

# Concept of Combine Concave-Convex & Knurling Tool at the Tool Post of Simple Lathe Machine

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**Abstract -Present,** days in industries CNC machines are widely used but they are costly. So, commonly simple lathe machines are being used for cost reduction purpose of any product. But the radius part can only be done with the help of special CNC lathe machine. So, overcome this limitation we are design a fixture for convex-concave tool on simple lathe machine and more over it can be also used for the knurling process. So this attachment provide knurling tool also so that multiple process will be done by this attachment. In this way result product will be create at low cost. By adjusting the tool holder a different range of radius can be achieve. The attachment will not vibrate due to machine vibration and good clamping arrangement has been made. This attachment provide knurling tool also so that multiple process can be done by this attachment. This attachment will be not that much heavy it can be easily transfer from one place to another . mounting attachment on the simple lathe machine is easy.

**IndexTerms - Convex concave tool Post, Simple Lathe Machine, Multipurpose Tool Post, Etc.**

## I. INTRODUCTION

Now present days in industries machine are commonly used but they are costly.so mainly simple lathe machine are being used for cost reduction purpose of any product. But the radius part can only be done with special CNC lathe machine. We can perform several operations on simple lathe machine like as threading, turning, facing, drilling, grooving, chamfering, fillet etc. But when it comes to produce radius or concave shapes of any object, we have to send our job to another inventory. For to give a simple radius shape we required lots of human hard work during the job and transportation cost. But the radius part can only be done with the help of special CNC lathe machines. So overcome this limitation company wants to design a tool post for convex concave tool on simple lathe machine and more over it can be used for the knurling process. So that process can be done by this tool post. Thus as an outcome products will be produced at low cost comparatively.

## I. LITERATURE REVIEW

By I. C. Gardner [1] et al, explained that Attachment for turning approximately spherical surfaces of small curvature on a lathe and tool mounted on the end of a radius Rod.so the surfaces produced as spherical. The surfaces produced are not accurately spherical, but the approximation becomes poorer as either the curvature or diameter of the surface is increased.

Devarakonda harish Kumar [2] et al, explain that fabricated cylindrical grinding attachment on lathe machine and optimized the grinding parameters by regression analysis for reduce power loss due to friction by grinding attachment. The improvement in surface finish on the pieces lead to higher corrosion resistance optimization of the parameter is done by regression analysis.

J. A. Travieso-Rodríguez, G. Desein, and H. A. González-Rojas [3] et al, They improved the surface finish of concave and convex surfaces by using a ball burnishing process conclusions are drawn about the improvement of surface roughness of work pieces through the ball burnishing process. In this paper, we could verify that the ball burnishing process is effective to improve the surface finish of work pieces of different materials and geometric configurations with a certain level of complexity.

Mr. Ashish d. saste, Mr. shriram k. shinde, Mr. shrikants kulkarni, Mr. matker m.v [4] et al, They design Spherical turning attachment because of the tool post on normal lathe machine is restricted at only two side direction to by replace that tool post with spherical turning attachment to manufacture spherical object. Cylindrical shape can be easily manufactured and concave type of the design can be given to the component.

Milan Patel, Divyesh Pateliya, Ankur Parmar, Bharat Kapadiya [5] et al, they design fixture for radius turning on lathe machine. This fixture provided radius turning on lathe machine & more over mechanism of worm gear for more high precision it can also be used with auto feed. These highly precise products produced at low-cost comparatively. Radius turning of any objects Manufactured easily.

Satoru Maegawa, Shinya Hayakawa, Fumihito Itoigawa and Takashi Nakamura [6] et al, they developed novel tool for cutting of carbon-fiber-reinforced plastics by the Positive use of abrasive wear at tool edge for reduction in cutting force. A simplified model for the wear process of a two-layer tool was developed to describe how to enhance the cutting force reduction effect of a two-layer tool. These papers indicate that it is possible to take advantage of the abrasive wear on the flank face of a cutting tool to reduce the cutting force without improvement of the tool material.



