DESIGN AND MANUFACTURING OF PROGRESSIVE PRESS TOOL

PARMINDERSINGH KHOSA, CHIRAG HIREMATH, BHARAT ODUGOUDAR, SANA HAVERI

B.E. Mechanical, BVBCET, Hubli, B.E. Mechanical, BVBCET, Hubli, B.E. Automation and Robotics, BVBCET, Hubli, B.E. Automation and Robotics, BVBCET, Hubli,

Email: pammikhosa@gmail.com, chiraghiremath1993@gmail.com, brtodugoudar69@gmail.com, sanahaveri@gmail.com

Abstract: The project work consists of a design and manufacturing of progressive press tool for a chain link. The chain link is made of mild steel and is used for conveyor belts. Thickness of the link is 2 mm. The progressive tool is a tool in which the operations are performed in multiple stations. The tool is designed and manufactured. The manufactured parts are inspected and assembly is made. Testing of the progressive tool is also done.

I. INTRODUCTION

A progressive tool performs a series of fundamental sheet metal operations at two or more stations during each press stroke in order to develop a work piece as the strip stock moves through the die. Each working station performs one or more distinct die operations but strip must move from the first station through each succeeding station to produce a complete part. The linear travel of the strip stock at each press stroke is called the “progression”.

II. RELATED WORK (LITERATURE SURVEY)

A simple blanking tool is designed only when the piece part has got internal details (pierced holes). If the piece part is to be produced by the combination of blanking and piercing operations. We should design an altogether different types of tool. One way of doing things is to perform the piercing in one station then the strip is advanced to another station where the blanking is carried out maintaining its relative position with the previously pierced hole. As the processing progresses from station to station to tool is known as “Progressive tool”.

The word tooling refers to the hardware necessary to produce a particular product. The most common classification of tooling are as follows

1) Sheet metal press working tools.
2) Moulds and tools for plastic moulding and die casting.
3) Forging tools for hot and cold forging.
4) Jigs and fixtures for guiding the tool and holding the work piece.
5) Gauges and measuring instruments.
6) Cutting tools such as drills, reamers, milling cutters broaches, taps, etc.

Press Tools

Whenever sheet metal or other material is worked on a press, press tools are used. Press tools are special tools custom built to produce a component mainly out of sheet metal. Press tool is of stampings include cutting operations (shearing, blanking, piercing, etc.) and forming operations (bending, drawing, etc.). Sheet metal items such as automobile parts (roofs, fenders, caps, etc.), components of air crafts, parts of business machines, household appliances, sheet metal parts of electronic equipment’s. Precision parts required for homological industry etc., are manufactured by press tools.

Dies:

Die: The die may be defined as the female part of a complete tool for producing work in a press. It is also referred to a complete tool consists of a pair of mating members for producing work in a press.

Die construction: Here the blank punch cum piercing die is mounted on the bottom of the bottom plate which is bolted with machine bed. Blank die and piercing punch are mounted on the top plate which is mounted on the press ram. A knockout is placed between blank, die and piercing punch which is used for to eject the component from the die. A stripper plate is held with blank punch.

The process of tool making calls for a high level of keenness and qualifications. It is important for the maker to produce tools that are of acceptable standards and which are suitable for the task they are meant for. It is not possible to achieve this unless one is competent enough and has the necessary skills to produce high quality tools.

There are rules and regulations that are often followed when creating tools to ensure that the products are of the quality that is needed. If a maker disregards the rules, chances are that products made will not be suitable. With poor quality tools, the manufacturing industry will not give out its best and this can affect a whole economy.

In the days when tools were handmade, several machines had to be used to polish them up. The purpose of this was to give the tools a finer finish and increase the quality. However, the process of producing quality tools has been made easier and...
faster due to the introduction of more efficient machines.

There are numerically controlled machines that are used to make tools more easily. Tool making machines can grind, mill and polish up the tools within a very short time. This is a very positive development from the time consuming hand making process.

