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Design and Development on Conventional Lathe Machine

Under the valuable guidance of

Prof. H. C. Patel

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OUTLINE

- Introduction
- Project Objective
- Scope of Project
- Methodology
- Literature Review
- Calculation
- Part Modeling
- Analysis
- Required Parts
- Mach 3 Software
- Conclusion
- Reference

INTRODUCTION

- The lathe is very important for the industrial revolution.

- Machine tool which spins a block of material to perform various operations such as cutting, knurling, drilling or deformation with tools that are applied to the work piece to create an object which has symmetry about an axis or rotation.

- Lead screw is a precision screw that runs the length of the bed. it is used to drive the carriage under power for turning and thread cutting operations.

PRINCIPLE OF LATHE MACHINE

- The lathe is a machine tool which holds the work piece between two rigid and strong supports called centers or in a chuck or face plate which revolves. The cutting tool is rigidly held and supported in a tool post which is fed against the revolving work. The normal cutting operations are performed with the cutting tool fed either parallel or at right angles to the axis of the work. [1]

PRINCIPLE OF LATHE MACHINE

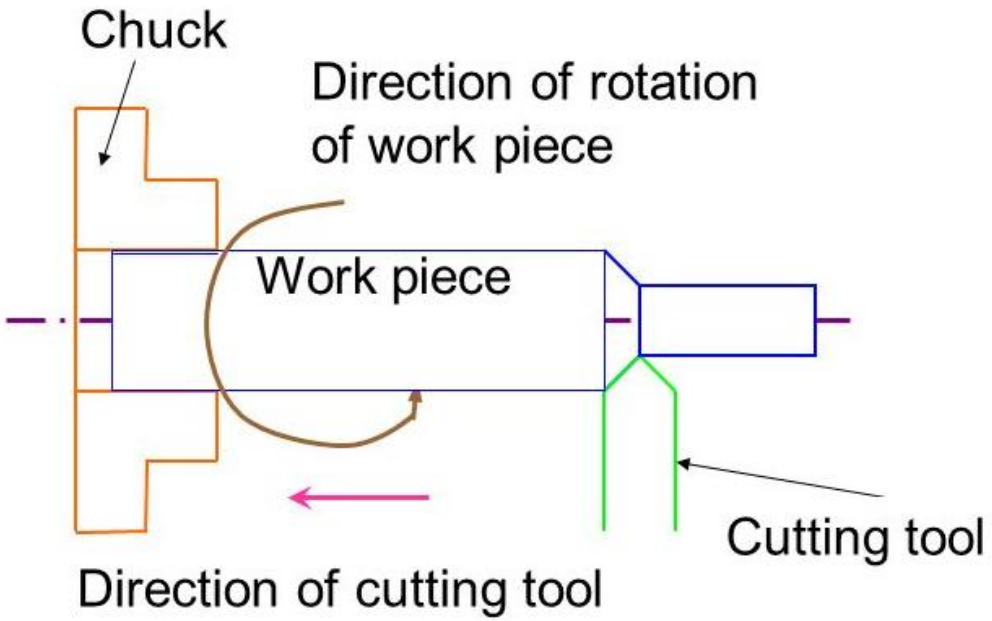


Figure: - working principle of lathe machine [1]

PROJECT OBJECTIVE

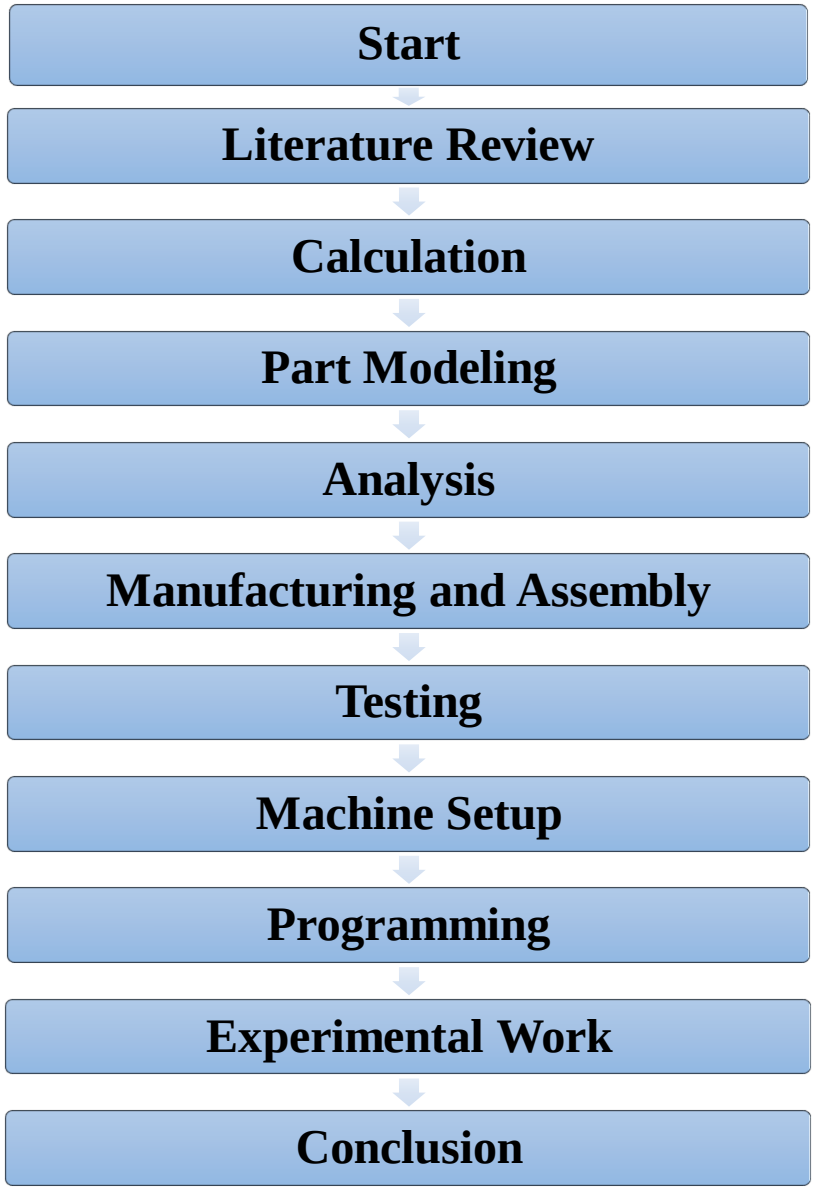
The objectives of the project is to convert the conventional lathe machine into the semi-automatic CNC lathe machine.