Figure 1 PCD (Polycrystalline diamond) type cutting tool.[6]

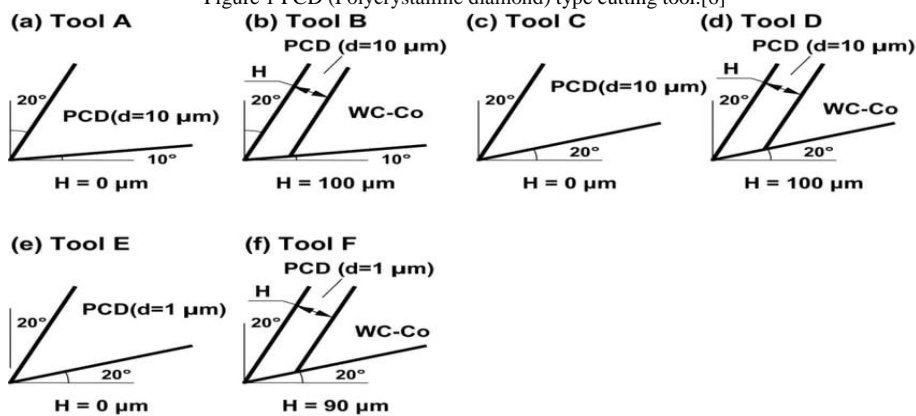


Figure 2 Geometries of Prepared PCD Cutting Edge [6]

Where,

H=Thickness of PCD layer

D=Grain size of diamond in PCD (polycrystalline diamond)

P. Sivasankaran, [7] et al, explained that fabricated and design the Slotting/ Milling Attachment to Lathe. In this examination, a connection is structured and created to include the ability of level processing machine in machine. A milling cutter is mounted in a cutting arbor, which in turn is mounted between the headstock and the tailstock of a lathe. A work holding device is designed and mounted on the tool post. With this arrangement, it is possible to do keyway cutting in a shaft or milling a plane surface on a work piece. This research is considered to be a milestone in the direction of increased the capability of the machine tool like lathe.

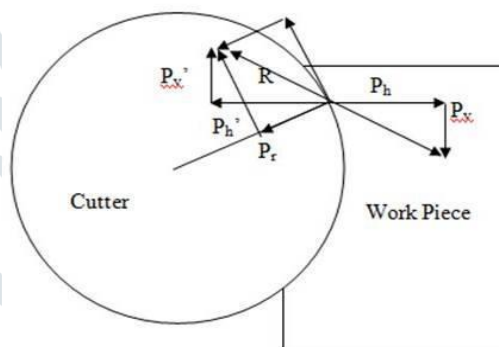


Figure 3 Force Diagram[7]

The forces of the cutter are at below,

Pt– Tangential force,

Pr– Radial force.

R – Resultant force of  $P_t$  and  $P_r$ .

The forces in the direction of machine movement are as

Below,

Ph- Force in a direction opposite to the feed,

Pv- Force in the direction of vertical movement,

The specific cutting pressure is given as,

$$K_m = P/A_m \text{ kg/mm}^2$$

Where,

P is the peripheral,

$A_m$  is cross-sectional area of the chip

Component of cutting force in Kg,

Therefore,

$$P = K_m * P_m$$

The value of  $K_m$  depends on the material hardness and chip cross section.

Rajendra Balappa Chingale , Prashant S Patil, [8] et al, They designed the machining fixture for conical wedge of post tensioning system of pre-stressed concrete needs to be designed and analyzed and it is a project sponsored by a SSI in Udyambag, Belgavi. Component is first machined from round bar stock giving to the conical shape with a threaded hole (Threading meant for only better grip on tensioning wires). Finally the cone is to be cut in to three equal wedge shaped pieces by slitting saw. In this paper company’s main aim is to reduce the cost of the machine without compromise on the quality of the output.

