Identification Of Defects In Drawing Operation With Remedial Steps

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Abstract: The defects in the drawing operation have to be minimised for the better product or the good quality of the product. This work emphasis in the improvement of the drawing operation, so that the product has to be made easily and within less time. The product which has to be produced is analysed and checked on software so that the product can be safe while manufacturing.

Keywords: Drawing operation, analysis, manufacturing process, punch, Die, Defects in drawing operation.

1. Introduction

Manufacturing process is having great impact on the quality of the product. In order to have the good quality of the punch has also been analyzed so that the punch should be safe while manufacturing product the process has to be designed carefully. In this paper the product which has to be manufactured is first modeled in the cad software and then it has been analyzed in the ANSYS-14 software.

2. Modeling of the punch

The fig.1 shows the model of the punch which will be used for the manufacturing of the part. The punch is modified so that the two operations can be combined in the one operation. The different materials are selected depending upon the number of product to be manufactured for the punch. After the modeling of the punch the punch is analyzed on the analysis software by applying the different meshing conditions on different material. The fig.2 shows the meshing conditions of the punch.

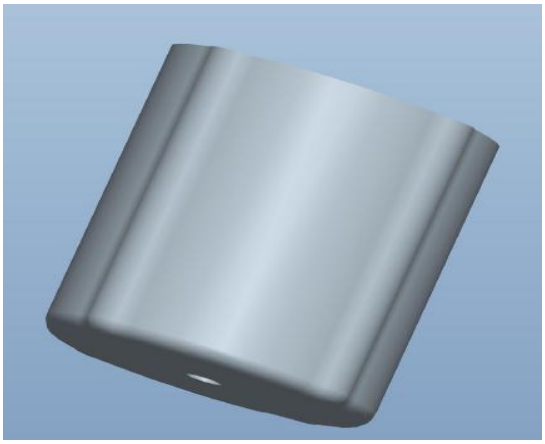

Fig. 1 *Model of the punch*

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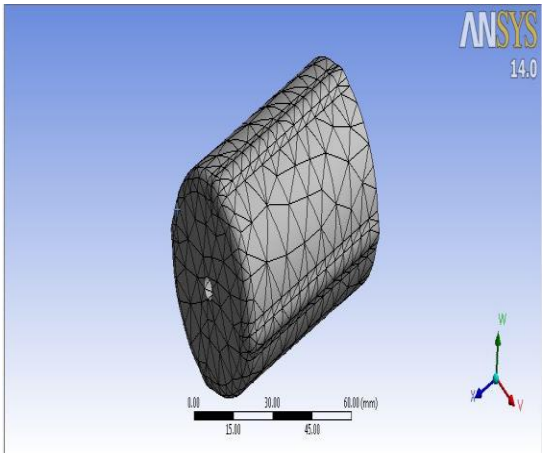

Fig.2 *Meshing of the punch*

3. Analysis of the punch

The fig. 3 shows the analysis of the punch in the above meshing condition. The cad model of the punch is imported in the analysis software i.e. ANSIS-14 and the boundary conditions are applied on the punch, which is shown in the fig. 3. After applying the boundary conditions on the punch the stress failure has been checked. It has been found that the stresses coming on the punch are limited to the indent portion only and are minimum. The other part of the punch is safe which is shown in the fig4.