- Reduce Cost.
- To increase productivity and improve controlling of machine.
- Reduce man work.
- High accuracy.
- High feed-rate.
- Superior repeatability.

SCOPE OF PROJECT

- Industrial application for automation purpose.
- Small scale industry.
- In Colleges study about automation.
- Improve productivity for small scale industry.

METHODOLOGY



LITERATURE REVIEW

- In 1984, Department of Mechanical Engineering, IIT, New Delhi, has taken a research on development of modern manufacturing technology, Flexible Manufacturing Systems have become key equipment in factory automation. [2]

- In 2013, V. Roy & S. Kumar from J institute Engineering, India published development of Lathe machine attachment for CNC machine. The CNC machine operates on mechatronic controls and a computer interface called CAMSOFT. [3]

- In 2013, M. Moses & Dr. Denis Ashok research on Development of a new machining setup for energy efficient turning process. [4]

LITERATURE REVIEW

- In 2014, Mr. Prakash N. Parmar et all published Review on Advance Automation of Conventional Lathe Machine. [5]

- In 2009, R. Lizarralde et all research on New Developments in Lathes. [6]

- In 2013, M. Minhat et all research on Retrofitting a conventional lathe to a digital intelligence system. [7]

CALCULATION

For the starting of the calculation some input parameter are required for calculation like diameter of x or z axis wheel, mass etc.

- First of all we find the diameter of x axis wheel and z axis wheel.
  - X axis wheel diameter is 17.2 cm
  - Z axis wheel diameter is 10.5 cm

- Then after we find the how much mass required to rotate the wheel.
  - X axis wheel mass is 3.5 kg.
  - Z axis wheel mass is 1 kg.

CALCULATION

- This mass is at the study or ideal moment of machine so we assume that three time more load at the machining time for that time mass are required.

  - X axis wheel mass (working) is 10.5 kg.
  - Z axis wheel mass (working) is 3 kg.

