# RESEARCH WORK ON DESIGN AND ANALYSIS OF PROGRESSIVE PRESS TOOL FOR MOBILE STAND

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*Abstract*

***Design procedure for developing progressive blanking and piercing tools for gasket parts. Press tool manufacturing is one of the common trends in production fields. Sheet metal parts are manufactured using predetermined press forces. Components manufactured with this process have high dimensional accuracy, so the majority of industries rely primarily on press tools. The mobile stand is usually the part used by most mobile users. The advantages of using a sheet metal stand are its durability, aesthetic appearance, its individual product (no other assembly like the plastic stands available on the market) the sequence of operations is initially planned, then press The tool is designed. The design is done in solid modeling AUTO CAD 2016, CATI AV5R18.***

***KeyWords: Processing Plan,Methodology ,FlowChart Design., Calculation***

## 1. INTRODUCTION

The Tool Design is the process of designing and developing the tools, methods and techniques necessary to improve manufacturing efficiency and productivity. It gives industry the machine and special tooling needed for today high speed, high volume production. It does this at a level of quality and economy that will ensure that the cost of the product is competitive. Since no single tool or process can serve all the forms of manufacturing, tool designs an ever changing, growing process of creative problem solving. Press tool form a vital and an integral part of our modern production houses. These tool act as the backbone for the production of stampings which range from the most general items like your wrist watch parts to the most sophisticated and complex items like the Skelton of automobiles, streamlined trains, aircraft, missiles etc. A great knowledge in the theory of design of press tools helps to have a better scientific background instead of using thumb rule method. The designs should be feasible for manufacturing with the available machinery and the equipment. Standardization of tooling element reduces the time and the cost of manufacturing, follow up the action of every stage of manufacturing and working of the tool helps the tool designers considering to arrangement his knowledge and development of skills. The project involves the designing tools for the driving shield of bed clamp. To produce the component in just one go is impossible and thus a gang of press comes into frame.

## 2. METHODOLOGY AND PROCESS PLANNING

### 2.1 Processing Plan

As work piece quantities and costs in press work are usually high, considerable economy can be affected by choosing an appropriate sequence of operations and the right type of tooling. The process plan should take into account the total cost: material, tooling, labor (time). Process planning generally includes the following considerations.

∟ Quantity required – total and annual,
∟ Work piece – shape and size,
∟ Work piece – dimensional tolerances,
∟ Work piece – material limitations,
∟ Equipment available for manufacture.

In every tool, the process planning done a vital role and it is followed by above mentioned points. To manufacture the parts of the tool, it is necessary to follow the proper methodology of manufacturing, so that one can get accurate dimensional stability for that particular part within appropriate time.

In Die casting dies also all the parts of the tool are manufactured by considering all above mentioned sequence and choosing of machining sequence. Below mentioned sheet expresses all the view of machining sequence of the tool. Similarly all the parts of the tool are manufactured by the same followed suit.

## 3. Manufacturing Processes Planning For Each Part

∟ All the features of the part with dimensions & their references with respect to the assembly.

∟ The part is studies and the plans for sequence of process like conventional, non-conventional & CNC machining, heat treatment in process & stage inspection etc.

∟ Special requirements for the tooling, electrode, and CAD/CAM support for the programs required for the Core & Cavity inserts that are to be machined on the CNC machines etc. are planned in advance to meet the process flow & to maintain the delivery schedule.

∟ Stage drawings of each parts coming & going out from process are made for the convenience of the machine operator showing the references, tolerance analysis, manufacturing allowances using the ordinate dimensioning and inspection methodology.

∟ A continuous follow up for the machine availability is made for the completion of the job in the planned time period to maintain the delivery date.

∟ The above information is applied for all processes related to the part indicating earliest start & finish date of each process with respect to material planning, date of availability of special tooling, electrode, CAD/CAM data, monthly priority list etc.The start & finish date can be taken from the job cards the earliest finish date of assembly can be analyzed for the first trial and is communicated to all the interface departments about planning and their support.

## 4. Flowchart

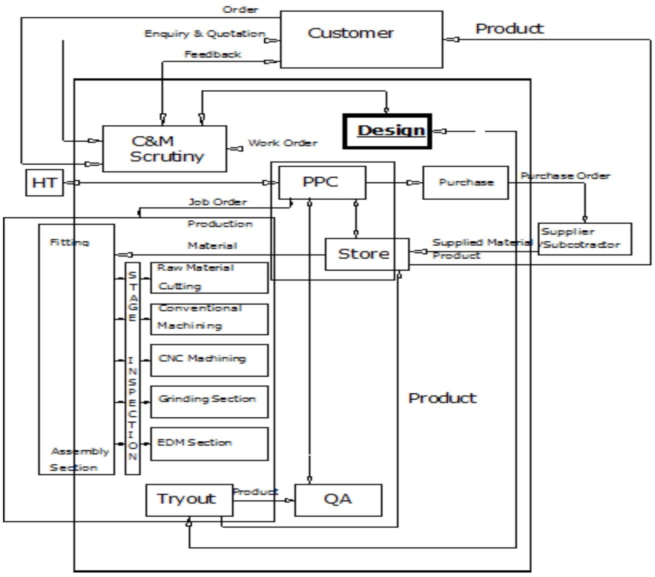



*Fig. Flowchart Design*

## 5. Calculation

**1) <u>Scrap Bridge</u>** = 1.2 x t

= 1.2 x 1

= 1.2 mm

2) Economy Factor

= Area of blank X no of rows X 100Width X pitch

= 9921.88 X 1 X 100

132 X 125

= 60.13%

3) Cutting Clearance

| | | |
|---|---|---|
| **C** | = | Constant (0.005 or 0.01) |
| **S** | = | Sheet thickness = 1mm |
| $\tau max$ | = | 360 N/mm$^2$ (for mild steel) |

