

Design Of Radial Feed For Gear Hobbing Machine

Presented By:

Prajwal Nayak	:	Roll No. 50
Abhijeet Mandavgane	:	Roll No. 42
Susmit Nichat	:	Roll No. 51
Pawan Kulkarni	:	Roll No. 39

Project Guide : Mrs Bhavana M.M.

Sponsorship Credits: ARK MAKTEK PVT. LTD., CHAKAN.

Hobbing machine

- **Hobbing** is a machining process for gear cutting, cutting splines, and cutting sprockets on a **hobbing machine**, which is a special type of milling machine.
- Uses a hobbing machine with two skew spindles, one mounted with a blank work piece and the other with the hob.
- The *hob* is a cutting tool used to cut the teeth into the workpiece.

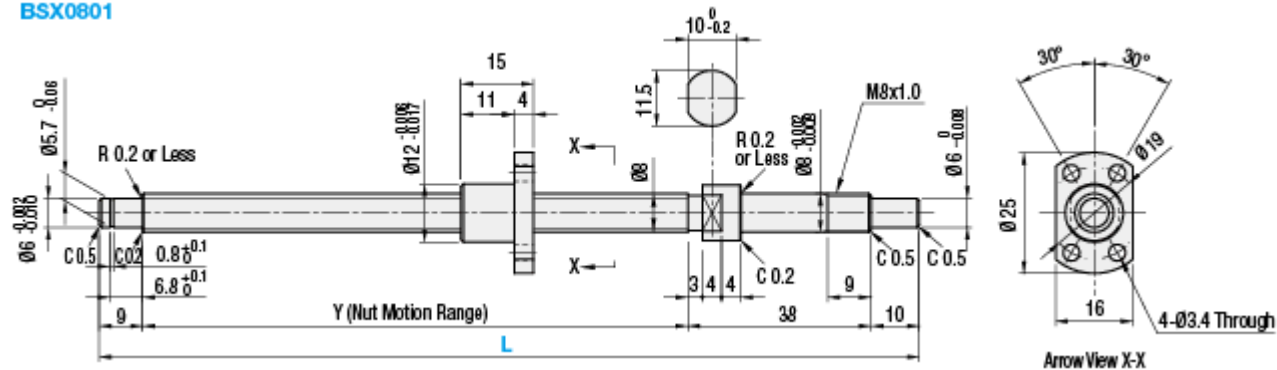
Scope of project

- Design of mechanism used in hobbing machine: We Are designing the radial feed of a CNC gear Hobbing Machine. The Feed Is Driven By a recirculating ball screw.
- The Main Advantage Of ball screw over lead screw is that it eliminates backlash error which is not the case with lead screw.
- The various design steps performed to manufacture Gear Hobbing Machine are Also Covered.