- **X axis wheel calculation**

  Taking moment

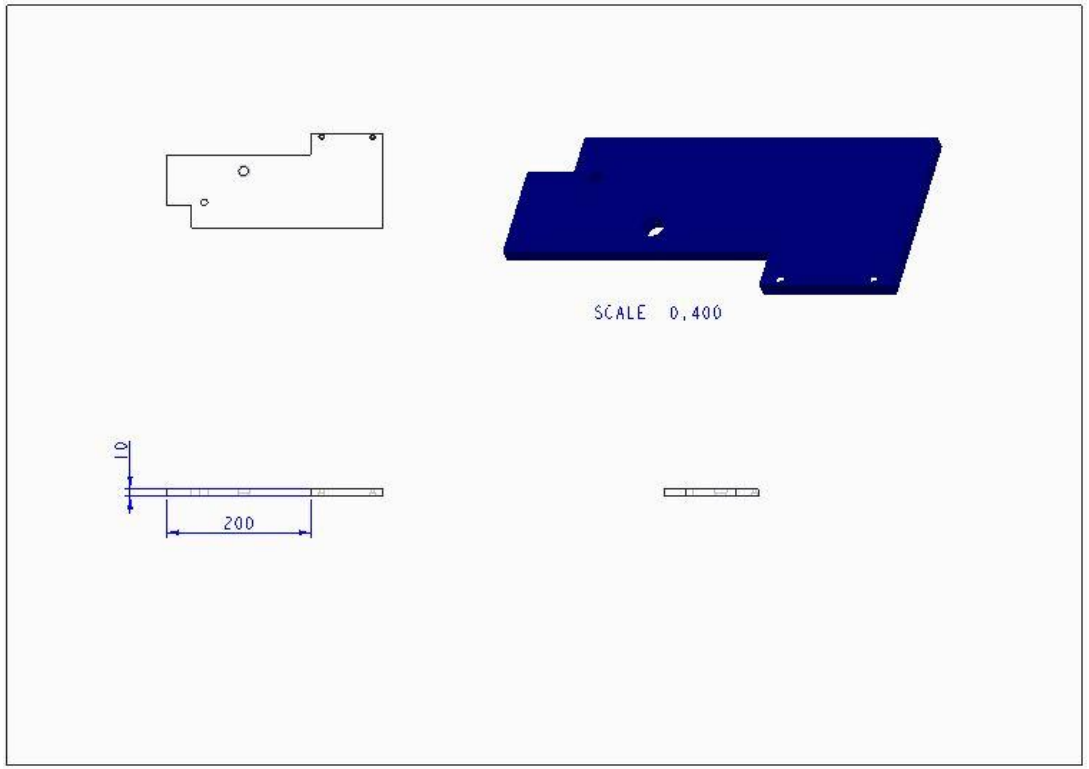
- **Z axis wheel calculation**

  Taking moment

MODELING

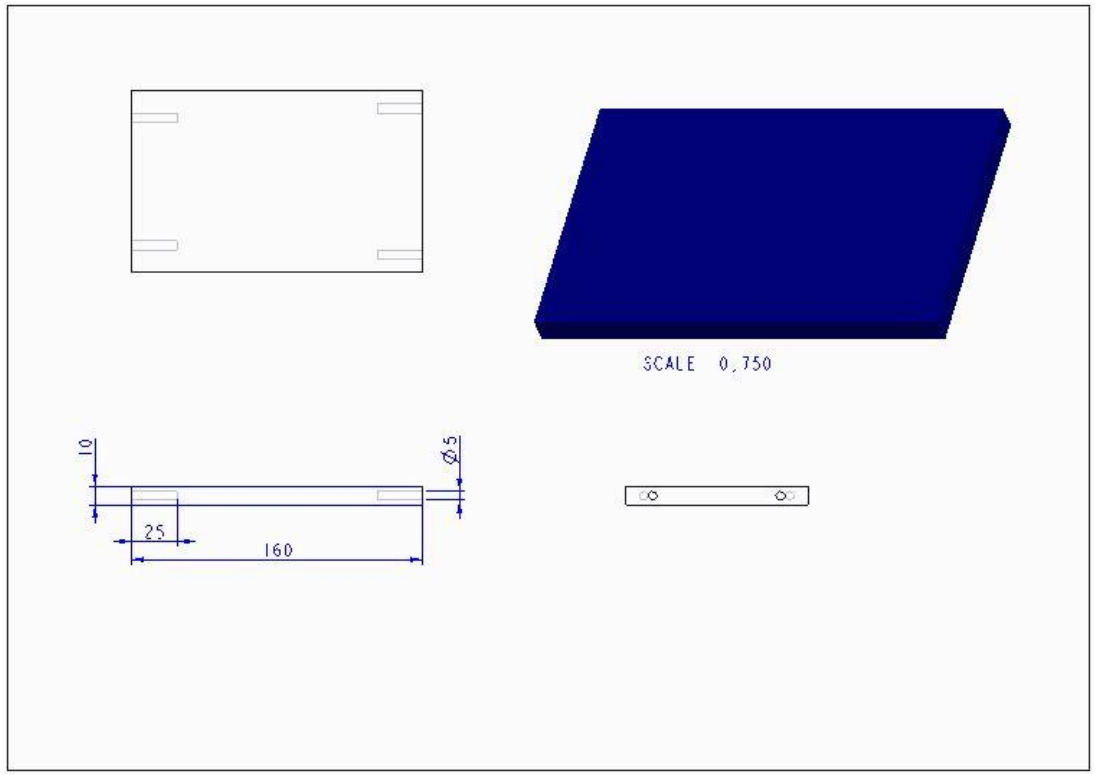
Base Plate for Z Axis

Figure:- 2



Base Plate for X Axis

