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# Comparison between CNC Router and Lathe Machine

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**ABSTRACT:** CNC Router is machine which is using to cut different type of material such wood, plastic, metal etc. in the desired shape and size. CNC stands for computer numerical control which is instructed and controlled by programable logics. Other side lathe machine operates manually i.e used to cut the metal in desired shape and size manually. CNC Routers can help ensure part repeatability and sufficiently efficient output for production or allow one off design to be made. Most suitable equipped metal lathe can also be used to produce most solid of revolution, plane surfaces and screw threads or helices. The purpose of this research we designed and fabrication a Computer Numerical Control (CNC) based router machine for wood, Aluminium etc engraving machine. The router machine that is made is driven by the driver in the form of a stepper motor, with a 3-axis motion so that the results of wood engraving obtained are precision and homogeneous.

**KEYWORDS:** CNC, CNC Router, Lathe Machine,

## I. INTRODUCTION

The CNC Router is precision piece of machinery, capable of cut precision equal to or greater than 0.001 inches. CNC routers are faster and more precise than human. Working with automatic mechanical equipment demands precision, accuracy, speed, consistency, and flexibility. CNC Router machine can cut along three axis direction knows as the X, Y and Z axes. In CNC X axis is moves front to back direction and vice versa. Y axis is moves left to right direction and vice versa. Z axis moves up to down direction. In modern CNC systems, the design of mechanical part and its manufacturing program is highly automated. The aim to design the CNC router is to develop a low-cost automatic mini-CNC machine for cutting, drilling, shaping, and milling on wood and remaining other material.

Lathe machine is mechanical device which used to remove the metal to get the desired shape and size. Lathe machine is oldest machine tool in production department. Lathe machine is manually control machine. It is heavy machinery. In lathe machine work piece is hold by chuck. There is such type of operation are used in lathe machine. Like turning, facing, chamfering, knurling, thread cutting, filing, grooving etc.

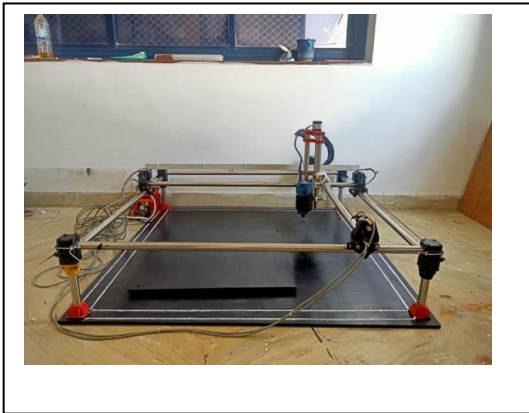


Fig. 1: 4X4 CNC Router



Fig.2: Lathe machine

## II. CONSTRUCTION

### 3.1 CNC Router

Router is very important part of any makers. It Allow to cut accurately in variety of material. It is look like 3d printer, but difference is hot end replaced with router. CNC routers have 3 axis which is X, Y, Z. The main part of CNC is router. It is rotating the bit for cutting. It has also stepper motor. It is controlled by computer for moving. Cutting ability means strong and weak cutting depend on the machine. To design the CNC router first of design 3d printer parts using design software like AutoCAD, Solid works etc. After that choose frame style like table style. In table style three axis moves. To choose this frame to make large and rigid CNC router. Then we must use electronics item like stepper motors, drivers, router controller and power supply. Stepper motors are used to accurately turn lead screw. Here we use NEMMA 17 motor. It is better for small CNC router. After that controller is connected to router and computer, it is operating with g-code. Router range for our CNC router is 12 v DC and 13000 rpm. Then power supply is important for router to run. Usually, 12-24 V DC power supply needed. CNC router moves three axes. For cheaper component we use GT-10 replaced by lead screw. After that bed is another important in which router will work. It is the surface of the machine. It is clamped down. MDF is use as working piece and for design. It can easily replace after working and clamped new one for another working.

### CNC Router Components

- CNC controller and Display Module: -Controller is the brain of the machine. Other side display module is key element, and it is used to set program to run the machine. A CNC Router's Controller is the electronics device that is used for executing a g-code programming and sending the necessary electrical signals to the motors for movement and cut the desired shape and size.
- Stepper Motor and servo motor: - Stepper motor moves step by step in each pulse. Other side Servo motor use feedback to control the motors position.
- Router: -It is a CNC component which is used to cut and shape the material.
- Lead screw: - It is a mechanical component which is transfer rotational motion into linear motion.
- Spindle: -It is the mechanical component which used to rotate the axis of the machine.
- Cutting Tool: - It is removing the material from metal, wood etc. and help to better finishing.



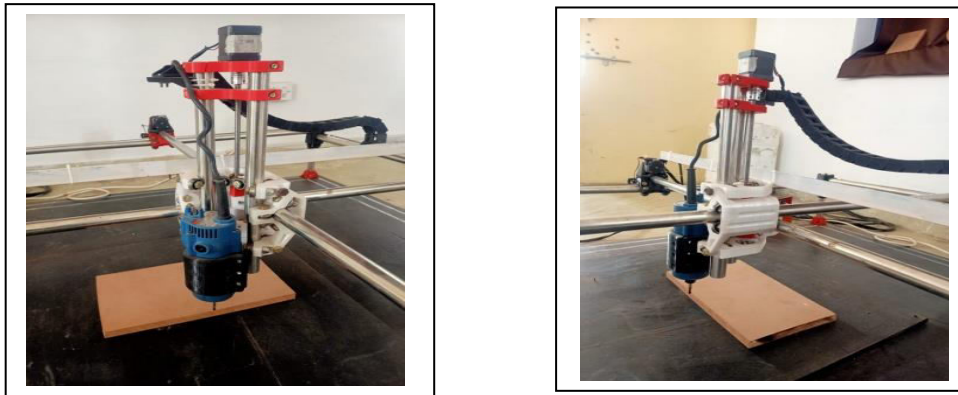


Fig. 3: Cutting Tool

### 3.2 Lathe Machine

Lathe machine is the oldest machine. In lathe all components are placed on bed which is made by Gray cast iron. The lathe components are as follow:

a) Bed

The bed is important and key structural component of the lathe machine. It is base of lathe on which other components like tailstock, headstock, and remaining parts are placed and work performed. On the top side two set of ways, one is inner ways which give sliding surface for tail stock and other ways is outer way which is for carriage. It should have sufficient dimensions to absorb vibration. It is made by cast iron material.

