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# COST REDUCTION IN DIE MAKING PROCESS USED IN SEAT SLIDING ASSEMBLY IN AUTOMOBILES

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## ABSTRACT

Most industrial processes and products are evaluated by more than one quality characteristic. To select the best design and operating control factors it is necessary to take into account all measures of quality simultaneously including the economy factor. Determination of the best operational settings for products or processes is usually accomplished through single-objective function optimization routines. We propose an easier and commercially viable procedure in order to reduce the cost of manufacturing press tools. The paper contains a case study from the die making industry.

***Keywords-*** *Die making, Cost effective die making, Blanking.*

## I. INTRODUCTION

The press is a metal forming machine tool, designed to shape or cut metal by applying mechanical force or pressure with help of punch. The metal is formed to desired shape without removal of chips.

Press components, though very cheap to manufacture, they require very high initial investment. This investment includes cost of machine, labor, maintenance and the press tools. For this reason, it is very much important to keep the cost of press tools as low as possible without hampering the product quality. Often, this cost has to be burdened by the manufacturer due to which his profit is at stake. This paper deals with various ways of minimizing the cost of press tools and makes the manufacturing of dies economically viable.

Blanking is a shearing process where a punch and die are used to create a blank from sheet metal or a plate. The blank is work-piece ejected from the starting stock. Fine blanking is a specialized form of blanking where there is no fracture zone when shearing. This is achieved by compressing the whole part and then an upper and lower punch extracts the blank. This allows the process to hold very tight tolerances, and perhaps eliminate secondary operations. Materials that can be fine blanked include aluminum, brass, copper, and carbon, alloy and stainless steels. A typical compound fine blanking press include a hardened die punch (male), the hardened blanking die (female), and a guide plate of similar shape/size to the blanking die. The guide plate is first applied to the material, impinging the material with a sharp protrusion or stinger around the perimeter of the die opening. Next a counter pressure is applied opposite the punch, and finally the die punch forces the material through the die opening. Mechanical properties of the cut benefit similarly with a hardened layer at the cut edge from the cold working of the part. Because the material is so tightly held and controlled in this setup, part flatness remains very true, distortion is nearly eliminated, and edge burr is minimal. With standard compound fine blanking processes, multiple parts can often be completed in a single operation. Parts can be pierced, partially pierced often in a single operation. Some combinations may require progressive fine blanking operations, in which multiple operations are performed at the same pressing station. It is widely used in manufacturing of seat sliding assembly.

Similarly, along with blanking, many things are associated. Some of them are strip layout, tonnage required, no. of blanks to be produced. Any alterations in the cost of all the associated processes are always welcomed as far as they don’t hamper the product quality.

## II. LITERATURE SURVEY

The process of identifying process influencing parameters of blanking process includes an exhaustive literature review of the factors that have been suggested by various authors. Literature review was performed by collecting articles from various journals, and various popular research related sites viz. Science Direct, IEEE, Emerald, Springer Link and various free articles from internet. Literature from journal papers and conference studied for various press tool works parameters optimization are reviewed in which number of working stations were designed and producing less manufactured products.

Next, the most important part of our literature survey was taken from Handbook of Die design, by Ivana Suchy. This book explains everything about die design right from behavior of sheet metal to assembling of dies. Another major part of the survey was the comparison between industrial and theoretical die making. This was explained to us neatly by Mr. Anand Somavanshi who excels in field of Die making for past 13 years at Varun Pressings Pvt. Ltd.

## III. METHODOLOGY

**I. Increasing no. of blanks in same strip layout**

- The distance between the blanks in present blanking process is 12mm.
- After some research on the part which we will be manufacturing, we came to know that lower portion of the blank can be altered.
- The two consecutive blanks will be overlapped by 8mm in order to increase the number of blanks from the sheet metal.
- The following figure explains the new and old strip layout