Schematic Of Ball Screw



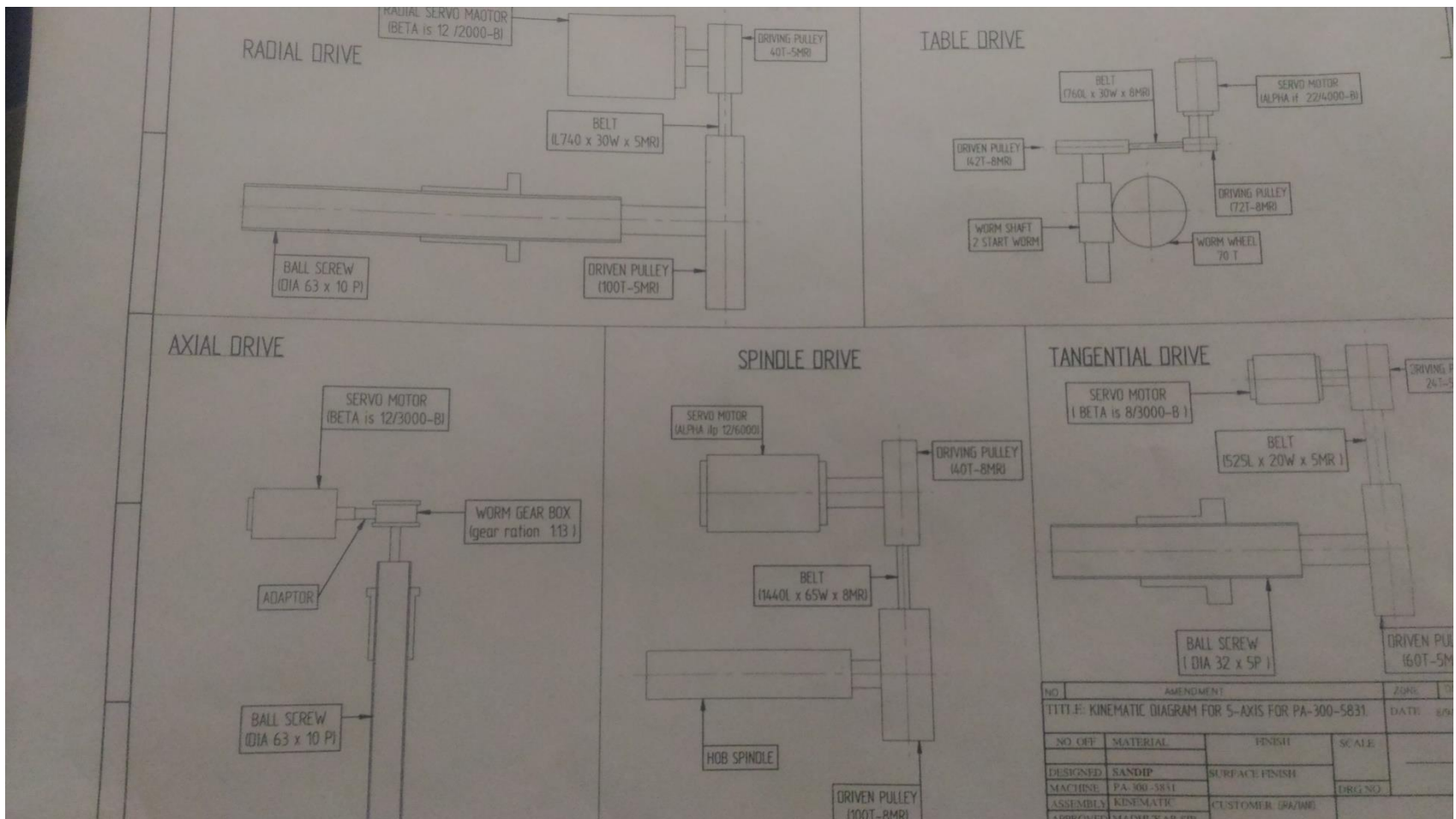
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