# A Software for Responding to Enquires of Blanking Tools: Cost Estimate of Tool & Component

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## Abstract

*For any industry, responding to different enquires/tenders at a rapid rate with correct cost estimation is very crucial to get orders. Same is true for tool and die making industries also. In these industries, having a correct process plan is essential to respond to any requirements of press tools. This helps in correctly obtaining the cost of press tools to be manufactured. This paper presents an approach in this direction. A software which works in JAVA environment developed from Net Beans for developing computer aided process plan for blanking tools. This software also finds out the cost of operations, materials, machining, etc and thus the cost of blanking tool within a short time. Thus, the software is useful for responding quickly to enquires/tenders of blanking tool.*

*Keywords: Press Tools, Process Plan, Blanking Tools, Cost Estimation, Sheet Metal Industries, CAPP software*



## 1. Introduction

For accurate estimation of tool cost it is necessary to design the blanking tool, prepare a process plan, calculate the time for machining and calculate the material cost, machining cost & the total cost. To estimate/calculate the various times and costs involved, experienced tool and die designer is required as one has to decide the strip layout, clearance, assembly drawings and detail drawing of the tool, type of press to be used etc. This process is tedious and time consuming and person dependent. Therefore, there is a scope to automate this process and make it faster and accurate. This paper presents an approach in this direction with an example of blanking tool.

## 2. Literature Review

In the earlier researches in the area of process planning, B. H. Lee [1] developed a knowledge based object oriented process planning system. The system was used for process planning of progressive tools. Whereas process planning for machining application was developed by Kramer [2]. This paper was about process planning of components for a milling machine directly from feature based design. Mohamed El-Mehalawi [3] developed a data base for mechanical components based on geometry and topology of the components. S. Kumar [4] has developed an intelligent system for selection of die sets for metal stamping press tools. J.Ciurana [5] in his paper has discussed about designing a computer aided system for sheet metal process planning.

B. Verlinden [6] developed a less-detailed method based on brief analysis the CAD file cost formulas are composed by applying regression techniques. Manfred Geiger [7] developed a method of quotation costing to increase the accuracy of cost planning for sheet metals by artificial neural networks. Fast and precise pricing is done by systems under consideration of material cost, work center, overhead cost and pricing strategy.

Concepts/Ideas from all the above papers where used in developing a process plan of blanking tools using a database for selection of die sets. Developed software, also gives the cost estimate of blanking tool and also the unit component cost produced by it. This software is manufactured by keeping in mind responding to tender/enquires of press tool. The cost of material and processing time is calculated from the process plan developed by the software.

The following paragraphs present software development for press tools in developing process plan and also its cost estimation and its unit component cost.

## 3. Software Development

In an industrial view, once a customer ask for an enquire for manufacture of a press tool, they should also enclose a detail drawing of the component with its dimensional tolerance, component material, time to deliver the tool for production etc. Thus for the industry to survive, it has to respond to the enquires in a short time and with correct cost estimates thus ensuring that press tool order. With accurate planning/estimation industry can finish the project well in time and also with a margin. It is very crucial when it comes to cost estimate it requires highly experienced hands to respond to enquiries with available component drawing.

Estimation/Planning of press tools for responding to tender/enquiries is very time consuming and expensive,

so it is always not wise to spent lot of money for an order which is not ensured. Thus, software is developed basically to help in responding to enquires of press tool economically and in a short time.

The software works in JAVA environment developed from Net Beans IDE 6.9.1. The software gives an output as process plan and cost estimation for blanking tools and also the cost of production and product cost if the total number of components to be supplied is known. The database is developed from Oracle as the backend for the software. The software is designed and constructed using JFrames. The fig. 1 shows a flow chart for the software.