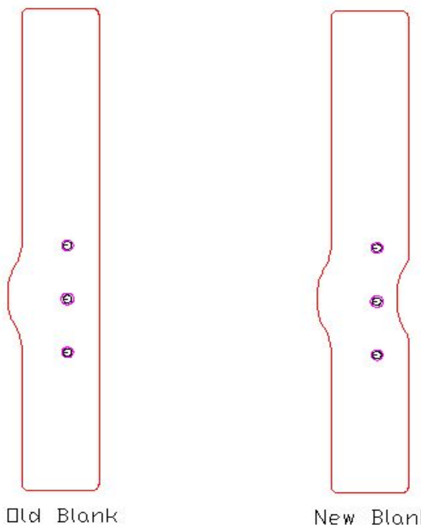


**Fig 1:- Old and New Blank**

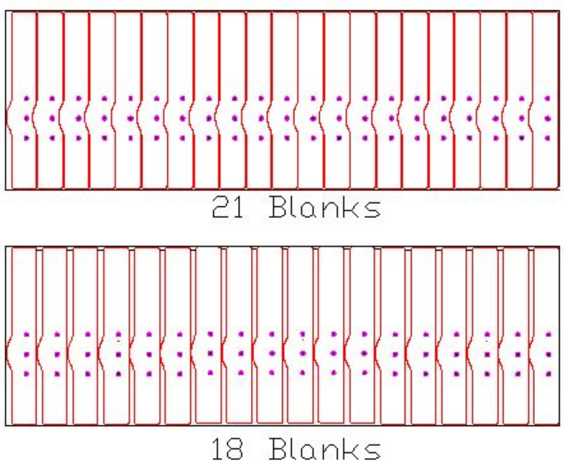


**Fig 2:-Strip Layout**

**II. Reducing the size of top plate and bottom plate to make it commercially viable**

- The top and bottom plates are the major components of any press tool.
- These components are the largest components of any press tool and require large volume of material.
- Any savings in these components can lead to huge savings.
- If the alignment of the press tool is accurate and movement of the ram is controlled, the dimensions of the top and bottom plate can be reduced.
- The figure below shows the difference between theoretical and practical (commercially viable) top & bottom plates.

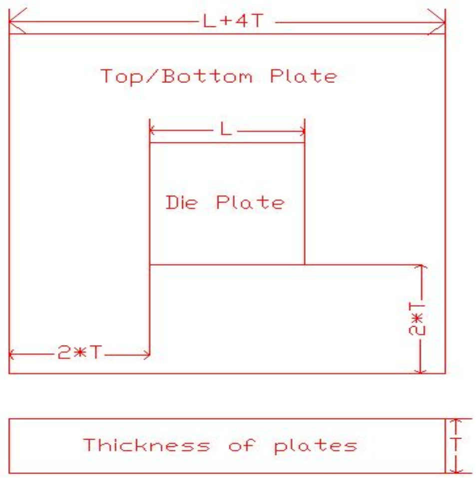


**Fig 3:- Theoretical approach**

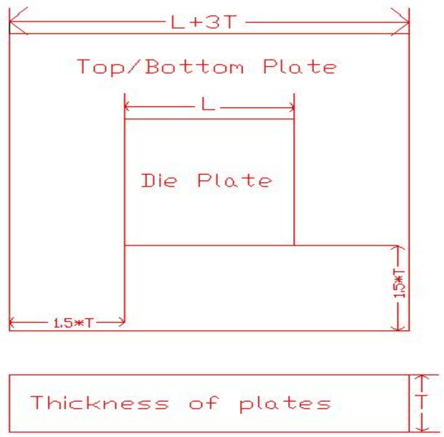


**Fig 4:- Commercial approach**

**III. Die designing based on life expectancy**

- Pressed components are often produced in large quantities as its dies requires high amount of cost to manufacture.
- But, it is necessary to consider the life of die in no. of components.
- If the no. of components produced from a particular die is very small, then manufacturing bulky tools is very uneconomical.
- The figure below shows the thickness of top, bottom, thrust and die plates based on no. of components.

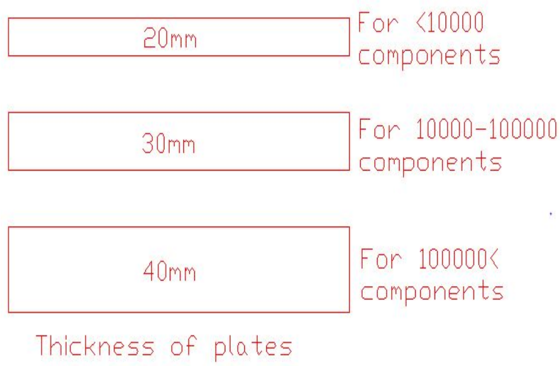


**Fig 5:- Thickness of plates**

- Similarly, if the no. of components produced from a die is less than 10000, the press tools need not be hardened.
- This will further add up to savings in die manufacturing.

## IV. VALIDATION

The no. of blanks that were previously produced increased from 18 to 21 from a single sheet.
This will increase the economy factor to 90% which was previously around 70%.
Thus blanking process will thus be more economical than the original blanking process.
The reduction in dimension of top and bottom plate helps to save considerable amount of material if the alignment of the press tool is done accurate.
The concept of Die designing based on die life helps to eliminate unnecessary costs of hardening, huge press tools and requirement of heavy tonnage press machines for smaller no. of components produced.

## V. CONCLUSION

The reduction in cost and increase in production rate is thus achieved by adopting above techniques of die designing.
The aim of reducing cost & thus increasing the economy factor is satisfied using above techniques.

## VI. ACKNOWLEGDEMENT

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