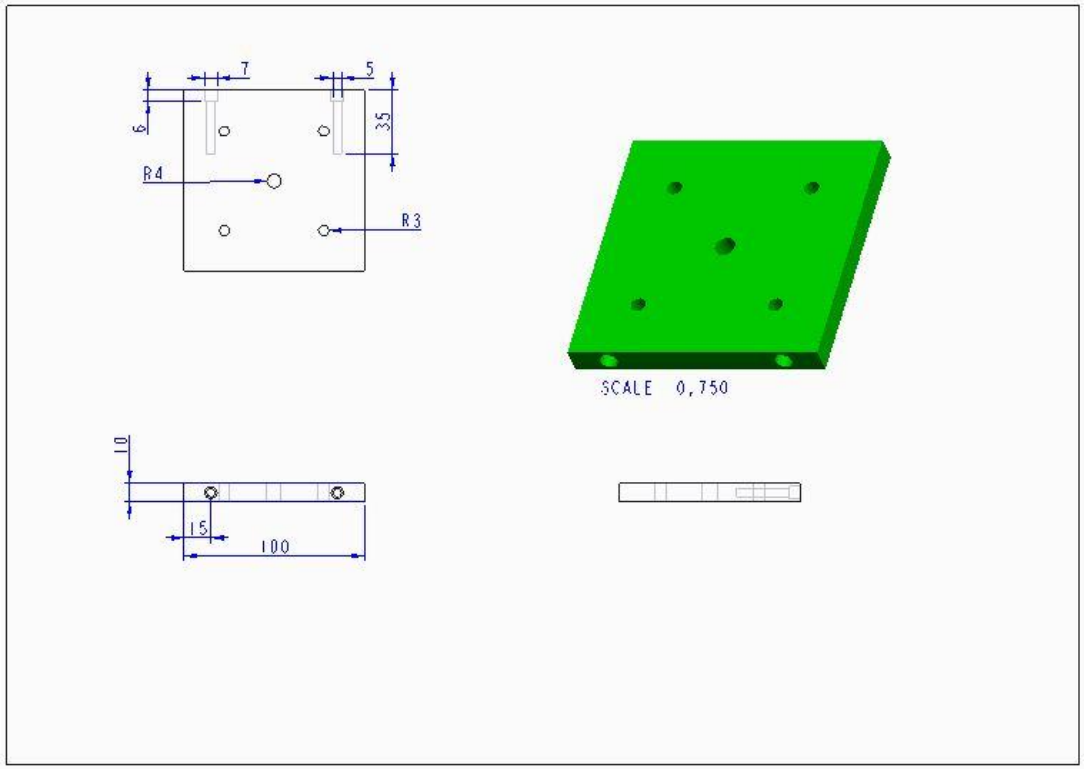
Figure:- 3



MODELING

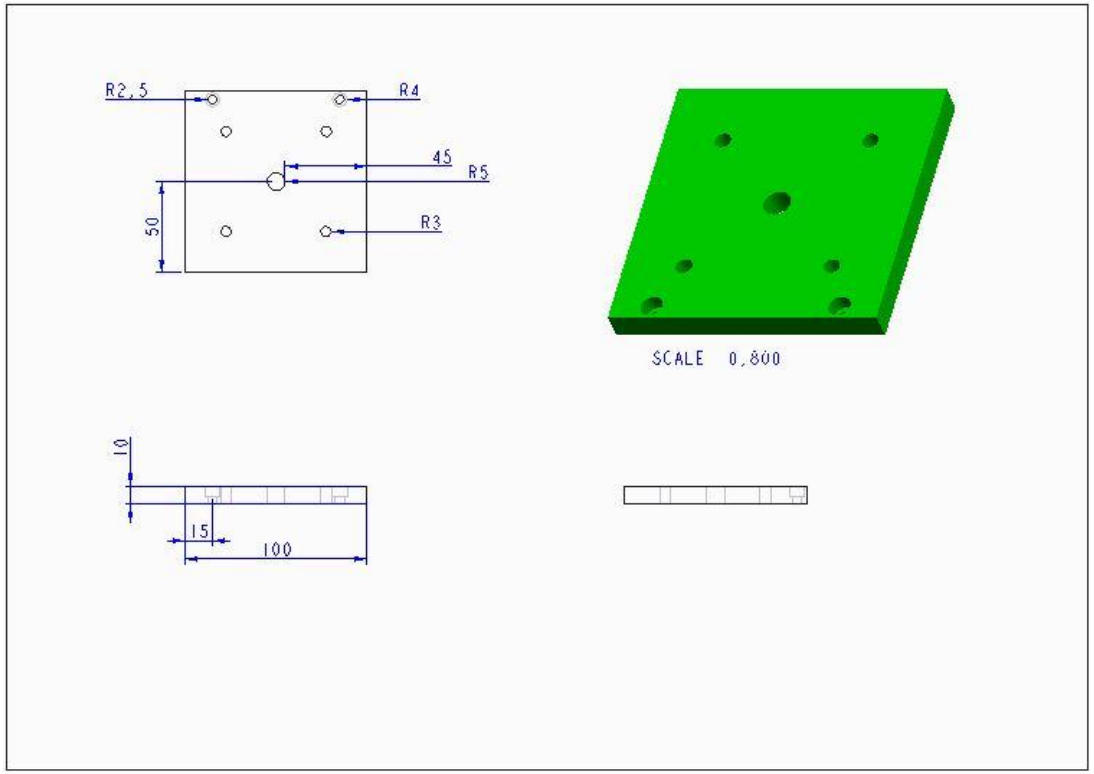
Vertical Plate for Z Axis

Figure:- 4



Vertical Plate for X Axis

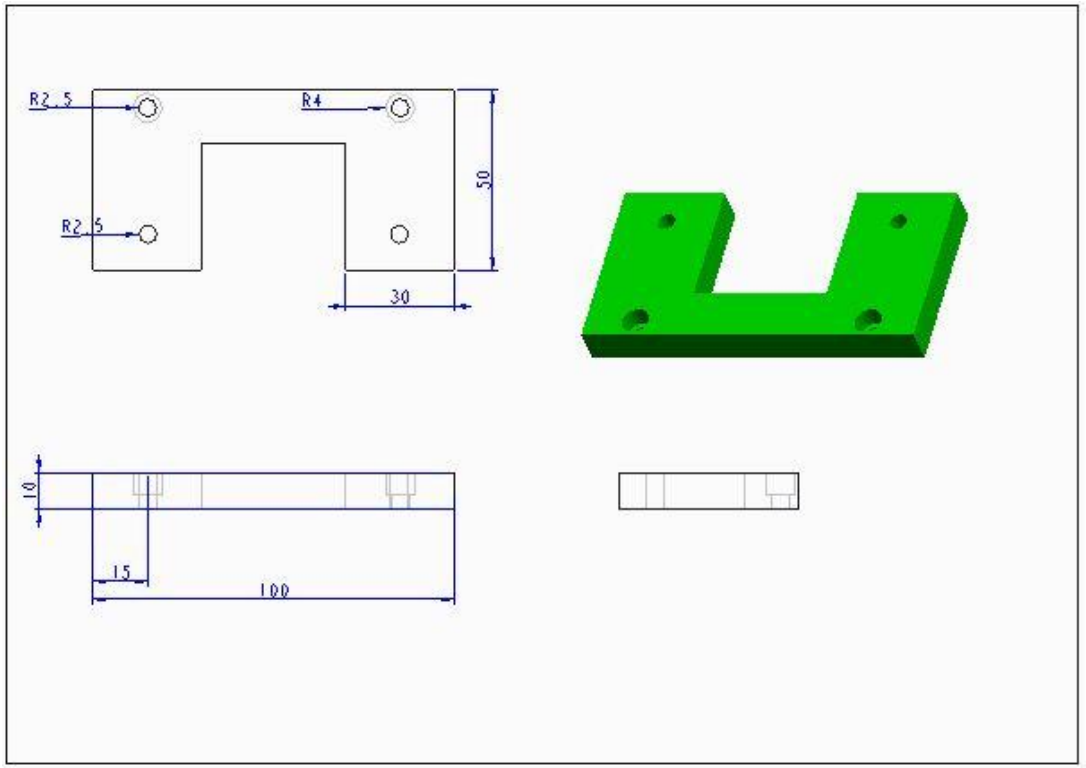
Figure:- 5



MODELING

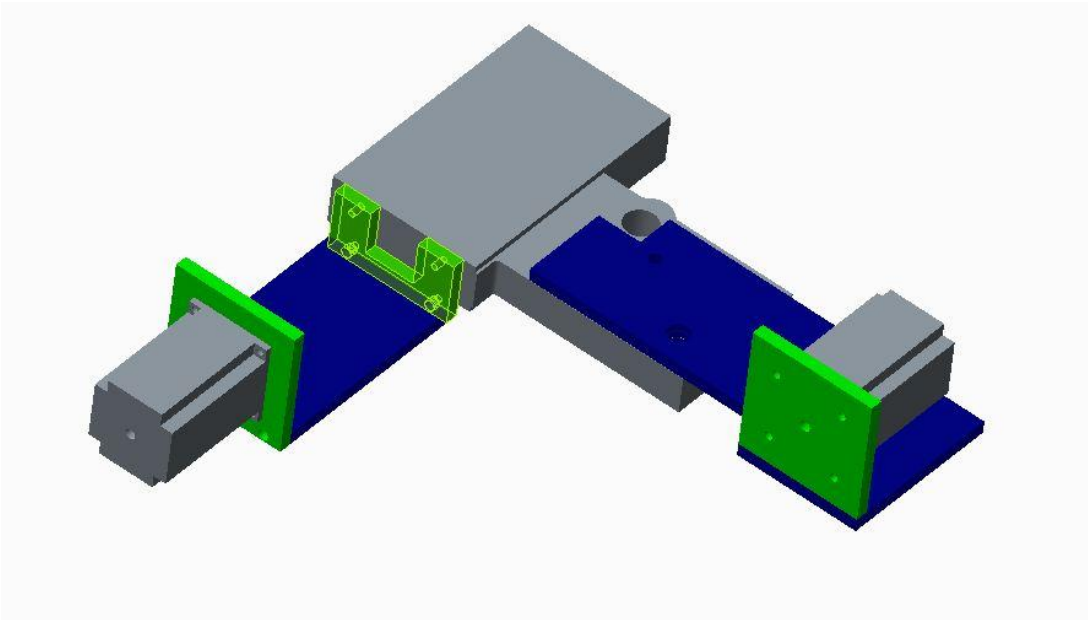
Vertical Base Plate for X Axis

Figure:- 6



Assembly

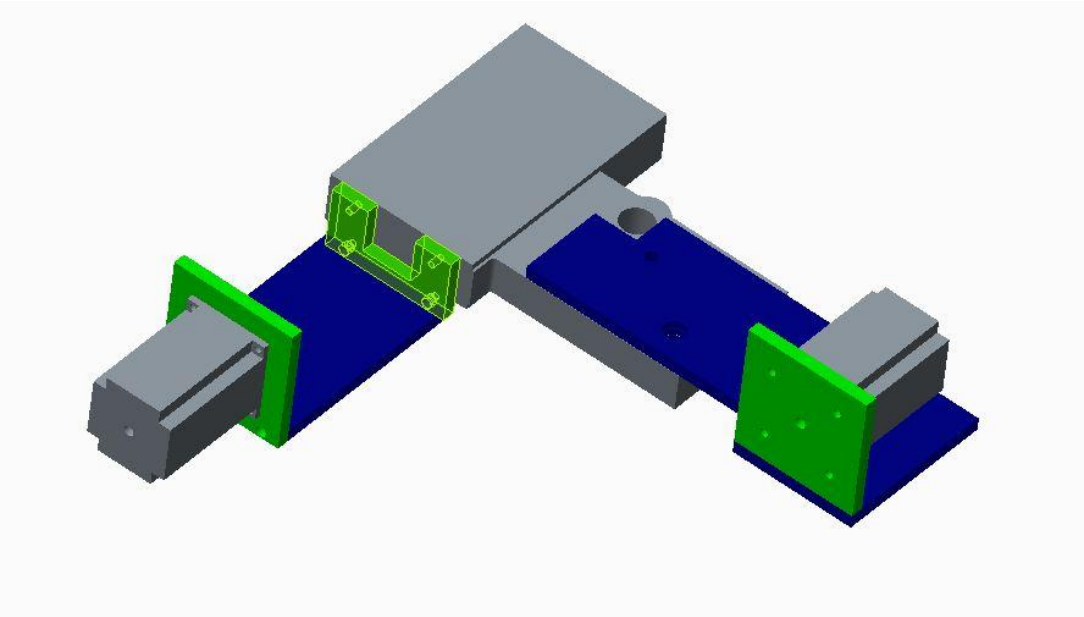
Figure:- 7



MODELING

Part Modelling Assembly

Figure:- 8

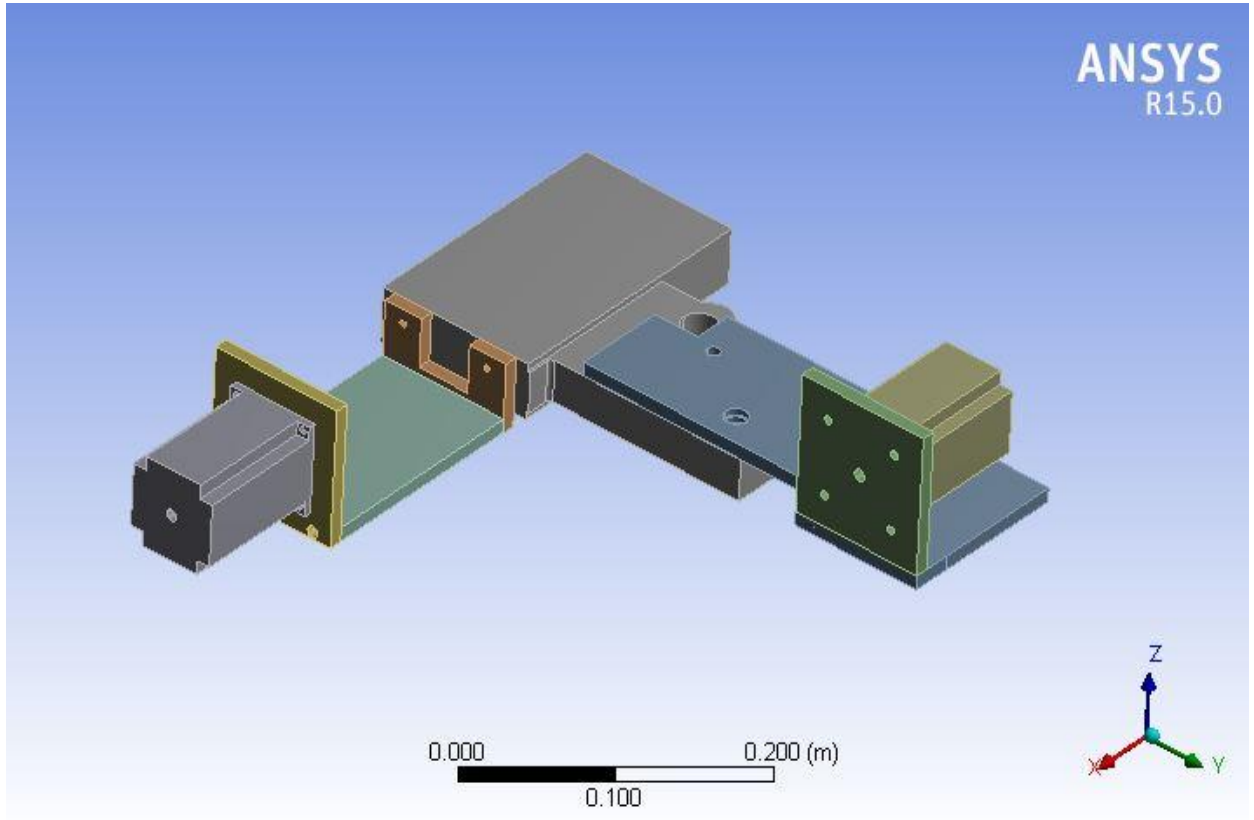


Actual Assembly

Figure:- 9

ANALYSIS