Cutting clearance

$$= C \times S \times \sqrt{\frac{\tau_{max}}{10}}$$

= 0.01 X 1 X √360

√10

= 0.06 mm/side

1) Cutting Force = L x S x $\tau max$ (S=Sheet thickness)

Shear force($F_{sh}$) = 972.57 x 1 x 360

= 350125.2 N

= 35.01 Tonns

Press tonnage =1.2 X $F_{sh}$

= 1.2 * 35.01

= 42.01 Tonns

2) Stripping Force

It is taken as 10% of cutting force (Shearing force),

= $(F_{sh})$ x 10%

= 350125.2 x 0.1

= 35012.52 N

3) Selection of Fasteners

8 bolts used hence strength required for one bolt is given by,

= 35012.52

06

= 5835.42 N

From technical table (Page no. 361, table no. 13.17.0 strength of threads) (Press Tool Design & Construction - P.H.JOSHI) we come to know

M12 X 1.75 bolt has safe load which is suitable for our requirement

Similarly 4 no. of dowels of same size are used for this tool.

**7) Press Selection**

Press tonnage = 1.2 x cutting force

= (1.2 x 35.01)

= 42.012 Tons

**8) Calculation of different part size**

a) Die plate thickness $T_D$ = $3\sqrt{F_{sh}}$

= $3\sqrt{35.01}$

= 3.27 cm

= 32.71 mm ≈ 35mm

b) Thickness of top bolster = 1.25 $T_D$

= 1.75 x 35

| | | | |
|---|---|---|---|
| | | = | 61.25 mm |
| c) | Thickness of bottom bolster | = | 1.75 $T_D$ |
| | | = | 1.75 x 35 |
| | | = | 61.25 mm |
| d) | Thickness of punch holder Plate | = | 0.8 $T_D$ |
| | | = | 0.8 x 35 |
| | | = | 28 mm |
| e) | Thickness of stripper Plate | = | 0.8 $T_D$ |
| | | = | 0.8 x 35 |
| | | = | 28 mm |
| f) | Thickness of thrust plate | = | 10 to 15 mm |
| | | = | 10 mm |

## 9) Calculating the flat blank length

Bending allowance

A = 2пө (R+Kt)360

Where,k=1/3 when R< 2t

K=1/2 when R≥2t A=2 X пX 90 X (15+⅓ X 1)

360

= 2.88 mm

$1^{st}$ Bending ForceVbv = K x l xFt x $T^2$

W

-

Where , k=1.33 for V bendingk=2.66 for u bending

$$Vbv1 = \frac{1.33 \times 70 \times 360 \times 1^2}{8 \times 1}$$

$=4189.5\ N/mm^2$

$2^{nd}$ Bending Force Vbv = K x l xFt x $T^2$

W

-

Where , k=1.33 for V bendingk=2.66 for u bending

$$Vbv2 = \frac{1.33 \times 110 \times 360 \times 1^2}{8 \times 1}$$

$=6583.55\ N/mm^2$

Total Bending force= Vbv1+ Vbv2

=4189.5+6583.5

$=10773\ N/mm^2$

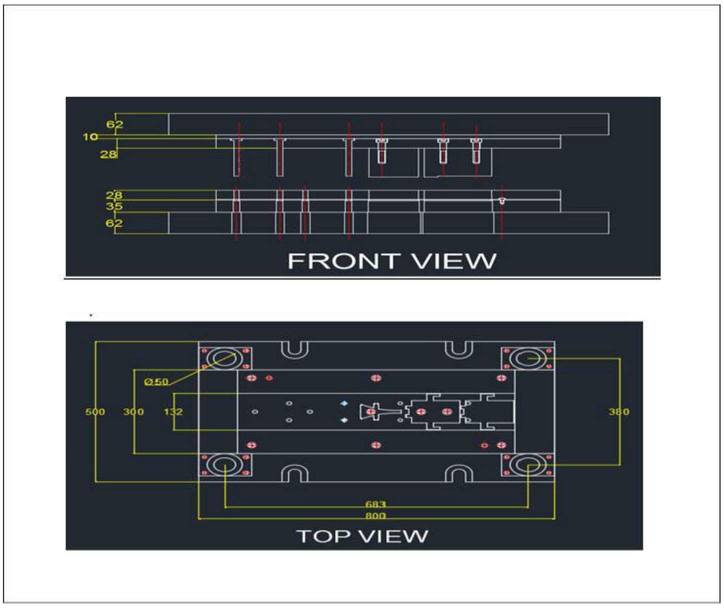
**10)** **Totalforce** **=** **Cutting force + Non cutting force**

**=** **35.01+1.077**

= 35.548 Tons

***ASSEMBLY DRAWING***

**Front View A-A'**




### 6. Conclusion

The project was a medium for us to enhance our knowledge in the field of tool design. It helped us lot in better understanding of the concept of press tool. During the project, we had to communicate with various departmentsand authorities to solve the problems and difficulties around in between. It has helped to improve our abilities to work as a team. The project for fluid line was required to be completed in a specific period of time for which we had to work to the best of our abilities to complete the modeling of the component, its 2D drafting and assembly. It was a nice opportunity for us to learn about the tools , thus enhancing our Knowledge.

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