

Design and Analysis of Dust Shield

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Abstract - The product dust shield is use to prevent front wheel braking system from dost dirt. It helps in increasing life of brake system also enables better functioning over a time, so its design must be effective but with optimum cost and less time of manufacturing To manufacture dust shield punch and die assemblies are used and it is going to manufacture in three stages. Stage for manufacturing dust shield are blanking followed by forming and lastly piercing Blanking involves cutting the sheet metal in required shape then followed by forming operation and lastly piercing operation. Afterward analysis of the design to check whether it is sale or not in Ansys workbench

Key Words: Dust Shield, forming, blanking, piercing, ansys

1.INTRODUCTION

Various operation can be carried out by press tools. These can be classified majorly into two types cutting operation and forming operations. Cutting operation are achieved by applying sufficient force which causes the material to fail, in many cases this force will be shear force. In cutting operation when significant enough shear force is applied, the shear stress in the material will exceed the ultimate shear strength of the material and the shear stress in the material will fail and separate at the cut location. Forming operation are achieved by applying a force which produces stresses in the material to be below the ultimate strength of the particular material. As the stress produced in the material are below the ultimate strength, there will be no cutting of the metal, but there will be a change of contour of the work piece to obtain the desired product. For manufacturing dust shield punch and die assembly is used. Dust shield is a sheet metal component. Sheet-metal parts are usually made by forming material in a cold condition, although many sheet metal parts are formed in a hot condition because the material when heated has a lower resistance to deformation. Strips of blanks are very often used as initial material and are formed on presses using appropriate tools.

2. Material Selection

Material selection is a step in the process of designing any physical object. In the concept of product design, the main goal of material selection is to minimize cost while meeting product performance goal.

D2 is most commonly used material for manufacturing punch die to withstand high pressure. AISI D2 is selected as the material for die and punches used in progressive die.

As AISI D2 is high carbon, high chromium tool steel which is alloyed with vanadium and molybdenum and it has high wear resistance, high compressive strength and excellent resistance to tempering back.

Table -1: Different Types of Materials Used for Punch Die

PROPERTIES	D2	D3	D4	D7
COMPOSITIONS	C – 1.50 % SI – 0.30 % Cr – 12.00 % Mo – 0.80 % V – 0.90 %	C – 2.10 % SI – 0.30 % Cr – 11.50 % Mn – 0.40 % Ni – 0.31 %	C- 2.25 % SI – 0.50 % Cr – 11.50 % Mn – 0.35 % Mo – 0.80 % V – 0.20 %	C – 2.30 % SI – 0.40 % Cr – 12.50 % Mn – 0.40 % Mo – 1.10 % V – 4 %
HARDNESS	62 - 64HRC	63 - 65 HRC	63- 65 HRC	65 – 67 HRC
TOUGHNESS	MODERATE	LOWER	LOWER	LOWER
WERA RESISTANCE	FAIR	GOOD	GOOD	GOOD

3. Manufacturing

To manufacture dust shield punch and die assemblies are used and it is going to manufacture in three stages. Stages for manufacturing dust shield are blanking followed by forming and lastly piercing. Blanking process is cutting process obtain in sheet metal in which sheet metal piece is removed from the large piece of stock by shearing force applied in the sheet metal then followed by forming operation and lastly piercing operation.



Fig -1: Dust Shield

4. Design

Increasing product varieties is beneficial for companies in terms of expanding the market and harmful in terms of increasing manufacturing costs. Producing different products with different geometrics is a significant portion of the manufacturing costs. If we manufacture product with costly setup then productivity decreases also not economical, therefore it is important to develop new method by using which products manufacturing cost decreases. Setup design is also important parameter i.e., the design must be cost effective.

Design stages are as follows,

- Designing products
- Modeling on software
- Analysis of design
- Finalizing the design

For manufacturing dust shield as shown below requires designing three punch and die assemblies i.e. Blanking, Forming, piercing.

- Name of the component: DUST SHIELD
- Material of component: MM21 D AS PER MM STD G- 00-0167
- Stock thickness: 0.8 mm
- Shear strength: 100 MPa
- Tensile strength: 380 MPa

5. Analysis

after designing and modeling the punch and die tool is analyzed by using FEA software to ensure the correctness of design. The analysis part is very essential to avoid the damage of meeting parts because for the tool very costlier material like D2 are used. To prevent this material form damage, analysis must be carried out. Also due to analysis the designer comes to know the distribution of stresses and deflection of the punch and die for particular operations. It provides an opportunities to improve the design of the parts before manufacturing.

6. CONCLUSIONS

Design of punch & die assembly for dust shield, which was produced by sheet metal has been developed by following primary die design principles. All the components in the press tool assembly were initially designed with respect to dimensions of dust shield. Structural analysis of all the components was done by theoretical. results were compared and found in acceptable range. The designed punch & die assembly will produced dust shield with high accuracy, good surface finish. Form designed punch and die assembly productivity will increased, time required for manufacturing will reduce, fatigue to operator will reduce and also human error while manufacturing will reduce.

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REFERENCES

- (1) Ketan Kapse, Hand Book of Die Design, 2nd edition McGraw-Hill, feb 2017
- (2) Subramanyam Pavuluri, R E Crowley, Die design fundamentals, New York, NY: Industrial Press, may 2016 (c) Dr. Taylan Altan, Tool Engineering and Design, Khanna Publishers april 2011
- (3) Pritam B. bhawar, Press Tools Design and Construction, Surya Kiran, 19, K.G.Marg.. New Delhi april 2017
- (4) Gaurav C. Rathod, Fundamentals of Tool Design july 2017 (1) Ch.Mastanamma Cold and Hot Forging: Fundamentals and Applications, ASM International, august 2012
- (5) M Subrahmanyam Design and Analysis of Press Tool to Produce Radiator Stay Bracket LJERTV5IS060802 Vol. 5 Issue 06, June-2016
- (6) Prof.K.D.Kattimani Design and analysis of progressive tool for moving contact holder, Volume 2, Issue 6 JETIR (ISSN-2349-5162) July 2015
- (7) A. K. Kumaresh Design and Analysis of Punching Die IJRET Eissn: 2319-1163 Pissn: 2321-7308
- (8) Rakesh Lilhare Design and Analysis Of Press Tool for Bracket Vol-4 Issue-3 2018
- (9) Vivek D. Barhate Design and Analysis of Progressive Die for an Industrial Part LJSR 2013.
- (10) Dr. Taylan Altan, Tool Engineering and design, Khanna Publishers April 2011