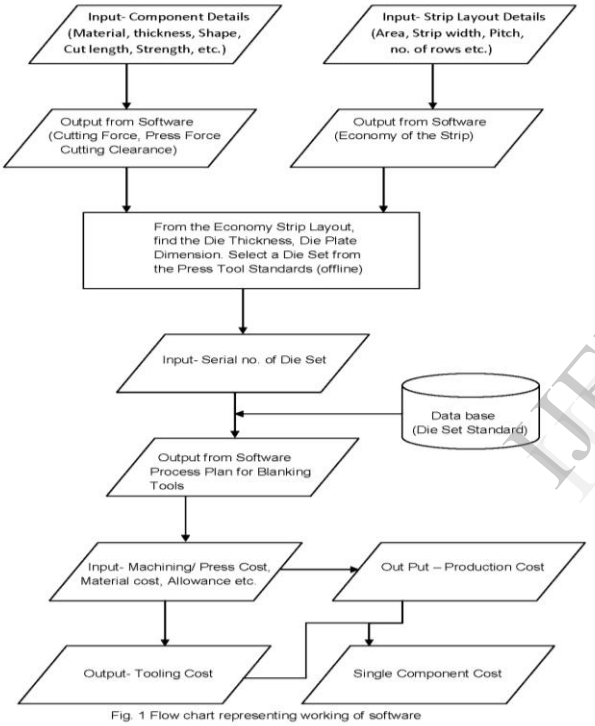


Fig. 1 Flow chart representing working of software

## 3.1 Process Planning for Blanking Tools

In an industry once a component drawing is received along with appropriate dimension and its material requirements, first step the designer should do is to generate an economic strip layout. Then calculate parameters like cutting clearance, cutting force, press force etc. From the strip layout the designer will give certain allowance according to the profile in die and formulate a die-set dimension. By comparing this dimension with the press tools die set standards which is used in the industry. She/he proceeds for the assembly drawing of the die set and the different sectional view to show the elements. From the assembly drawing the designer makes out the detailed drawing for the manufacturing section. With this detailed drawing of each element in the manufacturing section a toolmaker decides the processes to be carried out and their sequences and performs a rough estimation of time. Thus, developing a process plan for the tool.

On the same lines, in the software the logic is developed. Once a component drawing is received from the customer then, the software assist the designer in development of the strip layout by finding the economy of strip with basic information of material of strip, area of the component, pitch, etc. After designing an economic strip layout it proceeds and calculates the cutting force and press force. This helps to decide the press to be used. Then the user estimates approximate dimensions of die sets and select a serial number from the list of die set standards available in the software to match with the estimates. The software follows standards by NTTF industries limited Bangalore. Once the serial number from the standard is given as an input, the software computes each elements machining time. The machining time for each operation is calculated [8], [9] and added to get the elements total machining time. Then, software displays its process sequences. Thus giving an accurate process plan of blanking tool. The Fig. 2 show a sample process plan developed from the software. The software reduces the human efforts in both the design and manufacturing sections.

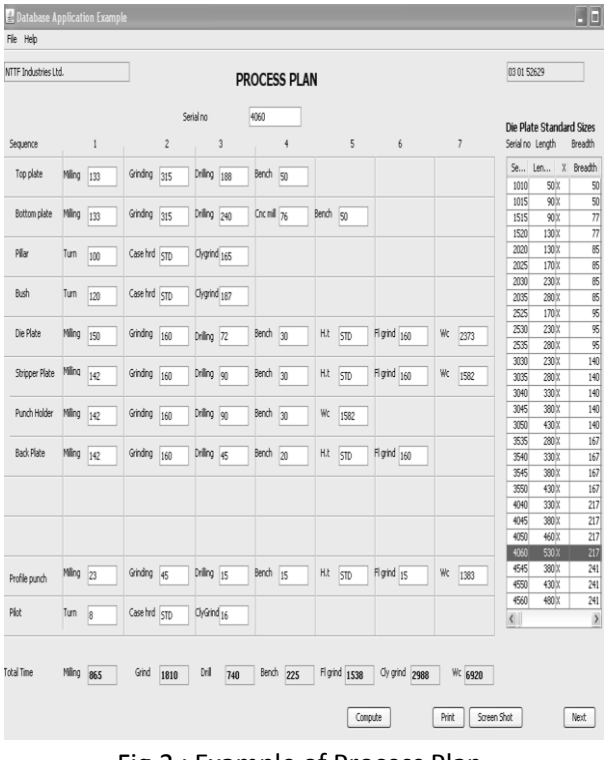


Fig.2 : Example of Process Plan

## 3.2 Cost Estimation for Blanking Tools

For cost estimation in industry, actual time of each process undergone by different elements are computed, multiplied by the cost of each process together with the material cost of elements, designing charges, assembly & trial charges and other allowances to give the tool cost.

Whereas in the software, once the die set series is selected from the standards, it automatically calculates weight of the element and its processing time. The software has all the default values of the various rates. These rates can be edited by the user based on the prevailing rates at a particular location. Also, software has considered cost allowance for designing, assembly & trial and other administrative expenses. These costs are added together to get the tool cost. Thus the software helps the user to get the correct cost details once he decides a strip layout & die set. Hence, necessary changes can be made in the strip layout if the tool cost increases considerably, thereby producing economic blanking tools. Fig. 3 shows an example of tooling cost provided by the software.

