Cost Calculation for the Production of M. 8 Nut Blank with Conical Punch

The basic cost data has been taken from Table 4.5 and 4.10

Size of nut blank: Flat to Flat distance 18 mm
Bore Size = 8 mm
Thickness = 8 mm

Material: 0.2% carbon steel

Working pressure on the die (approximately): 4000 kg/sq.cm

Press Capacity: 25 Tonnes

Maintenance cost of Machine: Rs. 3000 per year (approximate)

Number of Working Hours per year: 2400 hours

Production rate of the Machine: 120 pieces/minute

Cost of the Die (only replacement part): Rs. 1000/-

Mean time between two consecutive die replacements (approximately): 300 hours

Set up time (approximately): 10 hours

Material cost per unit: 6.34 paisa

Cost per unit therefore is (equation 3.175): 6.34065 paisa
(2) **Cost Calculation for the Production of M 8 Nut blank with Prabolic Punch**

The following cost will change and all other parameters are remain the same

- Working pressure on the die (approximately): 4400 kg/ sq.cm
- Press Capacity: 25 Tonnes
- Maintenance cost of Machine: Same
- Cost of the die: Same
- Mean time (tp): 270 hours
- Set up time (td): 10 hours
- Material cost (Mcu): 6.34 paise
- Cost per unit therefore is: 6.34070 paise

(3) **Cost Calculation for the Production of M 8 Nut blank with Spherical Punch**

The following cost will change and all other parameters are remain the same

- Working pressure on the die (approximately): 4800 kg/ sq.cm
- Press Capacity: 25 Tonnes
- Maintenance cost of Machine: Same
- Cost of the die (approximate): Rs.1200/-
- Mean time (tp): 210 hours
- Set up time (td): 10 hours
- Material cost (Mcu): 6.34 paise
- Cost per unit therefore is: 6.341 paise
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working pressure on the die</td>
<td>5000 kg/sq.cm</td>
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<tr>
<td>Press Capacity</td>
<td>30 Tonnes</td>
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<tr>
<td>Maintenance cost of Machine</td>
<td>Rs.4500 per year</td>
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<tr>
<td>Cost of the die (approximate)</td>
<td>Rs.1200/-</td>
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<tr>
<td>Mean time (tp)</td>
<td>180 hours</td>
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<tr>
<td>Set up time (td)</td>
<td>10 hours</td>
</tr>
<tr>
<td>Cost per unit</td>
<td>6.342 paise</td>
</tr>
</tbody>
</table>
COLD FORMING OF HEXAGONAL NUT BLANKS

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ABSTRACT:
In conventional methods of producing hexagonal nut blanks, both forming as well as cutting techniques are applied. But the material wastage is as large as 50%. This makes the cost of the finished hexagonal nut blanks considerably high. A die has been designed to transform a round circular disc into hexagonal nut blanks. The disc is kept in a closed die with hexagonal cavity and two identical punches of various shapes have been made to move axially in the opposite direction. This gives rise to indentations in the centre of the disc to cause the material to flow from the centre radially outwards to fill the hexagonal cavity of the closed die. However, a small amount of material is left in the centre of the blank obviously for the reason that if an attempt is made to force the entire material from the central portion of the die to move outward, it will tend to increase the load infinitely, which will rather be practically impossible to achieve. The movement of the punches will be restricted at the centre of the die depending on the capacity of the machine on which the nut blanks are to be formed. However, experiments are conducted with aluminium discs on U.T.M. of capacity 25 tonnes and depending on the limitations as cited above the percentage wastage of the material is considerably reduced and brought to a figure as low as about 10%. This paper deals with the experimental observations of the loads required to form the nut blanks with different shapes of the indentors and then to optimise the shape of the punches for material economy.

1. INTRODUCTION:
Two processes are generally utilized for the production of hexagonal nut blanks. In one process a round bar is drawn into a hexagonal bar through a drawing die. This bar is then fed to turning and drilling machine where the requisite drilling and boring of the hole, chamfering and parting off the blank is done. In this process the wastage, which accrues from drilling, boring, chamfering, parting off and the first drawing operation, amounting to 50%, goes as scrap. In the second process of hot forging the blanks are heated in a furnace and then forged in the requisite dies. Though the material wastage here is less amounting to 15 to 20% as scrap coming in the form of scaling, central hole strip coming from shearing and the die flash, but still the process is time consuming and even relatively costlier. In yet another machine nut is made by cold forming where a round bar is fed into the machine continuously turning out the final threaded nut. In this method though the forming is similar but a large number of dies are employed in sequence and the initial cost of the machine is very high.

In the proposed method of forming the nut blank, a closed die is utilised on a press machine. The description of the process is given as under.
2. DESCRIPTION:

In Figure 1 is shown the nut blank forming operation. The lower die consists of a hexagonal female portion in the centre of which is a central indenter/punch of the desired shape and size similar to the lower central punch. A circular disc as workpiece with diameter

![Image of nut blank forming operation](image)

A limit switch is also fitted in the die set so that if the punch has travelled through a pre-set distance, the machine will automatically come to stop when the load reaches the rated capacity of the machine.

![Image of die set](image)

Figures 2(b), (c) and (d) show the nut blanks drawn with different shapes of punch-nose. Figure 2(b) is of a punch with conical nose, 2(c) with elliptical nose and 2(d) a circular shaped nose.

3. EXPERIMENTAL DATA:

Experiments have been performed by taking the various shapes of the central punch nose for one type of jam nut. The material of the nut blanks is aluminium. The dimensions of the die have been taken from the dimensions of the finished nut as follows:

(a) Cone tip to Cone tip distance 22 mm
(b) Flat to Flat distance 19.25 mm
(c) Central Hole Diameter 9.40 mm
(d) Height of Nut 10.00 mm

The experiments were conducted on an universal testing machine of capacity 25 metric tonnes. The loads were noted for an average depth of 3.70 mm for the punches shown in figures 2(b) to 2(d). The height of the blank was taken as 10.00 mm.

3.1 EXPERIMENTAL OBSERVATIONS:

It was noticed that the load for the elliptical nose punch is approximately 10% higher than that with conical nose punch. The load for the circular nose punch is about 10% higher than that with elliptical nose. The relative percentage

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Though the load in case of circular nose punch is about 20% higher than that with conical one, but the percentage saving in material from the hole is 37.5% with respect to conical nose punch. By adjusting the movement of the punch the average depth of the hole can be increased so as to leave a central portion of smaller thickness which will reduce the wastage. However, the axial movement of the punch is restricted by the load carrying capacity of the machine and die both.

4. RESULTS:

From the experiments conducted so far, it has been found that with the exception of a small portion of about 1.5 mm in thickness at the centre having a shape of that of the punch nose on both sides, the whole of the material is utilised in the forming. This central portion of the material in the hole is the only rejection from blank material which is to be sheared and rejected afterwards. This comprises not more than 5 to 10% of the total volume of the nut blank. Therefore, for a maximum saving of the material the circular nose punch may be utilised.

5. CONCLUSION:

The process can be utilised on the power press for the manufacture of hexagonal nut blanks with the minimum wastage of material and hence getting nuts at lower cost. The authors are working on the cold forming of M.S. nut blanks as well, the results for which will be available after some time.

The significant advantage of the process will be the saving in material resulting in reduced cost.

REFERENCES: