

# To Develop a Hexagonal Cutting Machine for Hexagonal Cutting from Circular Work Piece

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**Abstract**— Our Research relates to a Hexagonal Cutting Machine which can cut out a Hexagonal Profile from a Hollow Circular Workpiece. As of now, a Vertical Milling Center is employed for cutting the Hexagonal Profile. But, the prevalent method is pretty much time consuming as well as Costly. Because, the operating cost of a VMC is high. So the concept of Hexagonal Cutting Machine, which will cut circular workpiece into Hexagonal Profile in less time, with less operating cost is hereby explained. In the present research, the various components as well as the concept behind the Hexagonal Cutting Machine are explained. For serving the purpose, the machine will be rotated with the help of an Electric Motor and the Workpiece will be fed against the cutter with the help of a leadscrew.

**Key words:** Hexagonal Profile, Circular Workpiece, Cutting Machine, Electric Motor, Lead Screw

## I. INTRODUCTION

If we are considering the Vertical Milling Centers currently employed in the formation of Hexagonal Profiles. They are a lot time consuming as well as too much costlier to operate. The current invention relates to the Hexagonal Cutting Machine, which can form Hexagonal Profile from a Hollow Circular workpiece. The movement to the cutter will be provided by the Electric Motor. While the workpiece will be fed against the cutter with the help of leadscrew. Thus, this machine will follow the principle of Lathe Machine. The present invention is really an easy set up of all appliances. Which will make the work easy as far as operator's part is concerned. So any semiskilled worker can also operate this Hexagonal Cutting Machine. Also various sizes and ranges of Hexagonal Cutting is possible by adjusting the Cutter according to the sleeve. Moreover, the structure of this machine will be light, which will make it easy to transport this machine from one place to another.

## II. VARIOUS SIMILAR RESEARCHES UNDERTAKEN

### A. Improvement in Hexagonal Cutting Machine with the help of V-Shaped Cutting Edge

As explained by John R. Blakeslee[1] in his patent, Improvement in Nut Machines. He has eliminated the complex mechanism of the present Hexagonal Cutting Machine designs, by replacing them with two V-Shaped Cutting Edges. This cutting edge can be driven by any kind of mechanism. The cutting edges will travel in a straight path on the die. And in this way, Hexagonal Cutting will be possible.

### B. Forming Hexagonal Profile by pressing against dies and rolls

George Johnson[2] has clearly explained his point in his research work Improvement in the Manufacture of Hexagonal Nuts. It is an economical method of producing

stronger Hexagonal Nuts, reducing the amount of Iron in the form of Scrap wasted. For serving the purpose, the bar is conveniently fed against the roller or dies of the Nut Cutting Machine. This invention relates to the Rolling Process. Although, the process is not much accurate, for that time it was an important tool for the mass production of Hexagonal Nuts.

### C. Cutting Regular Hexagonal Profile with Cutter rotating at Uniform Velocity

In his research work entitled Machine for Turning Regular Hexagons, Walter B. Pearson[3] has explained a two way method of Cutting the Hexagonal Profile. In this method, he explained about either rotating the cutter in an Elliptical Path at Uniform Velocity. Or else, revolving the Workpiece in a Circular Path around it's own axis. All this will take place at Uniform Velocity, providing the user with an ease for cutting Hexagonal Nuts.

### D. Cutting a Hexagonal Profile by a Motor operated Hexagonal Cutting Machine

In their Patents, Cutting Machine and Machine for Cutting Short Lengths of Tape from a Strip and Applying the Same to Articles, Christy A. Wiken et al.[4] and Peter J. Dewyer[5] have clearly briefed out the working of a Motor Operated Hexagonal Cutting Machine. The importance of an Electric Motor with the setup of a Hexagonal Cutting Machine is extremely important. In the present invention. The Electric Motor is connected to the machine elements either with the Belt Drive or with the Gear Drive. There is also a provision of stop, so as to limit the motion of the cutting blade of the Hexagonal Cutting Machine. It will save the overall machining time, which increases the productivity to the certain extent. In the later invention, the method of cutting short lengths Hexagonal Bars has been demonstrated. This method is useful when mass production of the Hexagonal Workpieces is to be done.

### E. Mounting for a Cutting Tool

In his research article, Tool Mounting for a Cutting Tool, Phillip A. Solami[6] demonstrated about an important accessory of the Hexagonal Cutting Machine. It is an accessory of Holding the Cutting Tool against the Workpiece, while the machine is running. It is a simple tool, with a front as well as back surface. As the mounting advances towards the cutting tool, it is tapered. This mounting also comprises of a locking nut assembly, which is fixed to the stud. There is also a provision of anti-rotation device in between the Block as well as the Cutting Tool.

## III. DESIGN OF VARIOUS COMPONENTS

As a reference for the Design of our Hexagonal Cutting Machine, we have used the research work Design and Fabrication of Hexagonal Cutting Lathe Machine by

Karamdeep Singh et al. [7] as a reference. The Models described here are made by us, using Inventor as our software tool.

#### A. Motor

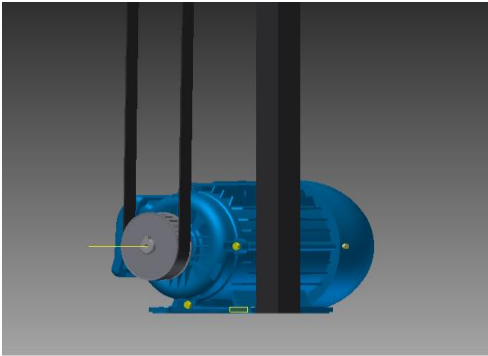


Fig. 1: Motor

The Electric Motor is of 7 Horse Power Capacity. The Motor is the basic tool, working on the AC Power Source. The power is supplied to the motor, which rotates it. Which in turn rotates the Cutter. And the machining is done.

