	$1.586*10^2$	$2.15*10^3$	N/mm^2

Displacement Analysis Results

Type	Displacement	units
Bottom forming die	0.0013	mm
Center punch	0.006	mm
Top forming punch	0.0052	mm

The analysis results for bottom race die, top forming Punch and center punch the stress value are within the limits and displacement are small value for the material to deform the load are within the limit value for 50 tons. Considering 50 ton is safe

VI CONCLUSION

The results were observed that the maximum tonnage required for forming process. The prediction show the material used for the tooling increases the life of the tool. Analysis results show the stress values in the forming process are less than the allowable or the limit values. Finally analysis results show that design is safe.

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