Sachin Bhosale, Sagar Raut, Swapnil Vipradas, Sandeep Raut [9] et al. they design lathe tool post grinding attachment. It attached on lathe machine where tool post is attached. It can achieve speed up to 3,500 RPM for external grinding and up to 12,000 RPM for internal grinding by varying size of driving and driven pulleys. The accuracy and surface finish of grinder is same as conventional grinding machine. Large size work piece can easily surface finish with this grinder providing base plate to supporting body. Accuracy up to 0.002mm can be achieved.

Akash Tiwari, Niral Panchal, Parth Solanki, Lalit Parmar, Diptesh Pate [10] et al, they Fabricated a multi-purpose tool post which can save money of small industrialist by avoid the subcontracting of works which may require special machines. With this attachment we can perform drilling, grinding, milling on same machine. By this type of selected and incorporated such small but useful ideas a small scale industrialist can save huge amount of time.

Abhishek A. Sakhare, et.al [11], they fabricate of multiple tool attachment for lathe machine That attachment is designed in such a way that various operations such as Offset Drilling, Grinding, Slotting and Milling can be carried out on the same Lathe Machine. This will reduce plenty of time and on the other hand will reduce the human efforts.

Prakash N. Parmar, et.al [12], they developed retrofitted lathe is done by replace or remove the components from conventional lathe machine, therefore setup cost is high as compare with standard lathe machine but production rate is too much high. So it is very useful for mass production.

Rendi Kurniawan, et.al [13], they introduced a method for making a micro-dimple pattern using the EVT method and an analysis of the orthogonal cutting forces. This paper will hopefully be helpful for researchers who are working on the EVT method. Our conclusions are summarized as follows.

II. SYSTEM DESIGN

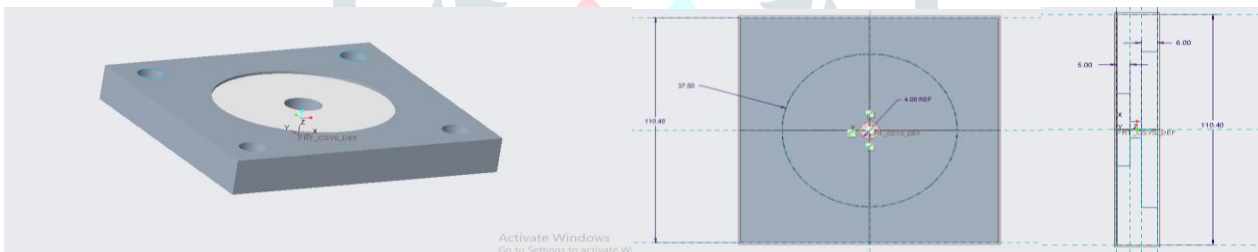


Figure 4 base plate

Base plate is the bottom plate of the work holding device, which will be mounted on the tool post of the lathe as shown in Fig.4.

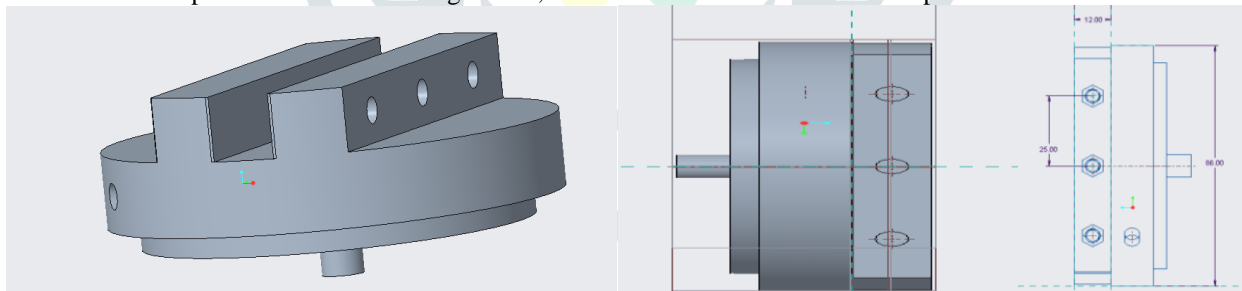


Figure 5 Circular Guide Plate

Base plate and circular guide plate are for the easy to operation. The circular guide way is guide to the tool holder.

