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# Modelling of Integral Parts of Press Tool

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**Abstract:** As there is race to lead the market with a top or better position, many industries (large as well as small scale) are upcoming with various quality of products and new techniques to achieve them. Various design considerations are also discussed in this paper along with the material selection. Generally press tool require a large changeover or setup time to load the new tool. So a technique named SMED (Single Minute Exchange of Dies) is also discussed in this paper. Technically this paper will be useful to every Engineer who is going to perform research on it.

**Keywords:** Press tool, SMED, Tool Design, Tool Material.

## I. INTRODUCTION

Pressing is a operation of producing components by impact of plunger on sheet to produce a definite shape. Various operations such as Blanking, Bending, Pressing, Punching, Piercing, Embossing, Wiring, Coining, Notching, trimming, etc. are performed on this tool. Pressing operation is performed by Press tool. Press Tool can also be called as Blanking Tool, Pressing Tool, Bending Tool, etc.

## II. LITERATURE REVIEW

As discussed in above Introduction that, Pressing is a operation of producing components by an impact of plunger on sheet to produce definite shape. Pressing is a sheet metal operation. Press tool is used to perform operations such as Blanking, Piercing, Bending, etc. Following are some research papers we took help of, to carry out this Literature Survey.

Mr. Subramanyam Pavulari et.al: He stated the Process of Design of Press Tool and its Manufacturing. Also he discussed literature survey of press tool in this paper. Various specifications of Press Tool machines and their capacities, along with the basic principle of Press tool die is also stated. A short description of Methodology of manufacturing of Press Tool consists of selection of materials and its various composition of alloys, assembly and design calculations are included. Analysis of tool is performed on software named SOLID WORKS. <sup>[1]</sup> Mr. Anudeep S, et.al: The main aim of this paper as per author is designing and analysis of Press Tool to produce an anchor bracket. Basically the main Blanking operation, how actually it is carried out along with Tool Design is discussed. As there is a part of Tool Design there is also a part of material selection and design calculations. Punch and die analysis of blanking and bending tool is carried out and a basic animated model of these Press Tool are given for better understanding of these processes. <sup>[2]</sup>

Mr. Abhijit Tagade et.al: prescribed sheet metal forming processes for manufacturing and design of Press Tool for washer. Washer is a result of various combination of sheet metal processes. These processes are discussed in this paper such as shearing, drawing, bending, squeezing, etc. As per the strength of material selected in material selection, Press Tool is selected accordingly. Various basic design considerations are considered to design the washer. A 3-D view of developed Press Tool is snapped in this paper along with the Design calculations required to produce the tool of various capacities. <sup>[3]</sup> Mr. Yash Dave et.al: explained the feasibility required in the market, of various components to lead the market with better position. He explains a technique named SMED (Single Minute Exchange of Dies) which helps the company to be flexible in the market with variety of components produced. A Literature Survey is carried out by author in this paper explaining the quick changeovers which take less than 10 minutes. A quick changeover improves the flow of process. The basic four steps of SMED and terms of SMED are explained by him in this paper. <sup>[4]</sup>

Mr. Jaeck Mucha: aimed on the wear of tool on burr during Blanking of Generator sheets. He explains various types of metal coating to be used to avoid or decrease wear to a greater extent. Also he provides a clearance formula to be followed for keeping clearance between punch and die, according to different thickness of sheet. He also provides a proof of some materials to be effective for different wear conditions. <sup>[5]</sup> Mr. Siji Qin et.al: stated a research on fine blanking process with a stepped edge punch. Analysis of blanking process with negative clearance is carried out by Finite Element Method. The fine blanking process is same as conventional blanking process. Burnish zone for three different materials as q235 steel, copper and industrial aluminium were observed. Also different conditions of Clearance would lead to failure of material and its proof of analysis is discussed in the paper. The reasonable process parameters were proposed for three different materials. <sup>[6]</sup>