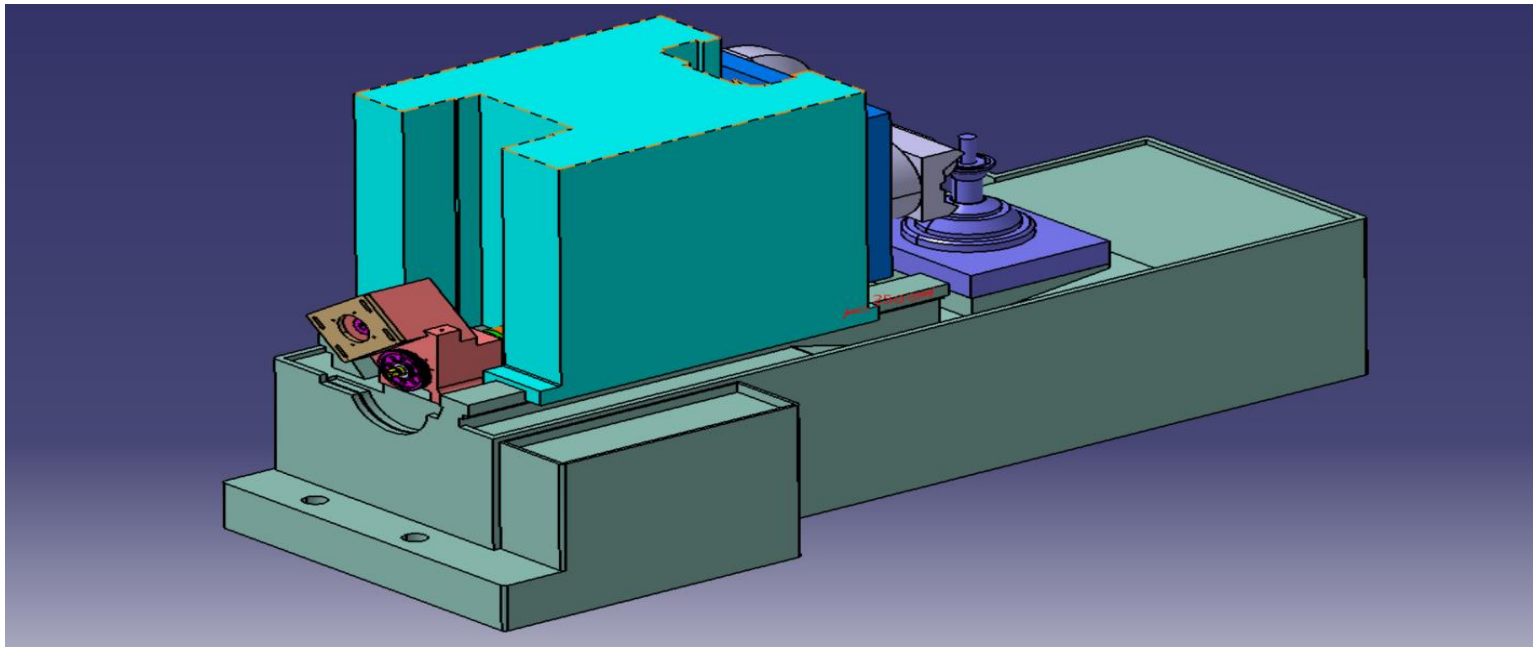
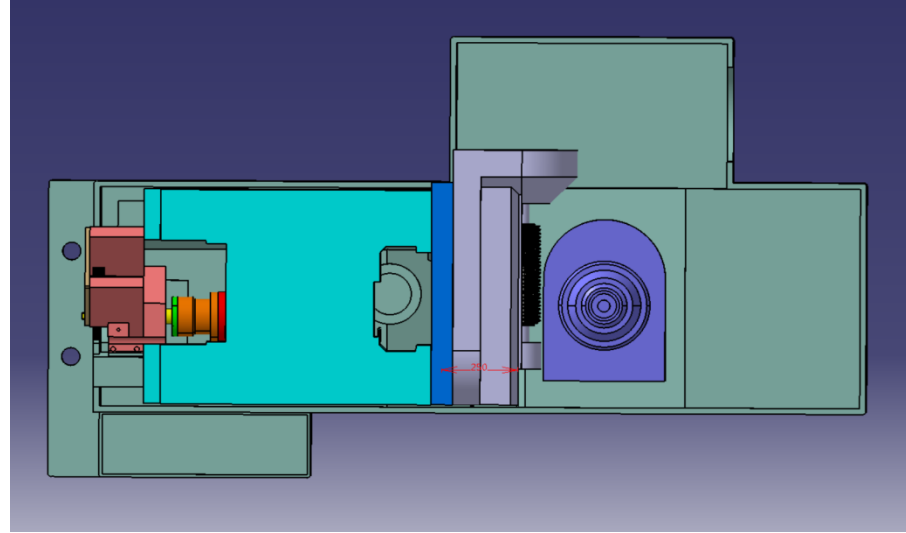
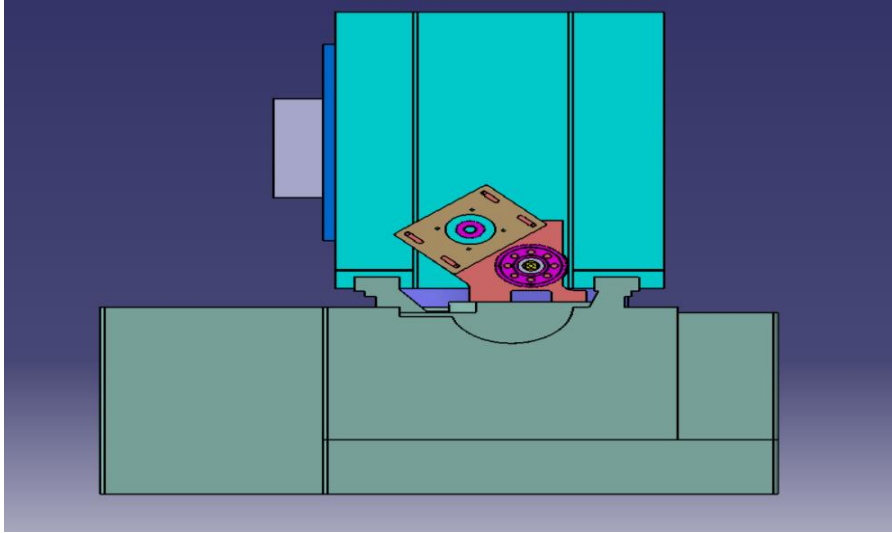
Reasons for Using Ball Screw