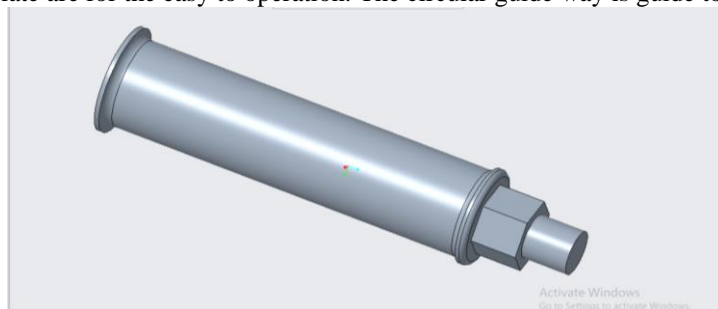


Figure 6 Handle of Circular Plate

- Handle which joint at circular plate for guide the plate and it is operate for the circular path of circular plate. By this handle circular plate will be guide by the hand. And easy to operate the circular path of the tool post. Total horizontal length is 51.50mm to hold easily and hand grip diameter is 10mm.

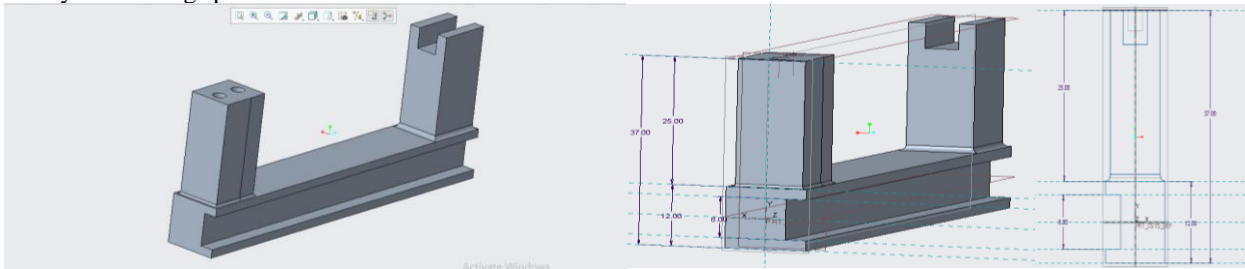


Figure 7 Tool holder

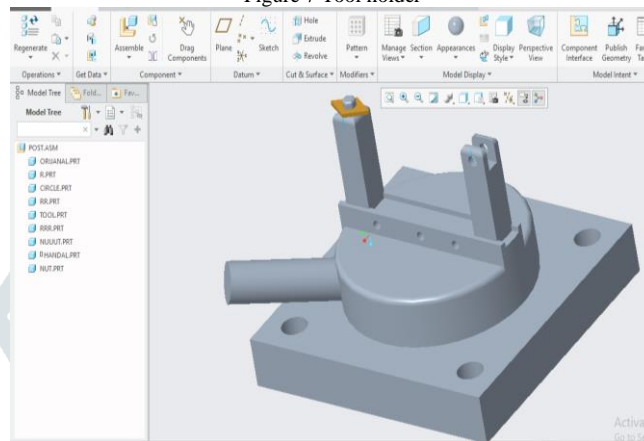


Figure 8 CREO Assembly

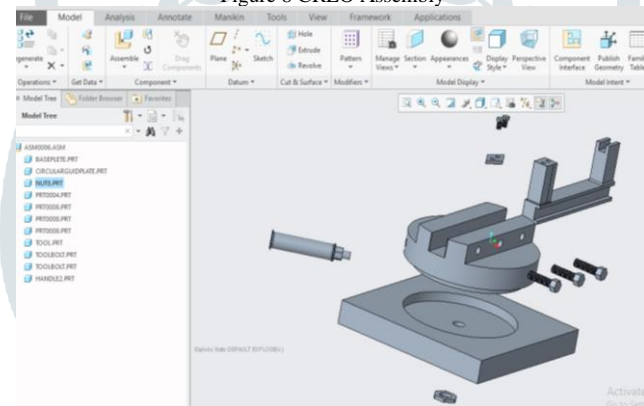


Figure 9 exploded view of tool post

The activity of round turning connection is simple. We can get diverse shapes, for example, round, curved with the assistance of the pivot of the activity which will be held in the hurl, through the hub of the device point and the hub of the roundabout plate. Presently, the entire work will rely on the connection. By and large, in machine the profundity of cut is given by instrument which is held over the roundabout plate and the turning activity is finished by pivoting the switch which is mounted on the roundabout plate. Bearing is press fitted in the middle of the base plate and round plate for simple task. The round guide path manual for the device holder.

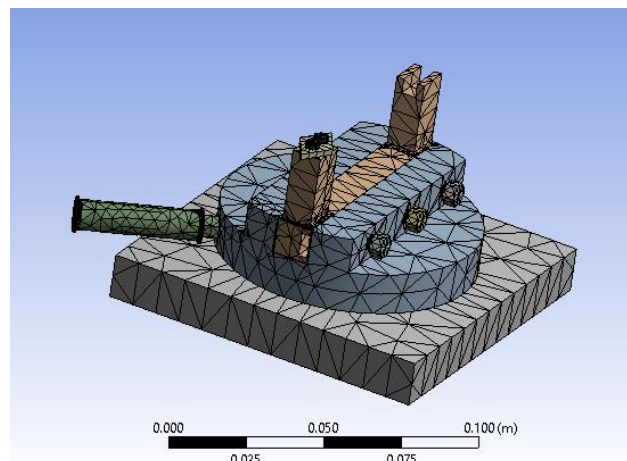


Figure 10 meshing of tool post



