Design and Development of Bending Die

Mangesh C. Gite[1], Akshay B. Gite[2], Amol B. Kolhal[3], Rahul V. Datir[4], Kiran A. Jagtap

[1234]Final Year Mechanical Engineering Students

[5]Assistant Professor in Department of Mechanical Engineering

[12345]G H Raisoni College of Engineering & Management, Ahmednagar

Abstract: Sheet metal working is a most commonly used process in manufacturing industry. In sheet metal working process the number of different components are produced. It is very economical process to develop a parts. In this process the press tool design is a very important part to produce a component. The main two types of sheet metal working process which is cutting process and non-cutting process. The various operations are carried out in press. This paper is related to the design of the bending die which is efficient and more effective.

Keywords: **Press work, bending die, sheet metal process.**

I. INTRODUCTION

The project is related to bending die is designed for piaggio ape bumper box this an industry based project. The company is placed in at kedgaon, ahmednagar and company name is Sumesh press shop has been assigned the project of designing and manufacturing tools during the visit to Sumesh Industry the problem was discussed. The previous design is less efficient. In previous manufacturing process the component required four stroke for bending. The cycle time for production is more and more space required. During this project, various causes was identified and solution by using collected data from the industry. The bending die is used to bend or moved the sheet metal into curved shape. In this project we combine the two bending tool in single base plate. We have bend the two types of sheet which have different side bending, one sheet have a left hand side and other one have a right side bending. Therefore we combine the two different side bending tool.

II. LITERATURE SURVEY

Ketan Kapse (2017) [1] has studied metal bending operation are widely performed on press machine. The number of operations are performed in press machine like, bending, drawing, dip drawing, etc. The tool used for manufacturing the component have a high accuracy and it is in large numbers. This paper shows the design of bending die which is use for producing the rib. This paper concentrated in design of different component of blanking tool, 2D and 3D modelling of parts. This modelling component was carried out on solid works.

B.Balaji et. al. (2016) [2] has studied that the sheet metal processes is commonly used in various purpose in industry. For that many people are engaged in developing the trends by their innovative ideas. Especially in design of die, they produced various die set for different functions such as compounds die, progressive die, steel rule die, modular die, sectional die. They are fail to increase the profit with well margins and few are face the difficulty in handled the dead weight by single person. The main purpose of this paper is to design a die with interchangeable die and punches to weight are reduce from material by means of changing the die set material.

D.R.Mete et.al. (2015) [3] has studied that the bending of sheet metal, plate the bending die is used. The purpose of this project is the produce a simple metal bending equipment and which is portable for use. The machine is used to bend sheet into an angle of the curved shapes. The machine size is very compact as compare to the other machine and it is suitable for working. The Mild Steel is used for manufacturing.

J.H.Park (2014) [4] the has studied that the die forming is a best forming methods to manufacture the large amount of component with less time and cleaning the surface by using high pressure injection of cast alloy, performed by using the trial and the error method, and is causes time loss and cost. The paper is define a research work of developing CAD product.

Mr. Bhaskar et. al. (2013) [5] authors says that compound die is process of collective operation perform on the sheet metal of various operations are working in a single stroke. The thickness of sheet metal, thickness and complexity of design and operation is a main aspect of the designing of compound die. This press tools has significances like high rate of production and minimum per unit cost of product. In compound die the variety of operation are performed at common work station in present thesis the intensions is given on quality Improvement along with production rate. Some drawbacks like spring back effect can be compensated in designing of compound die.

III. METHODOLOGY

PROJECT DESIGN

Design calculation for die
1) Bending force for die:

$$P = \frac{C}{3}*B*t*T_s, \text{ Kgf/mm}^2$$

Where,

P=bending force in tonn.
C=constant (1 to 2)
B=bending length in mm.
t= thickness of the plate in mm.
T_s=tensile strength of the material in Kgf/mm^2

P= 2/3*287.1*1.69*45.62
P=14756.51892, Kgf
P=14756.5189*9.81
P=14476145, N
P=144.76 Tonn.

2) Die plate:

The die is design by the reference of standard values book. In this book they are given in the standard dimensions which is suitable to design the die and its thickness also.[6]

Dimensions of the Die
Length of the Die=358.66 mm.
Width of the Die=154.5 mm.

So In This Available Data We Take the Thickness is 60 mm.

3) Punch plate:

The die is design by the reference of standard values book. In this book they are given in the standard dimensions which is suitable to design the die and its thickness also.[6]

Dimensions of the punch
Length of the punch plate =358.66 mm.
Width of the punch plate =154.5 mm.

So in this available data we take the thickness is 60 mm.

4) Ejector:

The ejector is the half of the punch. Ejector is placed in between the punch and die.

Te=0.5*Td
Where,
Te=thickness of the ejector
T_d=thickness of the punch

Te=0.5*60
Te =30.mm

5) Spring selection:
The spring is used here for giving the punching and also for holding the die. So this selection is given the punching force. The punching force is 144.76 KN required here, there for the spring selected from the PAWAN Std. book. The PAWAN is the spring manufacturing company. They give their standards. By referring this here requirement is 144.76 KN force and 14 mm travel which is fulfill bye PYE 64*50 type of spring.

The specification is given as:

Load caring capacity of spring =11.35 KN

Travel of this spring =16 mm.
So we can use the 8 spring.

CONCLUSION

We have done successfully this project by calculating the some values and selection of different standard component. By developing this tool we increase the efficiency of the product and reduce the various factors which is beneficial.

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REFERENCES

[1]   Ketan kapse, ajinkya jadhav Design of blanking die for stiffening rib: A case study IJRSET Vol.6,Issue 2, February 2017, pp. 1725-1735

[2]   B.Balaji design and development of punching die, IJRET, Vol.5, Issue 4,march 2016,pp.249-255

[3]   J.H.Park, et al. A study on development of die design system for die casting IEEE, Vol. 1 ,Issue 3, Sep. 2015,pp.44-45

[4]   A.D.Zope,D.R.Mate,Review paper on design and development of bending machine, IJERA, Vol.2,Issue 5, Aug. 2014,pp.25-30

[5]   Mr. Bhaskar F. Satpute A review on design, development and analysis of compound die for automobile component, IEEE, Vol.3, Issue 1, March 2014 pp. 415-425.

[6]   Sharma P. C., Production Engineering, 11th ed., S. Chand Publication, India, 1982, pp. 200-250.