Figure:- 10

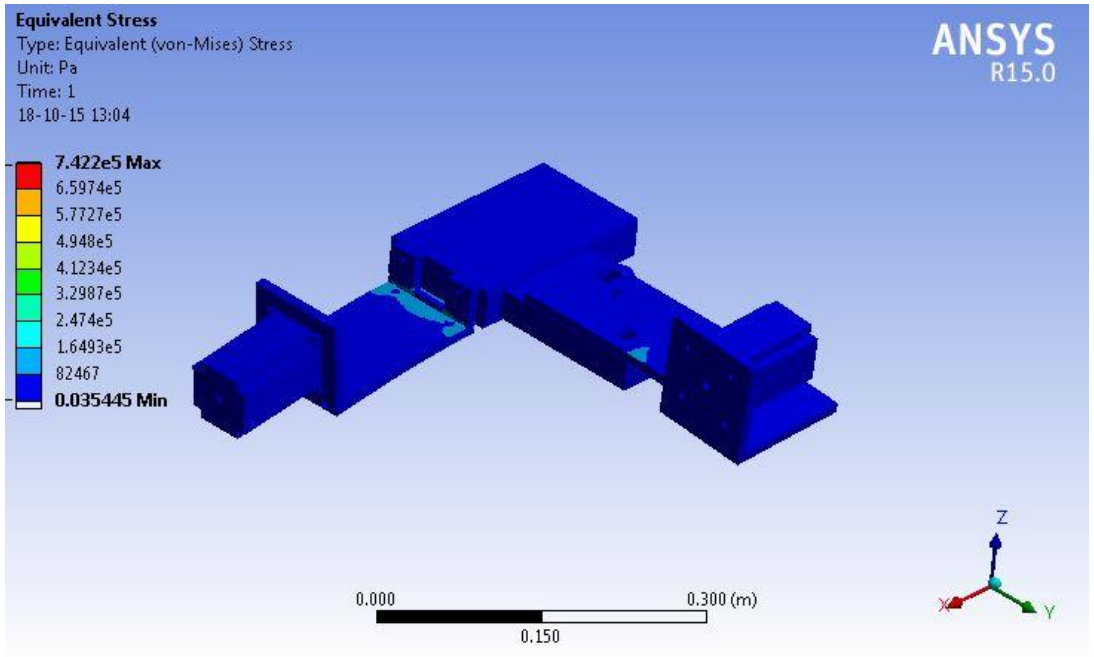


- For 10 mm
- Ultimate Tensile stress is 0.7422 Mpa it is less than the MS ultimate tensile stress there for our design is safe.
- And the deflection is 0.0022705 mm so the deflection are negligible.