The device post of a machine is supplanted by circular turning connection. In which circular part is created is turned with the assistance of single point cutting instrument. This connection is mounted on cross slide of the machine by utilizing nut and fastener the roundabout guide route manual for the instrument holder. Tool holder has a fitted screw. The lead screw is accommodated exact control of radius to be turn.

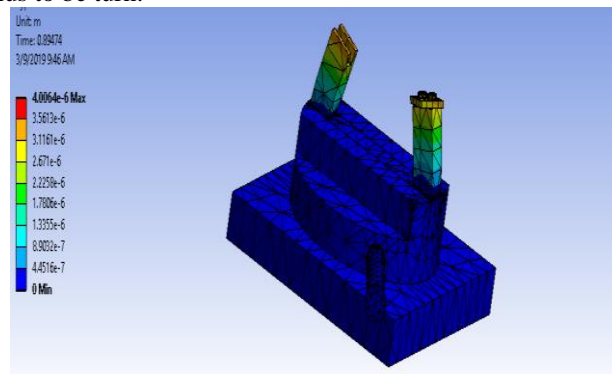


Figure 11 total deformation

Magnitude of force is 600 N. the result is obtained by the maximum principal stress and total deformation of the element. Maximum stress produced on joint of the body is indicating by red colors and minimum stress is blue colors (as shown in Fig 4.7.2). Maximum deformation is edge of the body and small deformation on center and Deformation range is 0 to .0112 mm (Fig 4.7.2). which is not effect to tool holder. And Maximum principle stress up to 117.42 MPa.

#### CONCLUSION

Here, the authors have presented review of all parameter related to reduce the cost of attachment, we conclude that radius part can only be done with the help of special CNC lathe machines, spherical and convex-concave shape manufacturing is not possible in simple lathe machine. so we have to design tool post for spherical shape manufacturing According to previous research paper it's all about the reduction of cost of attachment . So we can design convex concave tool post for simple lathe machine. This tool post will provide PCD cutting tool as well as knurling tool also so that multiple processes can be done by this attachment so that improve the accuracy and time requirement.

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