- Higher Efficiency
- Lesser Heat Generation
- No Stick-slip
- Higher Service Life
- High Precision & Reliability
- Precise Positioning
- High Power Transmission

Kinematics Of Gear hobbing Machine



Model Of PA320 In CATIA V5R20

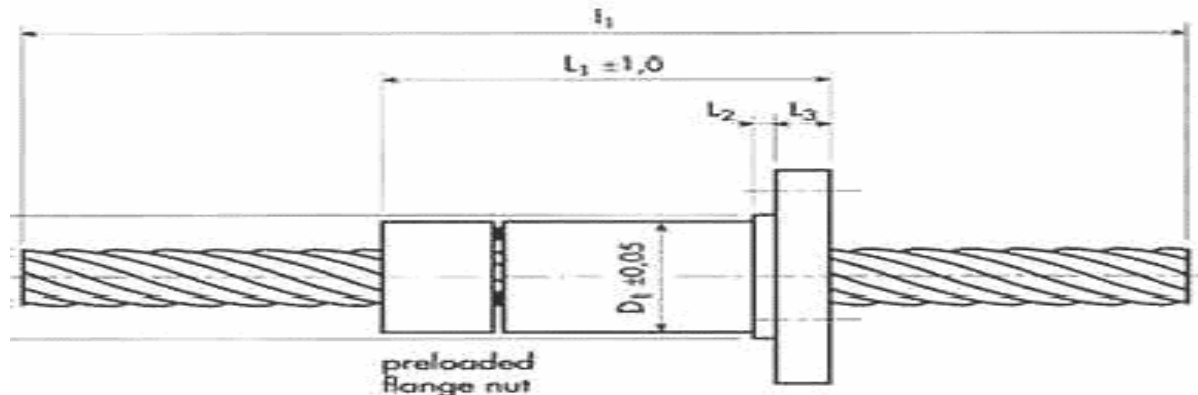


Steps In Design Of Hobbing Machine

- Selection Of Shaft And Nut: Based on The Given Parameters suitable calculations for the length and diameter of shaft are made.
- Validation Of Selected Bearing: The Manufacturer Has recommended a certain type of bearing. Using The Basic Calculations, Validity and Suitability Of the Bearing Is Confirmed.
- Design Of Bearing Housing: Based On The obtained Bearing , a Suitable Type Of Bearing housing is designed

Selection Of Screw Shaft

- The Following Calculations Were Made For Selection Of Screw Shaft
- Maximum stroke of column : 270 mm
- Minimum stroke of column : 30 mm
- Total effective stroke of the column: $270 - 30 = 240$ mm
- Nut length : $161 + 19 = 180$ mm
- Clearance distance = 10 mm
- Total length of Ball screw = $240 + 180 + 10 = 430$ mm
- Take total Safe length = 440 mm