b) Head Stock

It is a major component of lathe which is used to transmit power to the other lathe parts. It is placed on left side of the lathe. It has gears, spindle, chucks, speed controller, feed controller and pulleys. Head stock is the hollow cylindrical shaft that provides a drive motor to work the holding job.

c) Tail Stock

Tail Stock is in right side of the lathe and used for alignment and non-alignment respect to move spindle. A tailstock is also called as foot stock. It uses for supporting the longitudinal axis.

d) Carriage

Carriage is placed between the head stock and tail stock and contains apron, saddle, compound rest, cross slide, and tool post. It is outer guide ways which can easily move along the axis. It has mainly worked on guiding the tool bit and provides direction for cutting.

e) Feed Mechanism

Feed mechanism in which motion of head stock spindle is transmitted to the carriage of lathe. It works on rotating work piece and fixed cutting tool.

f) Thread Cutting Mechanism

This mechanism is used for engaging and disengage the carriage with the lead screw. That's why lead screw is used for screw threads. It is done by single point cutting tool. Tool is held in tool post and work piece is held in chuck.

g) Chip pan

It is used to collect the chip which is removed from material.

h) Tool Post: To mount tool holders in which the cutting bits are clamped.

i) Guideways: To ensure the accurate movement of tailstock and carriage on the bed, comes in outer or inner ways.

j) Apron: Attached to the front of the carriage, it has the mechanism and controls for moving the carriage and cross slide.

### III. WORKING

#### 4.1 CNC Router working

CNC Router is precise machine. It has 3 axis which can move using stepper motor. X and Y is moving direction and Z axis is moves for cutting. It is moves up and down. The working process of CNC router is simple and easy. First, we draw a design which we want. Design can be draw using much software like AutoCAD, Solid works, Fusion360 and many more. This file will save in dxf file type. After that we convert this file in CNC machine language. For converting file, we use universal g-code, Mech3, Eastalcam and other more software we can use. Then this file put into memory card. Then memory card inserts in display module of CNC router. Before starting the machine, work piece is set to the bed and fitted with screw. After that start the power supply and run the program which we inset. Machine automatically work and we get desired shape and size. When machine is working then we can do other works.

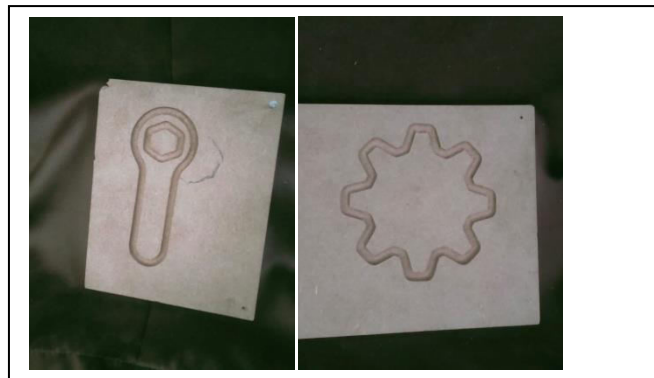


Fig. 4: Jobs which is made by CNC Router

#### 4.2 Lathe Machine

The main purpose of lathe is to remove the material from the work piece. Lathe is performed manually. Firstly, work piece is fit in chuck which is rotates with the help of motor. There are two types of chucks one is three jaw chuck and second is four jaw chuck. Here, head stock consists of the power system. It is help and provide engage with suitable levers. For the large job we need for using tail stock. It can fix vibrations during machining. The tool is fix in tool post which is placed between head stock and tail stock. Tool is perpendicular to the work piece. After that power supply is given then the chuck is start rotating. Then tool is set with respect to operation. Lathe operation like turning, facing, drilling, boring, thread cutting etc. With respect to material removal speed can be change by lever which is placed in head stock.

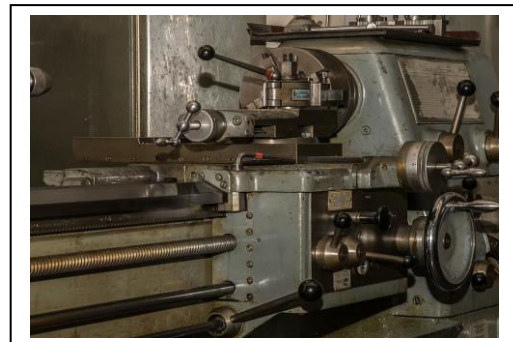


Fig. 5: Lathe job Fig.6: Internal Lathe Machine

### IV. CONCLUSION

The CNC Router is automatically operating compared to lathe machine. CNC Router is controlled by computer where programming through machine will run. Here lathe is manually controlled. CNC router has three axis which is moves in three directions but in lathe is works in two directions. In the vast field CNC router is better than lathe. CNC takes



less time compared to lathe. In CNC router cutting tool is cut work piece in up and down direction and In lathe cutting tool is cut the work piece perpendicular and at an angle. Result of CNC router and lathe is CNC is better than lathe in compared to time, working, handling and maintenance

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