For any maker of tools to be able to come up with good products, he should be able to have the image of the required end product in mind. Only when you understand what is needed can you develop it accordingly.

Therefore, additional knowledge such as computer literacy and the ability to use computer technology to come up with better tools is required. It is an easier way of ensuring quality and conformity to modern standards. With the ever changing technology, tools can only get better.

Methods Used in Creating New Tools
Tool making requires utmost precision for the creation of new equipment and parts. Standards are set to ensure that all the steps for the task are handled with the highest quality possible. Efficient and more effective machineries exist today to aid in the process. While these machines are used, it is still best to adhere to the rules and guidelines required in creating these tools.

Designing the tool is often the first essential step to creating new parts for the machines. This is crucial, as the design becomes this holographic representation of how the machine should perform. Precise measurements are needed to make sure that the entire diagram will work according to the requirements of the machines. Otherwise, the results would not end with useful products for the end-user.

III. DESIGN AND CALCULATIONS

Producing a chain link component for the conveyor for the movement of materials from one station to another has two possible ways:

1) using a Progressive press tool
2) using a Compound Press tool

We have consider the idea of using a progressive press tool

<table>
<thead>
<tr>
<th>Force Calculations:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shearing Force = (L x S x T max)</td>
</tr>
<tr>
<td>L=length of the periphery to be cut in mm</td>
</tr>
<tr>
<td>S=Stock thickness in mm</td>
</tr>
<tr>
<td>T max= Maximum Shear strength in N/mm</td>
</tr>
</tbody>
</table>

1. **Piercing Operation :**
Shear Force = L x S x T max
= 2x3.142x3x2x110
= 4,147.44 N

2. **Blanking operation :**
Shear Force = [(2x π x r) + 30] x 110
= [(2xπx 5) + 30 ] x 110
= 6756.2 N

3. Cutting Clearance = C x S x √T max
= 0.005 x 2 x √110
= 0.105mm/side

3. Strip Width = 25 + 2 + 2 = 29mm

4. Pitch = 10 + 2 = 12mm

Strip Layout:
Economy Factor Calculations:
E = (Area of the blank x 100% x No of Rows) / (Pitch x Strip Width)

Wide Run:
Pitch = 12mm
Strip Width = 56mm
No of rows = 2
Area of the Blank = (π x r x r) + (10 x 15) = 228.55 mm²
E = 228.55 x 100 x 2 / 12 x 56 = 68.02 %

Narrow Run

Pitch = 27mm
Design And Manufacturing Of Progressive Press Tool

Width = 14mm
Area = 228.55mm²

\[
E = \frac{228.55 \times 100 \times 2}{27 \times 28} = 60.46\%
\]

**Conclusion:** It is efficient to go for a wide run with two rows.

**COST ANALYSIS:**

<table>
<thead>
<tr>
<th>Progressive Die</th>
<th>Manufacturing Time in (Hrs.)</th>
<th>Manufacturing Cost per hour</th>
<th>Amount In Rs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convention Milling</td>
<td>8</td>
<td>100</td>
<td>800</td>
</tr>
<tr>
<td>Grinding</td>
<td>9</td>
<td>100</td>
<td>900</td>
</tr>
<tr>
<td>Jig Boring, Drilling and tapping</td>
<td>7</td>
<td>100</td>
<td>700</td>
</tr>
<tr>
<td>CNC Wire cut</td>
<td>5</td>
<td>320</td>
<td>1600</td>
</tr>
<tr>
<td>Lathe Turning</td>
<td>4</td>
<td>100</td>
<td>400</td>
</tr>
<tr>
<td>Cylindrical Grinding</td>
<td>3</td>
<td>200</td>
<td>600</td>
</tr>
<tr>
<td>Total Cost in (Rs)</td>
<td></td>
<td></td>
<td>5000</td>
</tr>
</tbody>
</table>

**BIBLIOGRAPHY**

[1] Press tool technology by NTTF technical training centre

[2] Tool Design by Donaldson

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