ANALYSIS

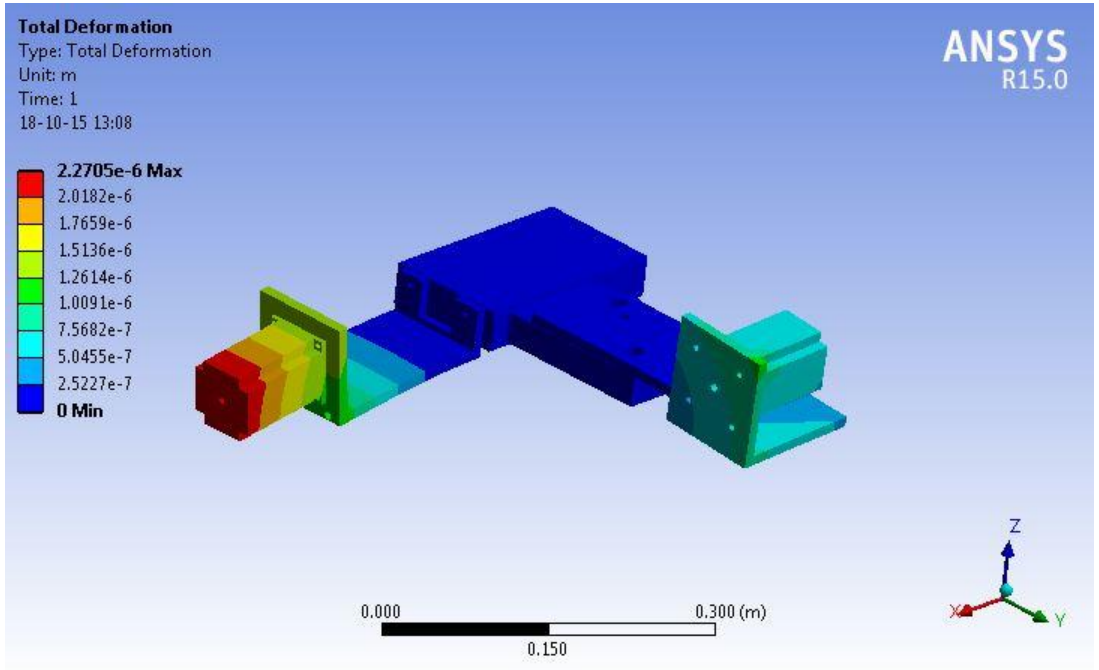
Equivalent (Von-Mises) Stress

Figure:- 11



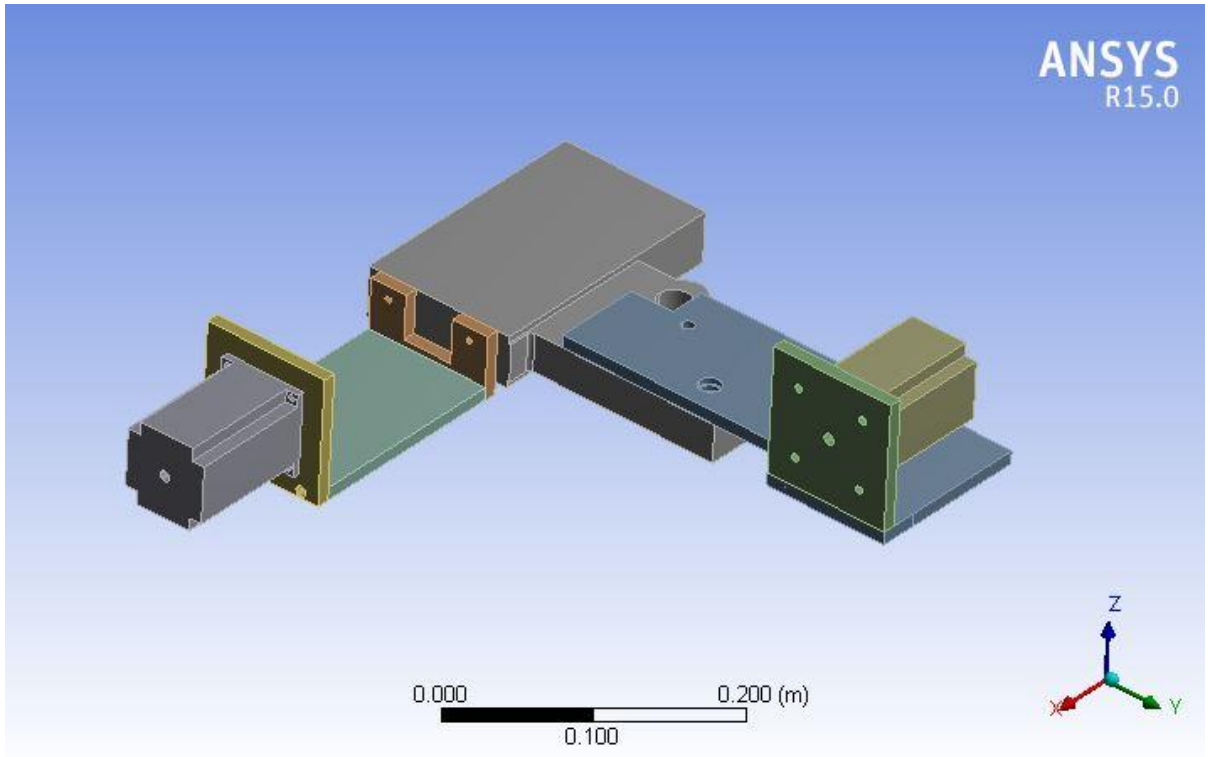
Total Deformation

Figure:- 12



ANALYSIS

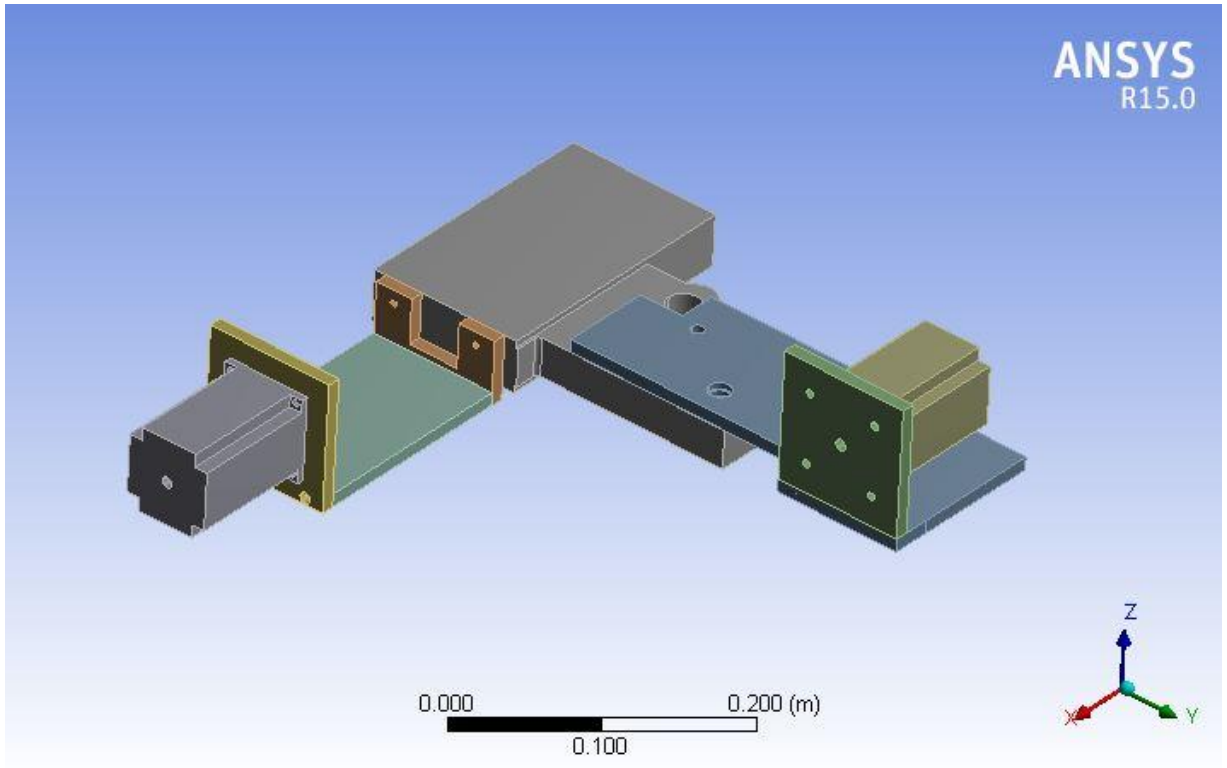
Figure:- 13



- For 3 mm
- Ultimate Tensile stress is 0.89236 Mpa it is less than the MS ultimate tensile stress there for our design is safe.
- And the deflection is 0.014198201 mm so the deflection are negligible.