### III.PRESS TOOL

#### A. Design Considerations

- 1) The size, shape, material and operations to be performed.
- 2) Selection of tool such as simple, progressive, compound, combination, etc.
- 3) Selection of proper strip layout.
- 4) In Progressive tool the strip layout must cover all the stages at proper sequence, considering the rigidity of die.
- 5) Considering the tonnage required and calculations related tool, such as economy factor, plate thickness, etc.
- 6) Try to construct tool that can be easily modified in future.
- 7) Shank location should be given at centre of the tool.
- 8) Tool must be rigid considering its involvement in type of production such as mass, batch, etc.
- 9) Re-sharpening allowance must be added to die and punch cutting edges.
- 10) Tool must withstand all the lateral thrust acting on it during operation.

#### B. CAD Model of Integral Parts of Press Tool

##### 1) Insert

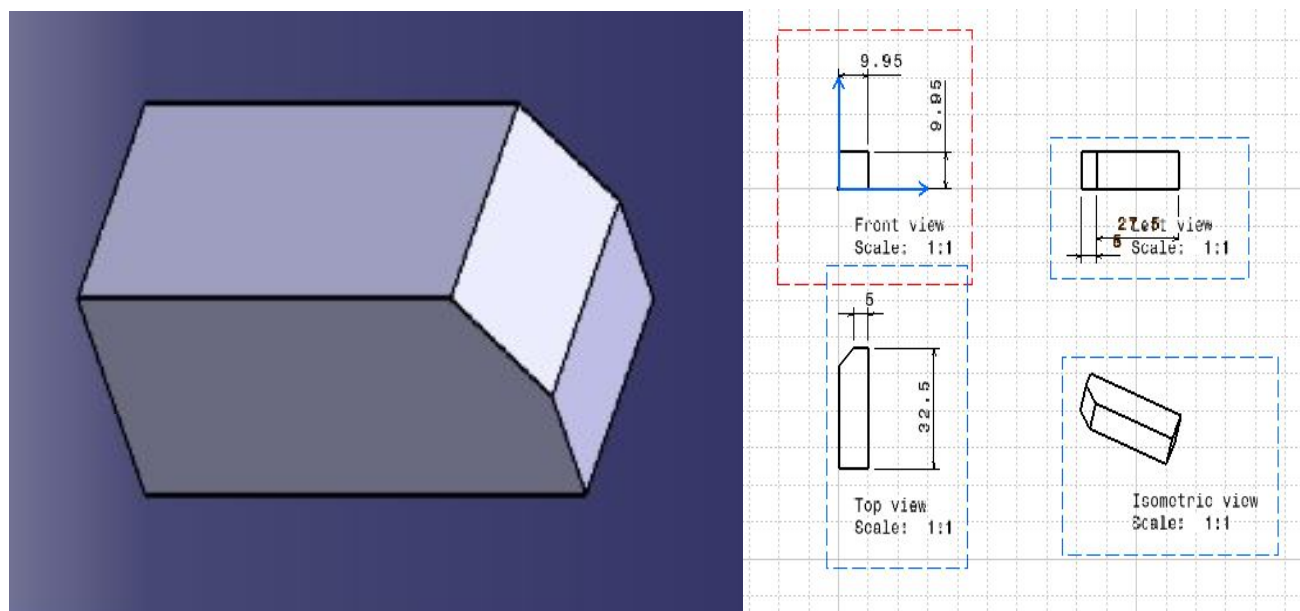


Fig 3: CAD and 2-D Model of Insert

##### 2) Guide

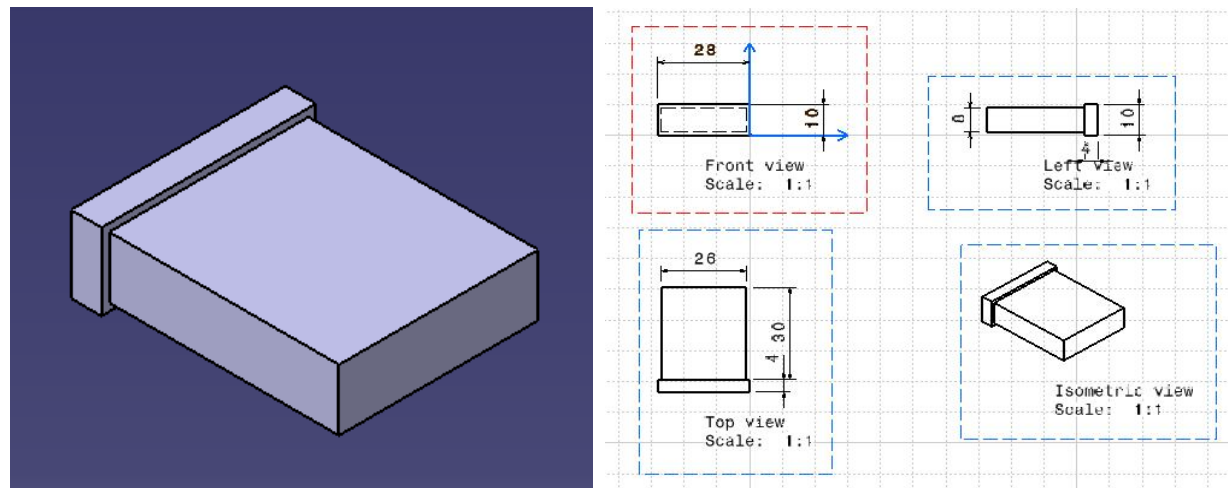


Fig 3: CAD and 2-D Model of Guide

### 3) Top Plate Assembly

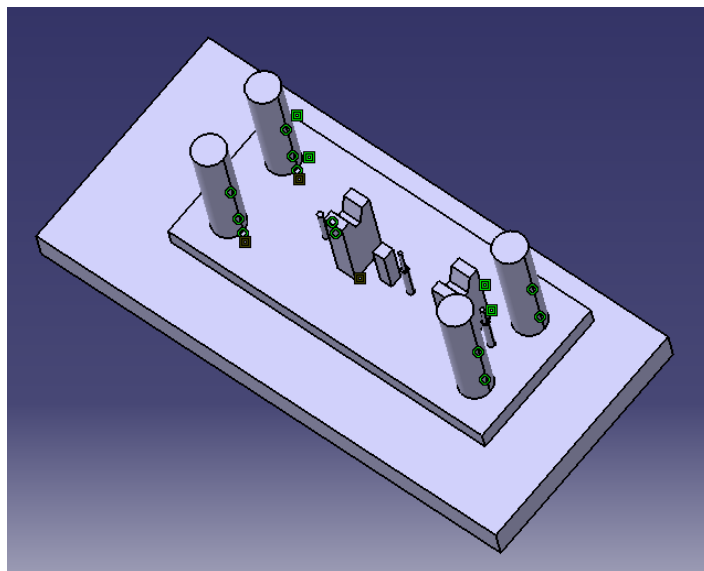


Fig 3: CAD Model of Top Plate Assembly