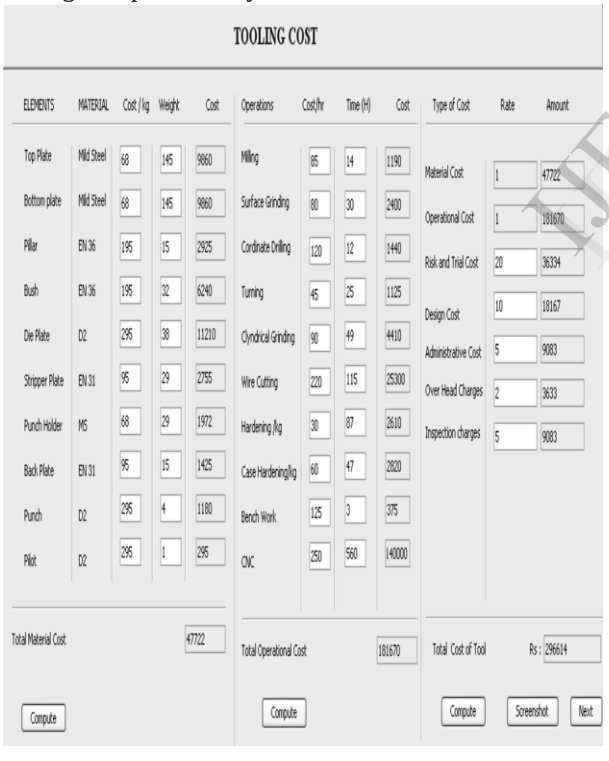


Fig.3: Example of Tooling Cost

### 3.3 Cost Estimate for a single Component

Now a days in tool & die making industries the customer asks for finished components only. The enquiry/tender asks for lowest cost by which an industry can deliver finished sheet metal components. The component cost can be found out by considering the total tool cost and the production cost. The production cost requires production planning, which include the total number of components to be supplied, type of press to be used, the batch size to be delivered, etc. Then, cost of production is computed from the total material cost, and the charges of press, which are usually available on hourly basis. Then, both tool cost and the production cost are considered to determine the product/component cost.

Whereas in the software the user has to provide the batch size and period of delivery. The software calculates the entire production cost. The hourly rate of the press is predefined but can be edited by user. It is same as in case of the material cost of sheet metal. The software also considers the cost of maintenance of the blanking tool during production. It also considers administrative and overhead charges. Fig. 4 shows output of the software for the production cost.

Then, the total manufacturing and production cost is computed with total number of components to be delivered and the cost of product is given as an output. Fig. 5 shows an example of component cost.