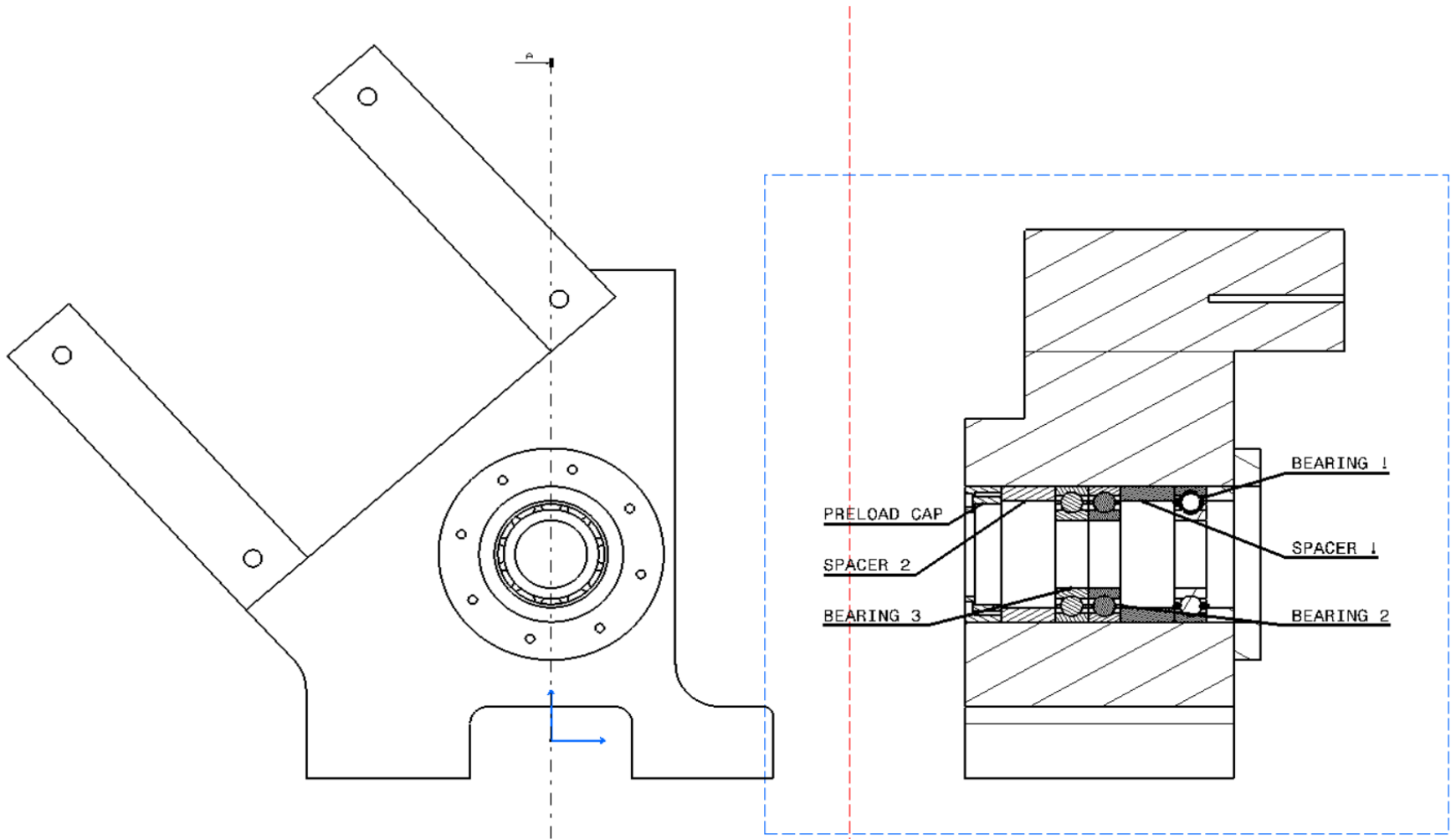
Validation Of Selected Bearing

- In Order To Obtain A Bearing For Our assembly, we Performed A Market research and obtained information about IBC and Temkin Bearing
- Hence, We Compared BS40M72 And BS40M90 Bearing.
- We Performed Various Calculations And Validations And Finally Selected The BS40M90 Type Of Bearing.
- INNER DIAMETER (d) = 40 mm
- OUTER DIAMETER(D) = 90 mm
- Basic dynamic load capacity(C) = 59000 N
- $C_r = 58155.46 \text{ N}$
- $L_{10} = 1500 \text{ Million Revolution .}$
- HERE $C > C_r$ THUS THE BEARING SELECTED IS SUITABLE.

Design Of Bearing Housing

- We had to restrict our design thinking and modeling due to the assigned area for bearing house mount.
- On the basis of this area we started our design iterations.
- Basic background check for the housing is that we need to convert the rotary motion of the shaft to linear motion.
- Along with this we need to hold the shaft so as it does not move along with the column giving rise to any back lash error.
- We inserted three BS40M90 bearings within the housing to hold the shaft .

DRAFT OF DESIGNED BEARING HOUSING



Machining Processes

- We used EN36 For Bearing Housing model.
- Later we Got It Machined From the Dealer.
- We Got Our Shaft Designed As Per Our Calculations And Design Conditions From Dealer

Machining Processes Used

- Scrapping:

The guide ways was applied with a certain amount of glue and was then scrapped out with the help of a chisel. These processes helped in filling up minute gaps present over the surface and provide a flat surface. This same procedure was carried out over the column strip.