#### B. Cutter

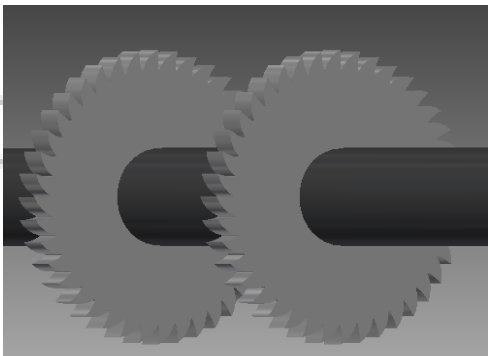


Fig. 2: Cutter

The Cutter is the Metal Removing Tool of our Hexagonal Cutting Machine. The Cutter is fixed on the Arbor. It gets the power from the Electric Motor, which makes it to rotate. It is required to sharpen the Cutter at regular intervals, so as to get the accurate cutting of the Hexagonal Profile from the Cylindrical Workpiece. The Cutting Tool is made up of Carbide, so as to ensure the accurate cutting of the Hexagonal Profile. The Rotation Per Minute (RPM) of the Cutter will be kept 24 to 60. Because the rotation of the Cutter at high speed might result into the degradation of workpiece. Which might affect the surface finish of the Hexagonal Workpiece. As well as it would also be an economical loss for you.

#### C. Workpiece Holder

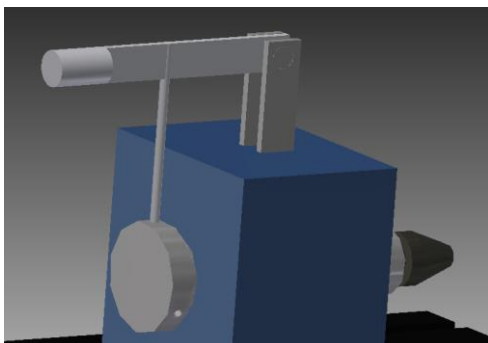


Fig. 3: Workpiece Holder

The Workpiece Holder is an essential tool for our unit of Hexagonal Cutting Machine. For the better machining of the Workpiece, it is necessary to have a firm grip. And to serve this purpose, a Workpiece Holder is provided so as to enable the firm grip over the workpiece. The Holder consists of the Collet, in which the Workpiece will be held. The Collet is made up of thin steel, so that it doesn't impart any kind of marks on the workpiece. Moreover, the External Surface of the Collet is kept tapered, so as to enable the grip more firmly.

#### IV. EXPERIMENTAL SETUP

With the help of current research, we briefed out the basic Design Procedure of the Hexagonal Cutting Machine. Whose different views are shown in the figures given below.

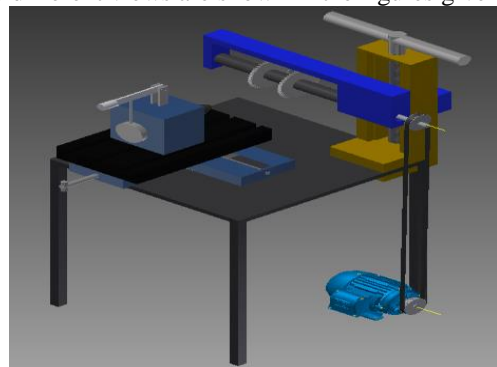


Fig. 4: Front View of Hexagonal Cutting Machine

In this figure, the Front View of the Hexagonal Cutting Machine has been shown. With all the equipment and tools we have used. Also, the arrangement of all the parts of the machine has been shown clearly in this view.

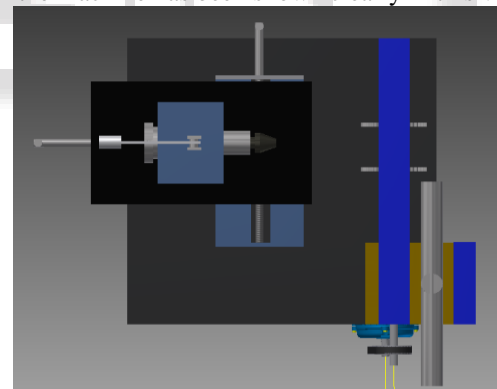


Fig. 5: Top View of Hexagonal Cutting Machine

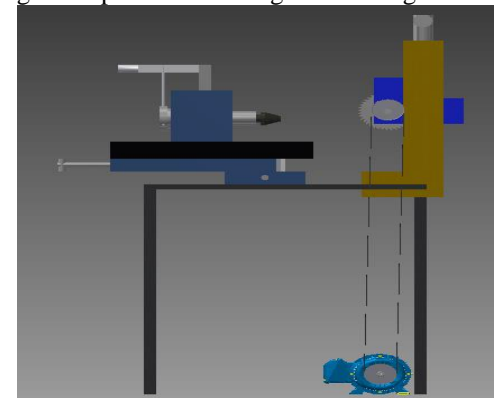


Fig. 6: Side View of Hexagonal Cutting Machine

## V. CONCLUSION

With the Help of Current Research we have redesigned the Hexagonal Cutting Machine, which will be able to cut Hexagonal Profile from the Circular Workpiece with better efficiency, in less time and at higher rate.

## REFERENCES

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