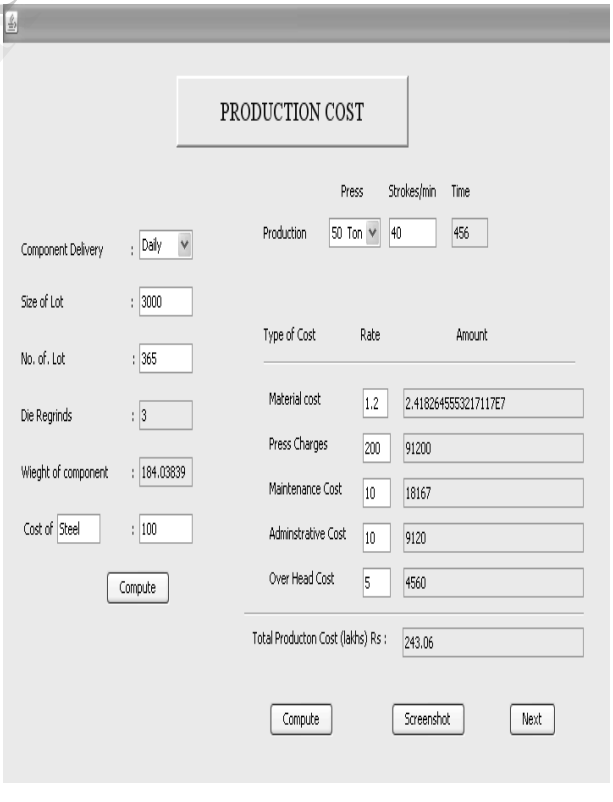


Fig.4: Example of Production Cost

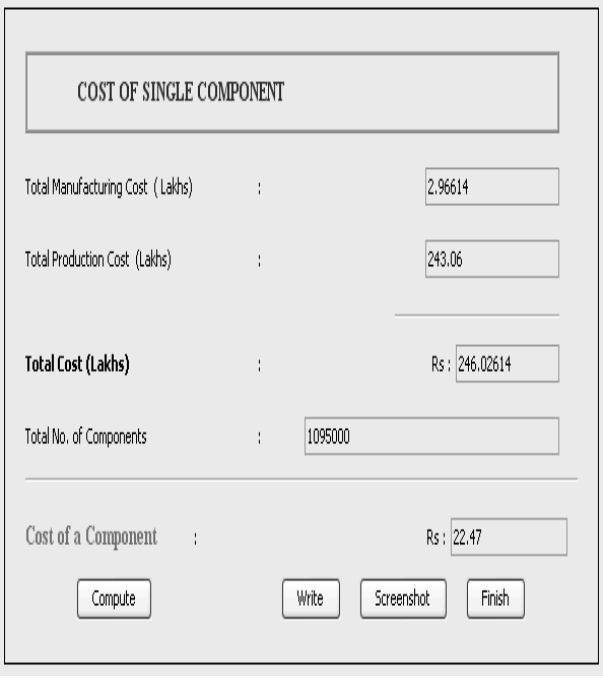


Fig.5: Example of Component Cost

## 4 Summary of Software working

The software generates a report of the cost estimate in text format as show in the Fig.6. The report consists of all the necessary details for responding towards the enquiry by the customer.

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                NTTF Industries Ltd

      Order no            :   03 01 52629
      Customer            :   STTI

Strip Required for Production
      Material            :   Steel
      Strip Width         :   130
      Thickness           :   2.6

Minimum Press Required
      Press force         :   167

Cost Details for responding to enquires
      Tool Material cost  :   Rs 47722
      Operations Cost     :   RS 181670
      Tool Cost           :   RS 296614
      No of components    :   1095000
      Production Cost     :   RS 243.06Lakhs
      Per Component cost  :   RS 22.47
```

Fig.6: Final Result from software

The Fig.7 show the detailed working of the software each screen input and the output. The table shows the detail of each screen from 1- 8.

**SUMMARY OF WORKING OF SOFTWARE**

| | | |
|---|---|---|
| Screen 1 | COMPONENT DETAIL | |
| | **Input** | **Output** |
| | Company = NTTF | |
| | Customer = STTI | |
| | Material = Steel | |
| | Thickness (mm) = 2.6 | Cutting Clearence (mm) = 2.6 |
| | Shape = Profile | |
| | Cut Length (mm) = 1978 | |
| | Shear Stength(Pa) = 270 | |
| Screen 2 | STRIPLAYOUT DETAILS | |
| | **Input** | **Output** |
| | Area (mm) = 8848 | |
| | Row (no. of comp) = 2 | |
| | Pitch (mm) = 164 | |
| | Strip width (mm) = 130 | |
| | Pilot = Yes | Strip Economy = 83% |
| Screen 3 | TOOL FORCES | |
| | **Input** | **Output** |
| | Pilot Size (mm) = 4 | Buckling Force (ton) = 1010 |
| | | Cutting Force (ton) = 111 |
| | | Press Force (ton) = 133 |
| Screen 4 | TOOL DETAILS | |
| | Input | Output |
| | Tool Order no. = 03 01 52629 | |
| | Die Size (mm) = 42 | |
| Screen 5 | PROCESS PLAN | |
| | **Input** | **Output** |
| | Die Plate Size (mm) = 530 x 217 | Process Sequences in Elements |
| | Die Set Series = 4060 | Processing Time of Elements |
| | | Total Time of Machining/ Process |
| Screen 5 | PROCESS PLAN | |
| | **Input** | **Output** |
| | Die Plate Size (mm) = 530 x 217 | Process Sequences in Elements |
| | Die Set Series = 4060 | Processing Time of Elements |
| | | Total Time of Machining/ Process |
| Screen 6 | TOOLING COST | |
| | **Output** | |
| | Each Elements material cost, processing cost, Allowances | |
| | Total Material cost= Rs.48,312 Total Operational Cost= Rs 1,82,610 | |
| | Total Tool Cost = Rs 2,98,492 | |
| | Input: Material, Process, Allowance charges (Preset default values) | |
| Screen 7 | PRODUCTION COST | |
| | **Input** | **Output** |
| | Size of Lot : 1000 | |
| | No. of lot : 365 | |
| | Cost of Steel, press & allowances | Total Production Cost = 110.09 Lakhs |
| Screen 8 | COST OF SINGLE COMPONENT | |
| | **Output** | |
| | Cost of Single Component = 30. 98 | |

Fig.7: Table showing working of software

## 5. Conclusion

This software enables us to get process plan and the cost estimates of the blanking tool in a short time, when a component drawing is received. This will help the industry to plan the work well in advance. Thus, the project can be taken up by knowing the work load of the company. The cost estimates available will help us in providing the cost of the blanking tool or the sheet metal product which the customer requires. The software helps in getting a fair and fast estimate of the tool cost and thus helps to respond quickly to the tenders/enquires. It is going to eliminate human errors and delays involved in the entire process of planning and thus improving the cost of the company

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