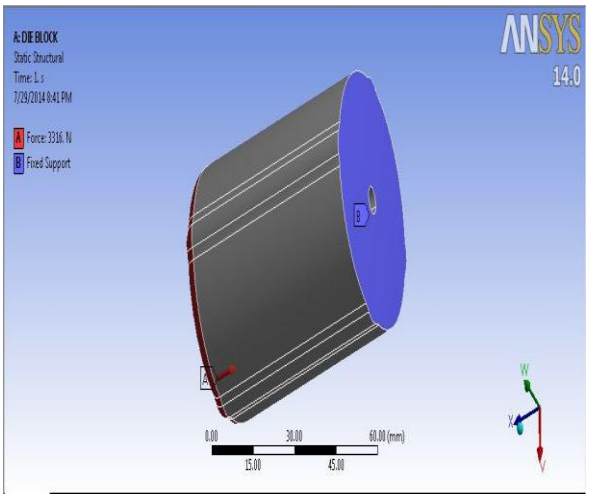

Fig. 3 *boundary conditions of punch*

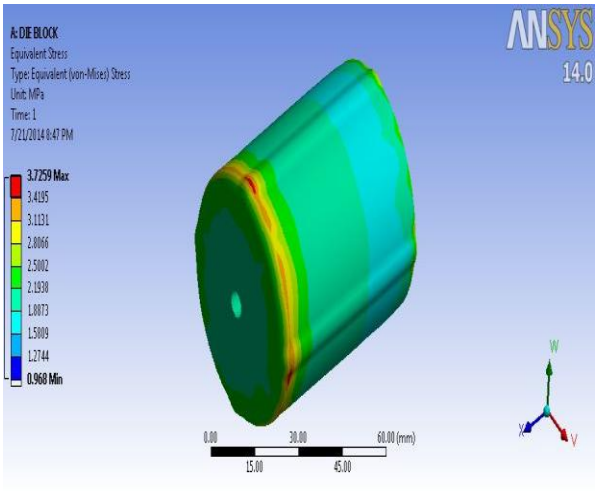

Fig. 4 *stress on the punch*

The punch has been analyzed for different materials and it has been found that all three materials can be used for punch but the one who is having minimum stress is used for manufacturing purpose.

4. Analysis of the die

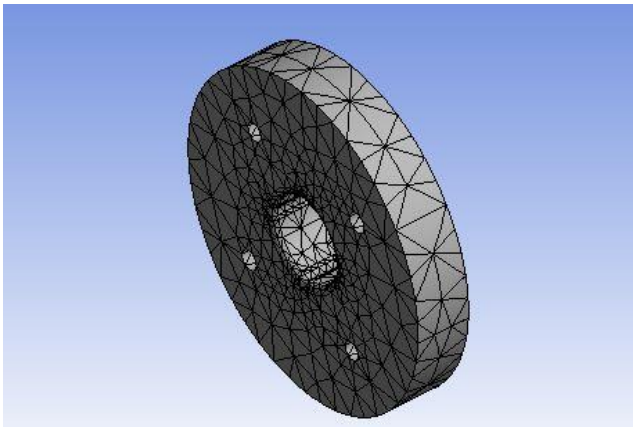

Fig.5 *Tetrahedron Meshing of the Die*

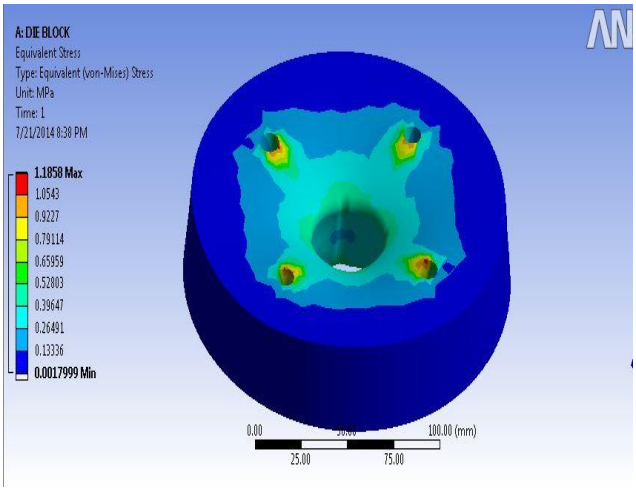

Fig. 6 *Stress on Nickel Material Die*

The analysis of the die for the different material has been carried out. The material is selected depending upon the quantity of manufacturing the product. The three different materials which have been used for the analysis were Nickel Steel, Malleable cast iron, and the tungsten carbide. All these three materials were tested on tetrahedron meshing. After analysis it has been found that the Nickel Steel Material can be used for the Die and it is having the minimum stresses for the forces acting on it. The other two materials can also be used for the manufacturing purpose. The stresses which are acting on the die at the fixing arrangement of the die that is at the joining position of the die with the another part are lowered by providing the groove at the sharp corners of the joining area.

5. Analysis of the cup part

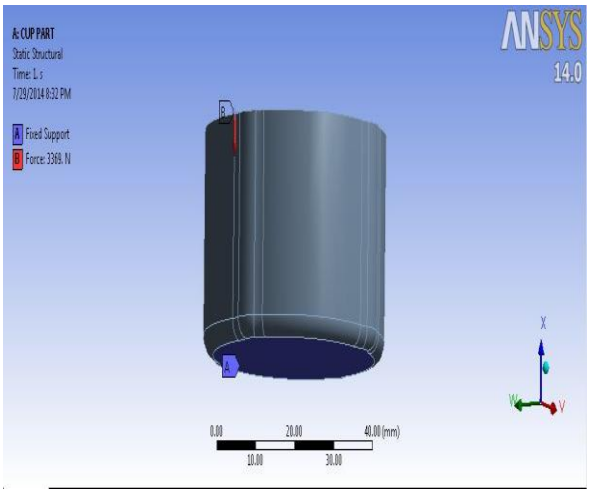

Fig. 7 *Forces on the cup part*

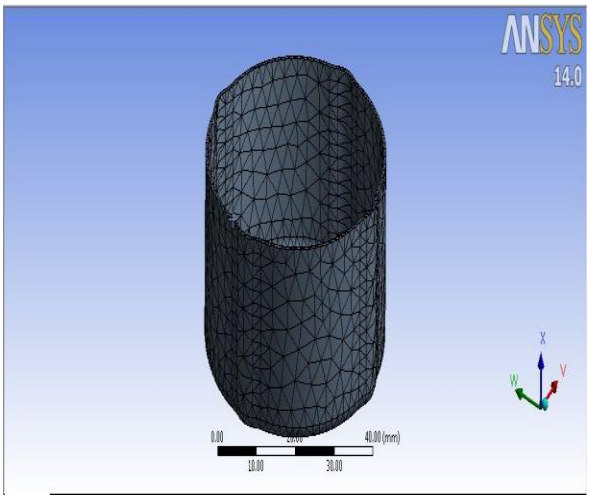

Fig. 8 *Meshing of the cup part*

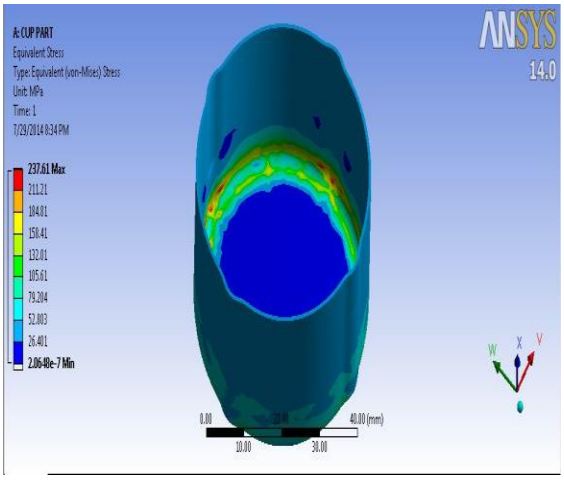

Fig. 9 *stress analysis on the inner side of the cup*

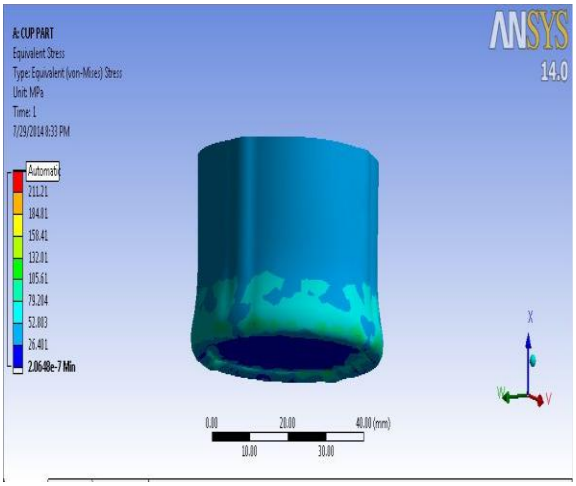

Fig. 10 *Stress analysis of the cup part on the outer surfaces*

The analysis of the cup part is shown in the figures. First the cup is meshed (Fig. 7) and the boundary conditions are applied on the cup (Fig. 8) and after the cup is meshed with the tetrahedron meshing the analysis has been carried out and found that the cup is safe in the stress failure but the deformation are always be there as the forces acting on the cup part. From the fig.9 it can be seen that the maximum stress comes at the indent edge of the cup part from inside and if we see it from the outside the stresses are not there at the outer surfaces (Fig. 10) so we can say that the cup is safe in the analysis. Now in order to check that the cup is safe or not we can check it by using the simple relation of the load and area that is Stress= load/ area.
So, Stress = Force / Area

$$\sigma = F/A$$

$$\sigma = 5.235 \times 10^3/20543.6$$

$$\sigma = 254.823 \text{ N/mm}^2$$

Where: σ – Shear Stress
F – Shearing Force or Total Force On the Cup
A – Shearing Area of the cup

As the induced stress is less than the permissible stress limit of the material which is used for the cup, hence we can say that the product is safe.

6. Conclusion

On the basis of software solutions it may be concluded that the cup or the product which has to be manufactured is safe in the manufacturing process if the various operations are combined. And the die is also safe as well as the punch also. Various materials can be used to manufacture the die & punch. The cup sustains the stresses Cumming on it. The stresses are at inner surfaces only and the outer surface does not get disturb. So we can manufacture the product by combining the various operations.

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