ANALYSIS

Figure:- 12



- For 5 mm
- Ultimate Tensile stress is 0.57403 Mpa it is less than the MS ultimate tensile stress there for our design is safe.
- And the deflection is 0.056724 mm so the deflection are negligible.

ANALYSIS

- After that all analysis, 10 mm thick plate are used for better support and attachment on carriage.

REQUIRED PARTS

- Power Supply
- Stepper Motor
- Motor Drive
- Computer
- Coupler
- Timing belt and timing pulley
- Control Panel

REQUIRED PARTS

Power Supply

Motor Drive

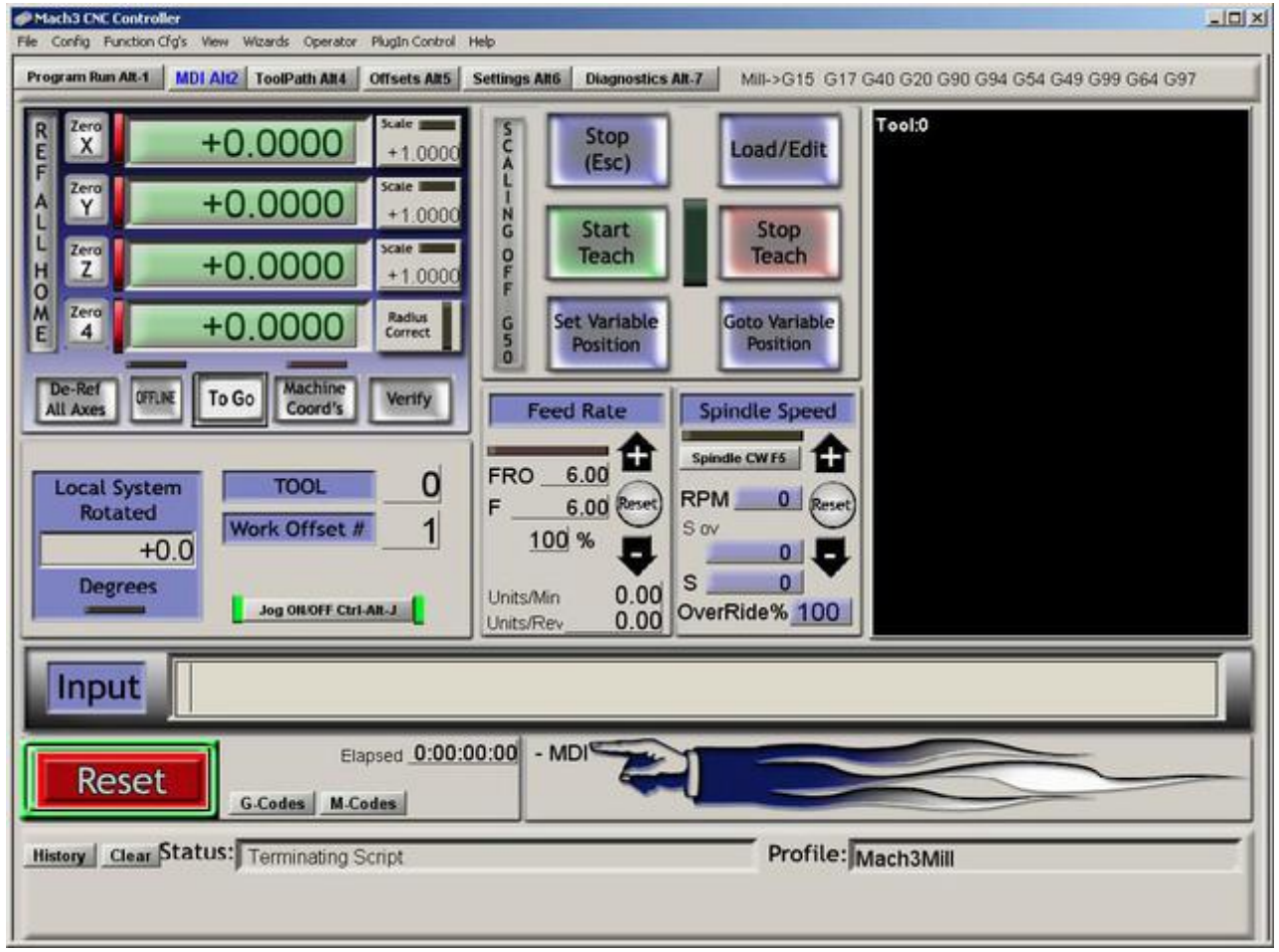
Stepper Motor

REQUIRED PARTS

Timing Belt

Timing Pulley

MACH 3 SOFTWARE



Mach 3 Software

CONCLUSION

- Only one attachment is required to modify the conventional lathe machine into semi automatic conventional lathe machine.
- After the analysis and attachment on lathe machine it is conclude that the design is safe.
- We reduce the cost as compare to the new CNC machine.
- Our attachment is easily removable for manual work on lathe machine.

REFERENCE

- [1] In September 4, 2014 By Syed Mazhar Ali, http://engineering.myindialist.com/2014/types-of-lathes/.
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- [6] New Developments in Lathes. R. Lizarralde, A. Azkarate and O. Zelaieta. 2009.
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