### 4) Bottom Plate Assembly

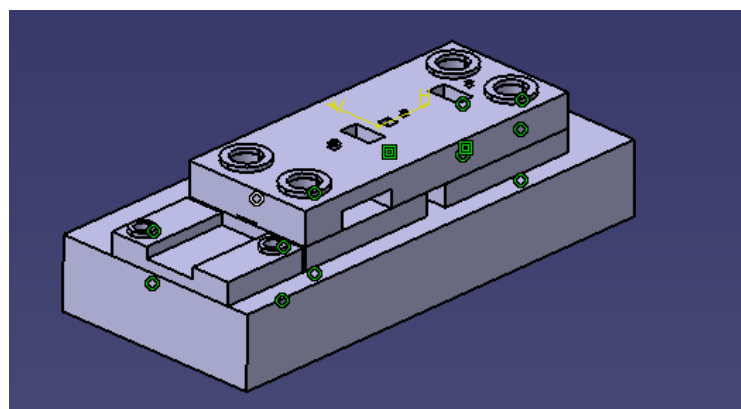


Fig 4: CAD Model of Bottom Plate Assembly

### 5) Complete Assembly

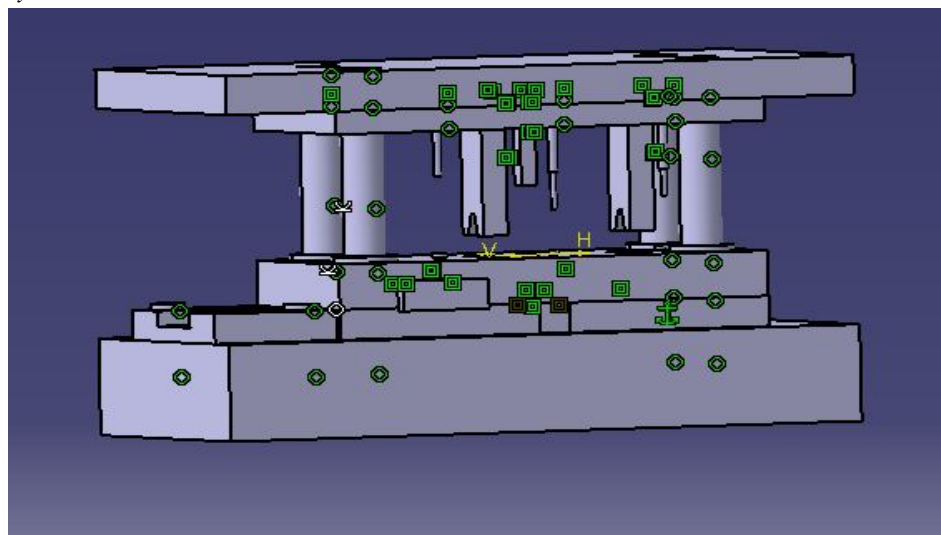


Fig 5: CAD Model of Complete Assembly



### C. Material Selection

The life of tool, reliability and some other important properties mainly depend on the type of material used in the tool, therefore, material selection is the base of any tool to be manufactured. Generally D2 material is used in Die plate. Die plate should have enough strength to resist load of Punch plate and do not undergo bending. Accordingly the material D2 is selected for die plate. EN31 is also used for manufacturing of different parts of a Press Tool. Following are some materials used for different parts of Press Tool

TABLE I: MATERIALS FOR PRESS TOOL

Sr. No.	Elements	Material
01	Pilot	Heat treated steel (56-60 HRC)
02	Bottom Plate	Mild Steel
03	Top Plate	Mild Steel
04	Stripper plate	OHNS (45-50 HRC) for higher production
05	Stopper	Hardened Steel
06	Dowels	Alloy Steel (case hardened 58 HRC)
07	Screws	Mild Steel
08	Die	D2
09	Punch Holder Plate	Cast Iron, semi steel, rolled steel
10	Thrust Plate	Hardened Steel (45-50 HRC)
11	Punch	Alloy Steel (hardened and tempered 58-60 HRC)

TABLE 2: COMPOSITION OF D2

C	Si	Cr	Mo	V
1.50%	0.30%	12.00%	0.80%	0.90%

### D. YSM Multislide Machine with Press Tool



Fig 6: YSM Multislide Machine With Press Tool

YSM multi slide machine is Taiwan made machine. Its capacity is 26 Ton. Machines have various parts like a decoiler which is used to hold the coil. Next is straightner which is used to keep this coil in straight way with some tension. Then feeder attachment provided to feed this coil to blanking tool. This machine is used to produce bi-metals of different specifications. The Press Tool so designed is specially designed for this machine. The proposed design will prove more effective than the basic tool provided by the YSM company to produce bi-metals.

#### IV.CONCLUSION

In this paper, the literature survey carried out on Press Tool helped us in a better way to prepare a project on Press Tool. Various Press Tool operations and their calculations lead us to gain knowledge about the Design and Development of Press Tool with some basic design considerations required to be considered. Animated models of blanking and bending tool operation made it easy to understand these processes in a qualified way.

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