- Lapping:

Lapping is a machining process in which two surfaces are rubbed together with an abrasive between them, by hand movement or using a machine. This can take two forms. The lap is then used to cut a harder material the work piece.

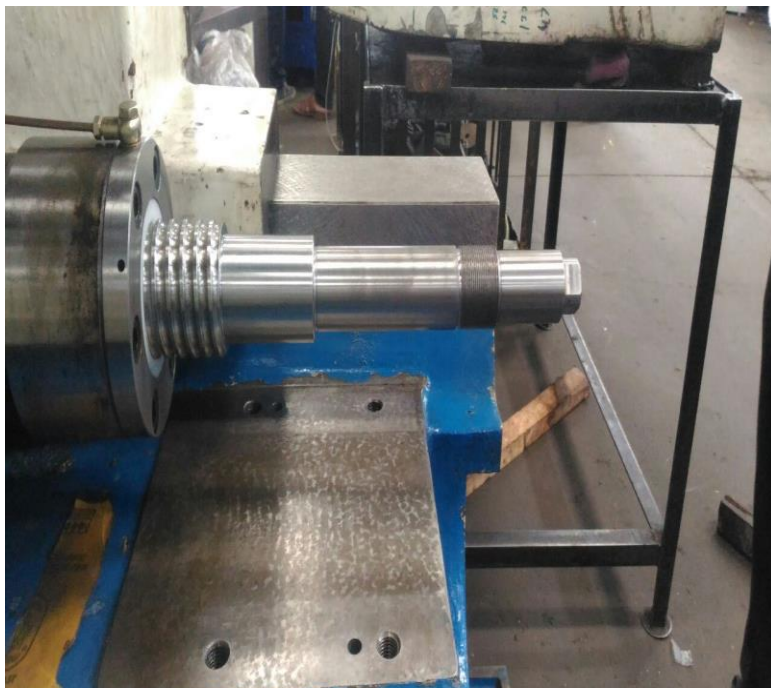
COST ESTIMATION

THE ABOVE COST IS APPROXIMATE . The Actual Cost May Vary!
The Entire Project Amount Is Sponsored By ARC MACHTECH PVT. LTD

SR. NO.	Particulars	Cost
1	Material	1,00,000
2	Machining	15,000(approx.)
3	Labour	20,000
4	Finishing & Testing	15,000
5	Coding Unit	1,00,000
	TOTAL COST	2,50,000 (approx.)

Schematic of hobbing machine

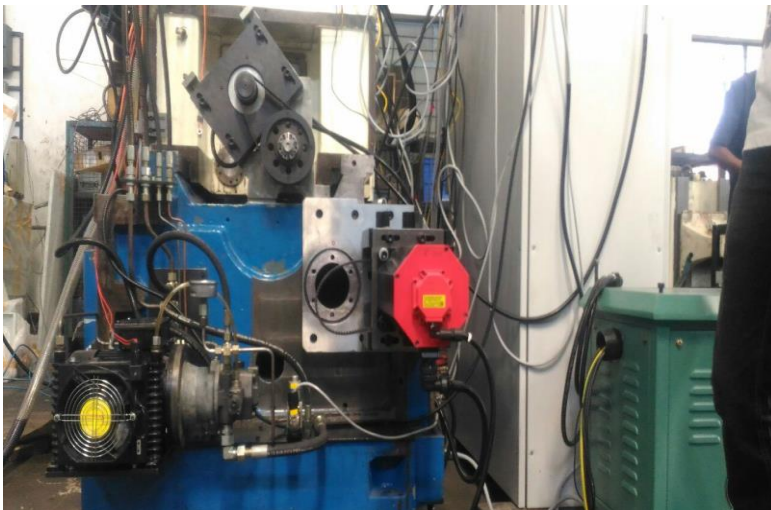




ACTUAL BALL SCREW USED



BEARING HOUSING ASSEMBLY



REAR VIEW OF RADIAL FEED



BEARING HOUSING CASING

CONCLUSION

- Thus, our design project has covered the complete design and modelling of the radial feed of a CNC Gear Gear Hobbing Machine.
- We also covered the various machining processes carried out during the conversion of a simple gear hobbing machine into a CNC Gear Hobbing Machine.
- The Various Design Validation And Calculations carried out by us match with the design specifications of the company.

THANKYOU!