

# Conversion of Conventional Hobbing machine into a 2-axis CNC gear hobbing machine

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**ABSTRACT-** Today, every manufacturing industry is very much conscious about improvement in equipment performance and in this computerized Numerical Control Technology is playing most important role. The benefit of conversion include a lower cost investment than purchasing a new machine and an improvement in uptime and availability. There are also other benefits including lower energy costs, higher performance and a new level of manufacturing data accessibility. If industries have conventional hobbing machine than conversion of conventional gear hobbing machine in to CNC machine is a great choice. For conversion of conventional gear hobbing machine into 2- axis CNC machine, the axial slide and radial slide is replaced by right hand ball screw. After completing the mechanical work, new electrical panel was installed containing servo drives and CNC control panel [Seimens 802D]. New AC frequency drive was provided for main motor to control the RPM of hob drive which will eliminates the gear changing. The RPM of the hob can be set by operator through variable frequency drive without changing its change gears. After conversion, setting time was reduced and achieve higher productivity , achieved higher accuracy, minimize the rejection due to size variation, good quality finishing of large module gear was achieved.

**KEYWORDS-** servo drives, ball screw, Seimens, CNC control panel.

## I. INTROUCTION-

Man is the only one that develops the goods for its convenience and luxury. With the change in technology, manmade machines are going to be automatic. Present days we can say that it is time of technology and conventional methods of working in industries are changing to semi-automatic and automatic methods. Old conventional machines are being replaced by CNC and PLC control machines for mass production

with higher accuracies and higher production rates. In some industries conventional machines are still using. Further modifications are being done by engineers to obtain maximum efficiency of the machines. Now a day electrical control panels of machines are modified from relay control circuits to CNC and PLC control for reducing the lead and setting time and for desired automation. In industries where the men are too busy that they need everything to be done automatically and conveniently. Due to high targets, if settings are done on conventional machines for product changeover, it takes a lot of time. So we have to make a system that can fulfill above mentioned requirements. The conversion of conventional hobbing machine into a CNC machine will meet all the requirements. It is not a good decision to replace the old hobbing machine with a new CNC machine because if the old machine is replaced with CNC machine then the old machine will get deteriorate. The cost of a CNC machine is also very high so it is not economical for industry to install a CNC machine at a time they have old machine so conversion of Conventional machine into CNC machine is useful. Instead of buying a new CNC gearhobbing machine it was more convenient to convert the old conventional machine into CNC by programmable logical controllers and servo mechanisms.

## II.PROBLEM FORMULATION

The main problem that occurred was the size variation in the manual hobbing machine which results in the rejection of the components. In these machines, a manual micrometer type size adjuster is provided for size adjustment.



**Fig. 1 Manual size adjuster of conventional hobbing machine**

The main disadvantage of these size adjuster are the uneven backlash which results in uneven size variation. As the machine is very old so it is noteconomic for industry to install a machine at a time they have old machine so that conversion of manual machine is very good option. If the industry buys a new CNC machine then the old machines will become obsolete and not even use in future. So, it is decided to convert the manual machine into CNC machine

### II.OBJECTIVE

The objective of this project is to modify a gear hobbing machine from conventional machine to a two axis CNC gear hobbing machine to increase the productivity and overall efficiency of the machine, reduce the rejection, minimizing the breakdown time and setting time during changeover.

### IV.METHODOLOGY

The CNC system is a very useful for two and three axis machines in industries. There are a lot of electronic systems available in the market for this purpose but according to our objective here we are using SEIMENS 802D based system. In this system we use servo drives for controlling the servo motors of axial slide and radial slide. The main advantage of the CNC system is that it eliminates the limit switch boxes with are used in axial and radial slides of hobbing machine for controlling and we can make and save programs for different components without adjusting its limit switch stoppers in every setting. Gear hobbing machine consist of radial slide and axial slide.Radial slide works on hydraulic cylinder and axial slide has lead screw for drive. In axial rapid movement, slide travels with rapid motor drive and

while in feed, clutch is used for axial feed drive through main motor. For CNC system, radial slide hydraulic cylinder is replaced with the ball screw. The cylinder cover is used as a mounting plate of box nut and bracket is made for mounting the servo motor. The axial slide lead screw is replaced with ball screw and its driving motor is replaced with servo motor by providing mounting plate for motor. Both the axis are controlled by CNC system. For this, old electrical panel is replaced with new PLC control panel with CNC system. A variable frequency AC drive is provided to control the RPM of main motor which eliminates the change gears setting for RPM control.

### V. MATERIAL AND EQUIPMENT REQUIRED-

The following table (Table-1) shows the equipment and material required for the preparation of the model. In this list there some materials are consumable and some are not consumable. For construction of model only consumable components are considered as the cost of the model.

S.N .	Materials and equipments	Qty
1	Servo motors 3KW 10Nm with servo drives	02 no's
2	Ball screws	02 no's
3	Mounting bracket for radial slide (tool room)	01 no's
4	Axial slide motor mounting plate (tool room)	01 no's
5	Coupling for servo motor	02 no's
6	Angular contact bearing 7206 CTDRUL P4	01 set
7	CNC system Siemens 802D	01 no's
8	Electrical Panel with PLC and control circuit (prepared from external source)	01 no's
9	Toolkits and hand drilling machine	

**Table-1 Materials and equipments required for the project**

### VI. FINAL RESULT-

The machine has been checked by making programs for some components and run the machine according to the program. The RPM of the hob can be set by operator through variable frequency drive without changing its change gears. After conversion, reducing setting time, achieving accuracy and productivity, minimizing the rejection, reduction in cycle time took place and

good quality and finishing are achieved in large module gear. If in case some fault may occur in m/c then alarm is shown on the display panel of the m/c which also reduces the maintenance troubleshooting.



**Figure 2. Size correction in CNC hobbing machine**

The problem of size variation is eliminated by the conversion of manual hobbing m/c into CNC machine. Now the size correction can be given in the CNC program on display panel as shown in the Fig. 2.

## VII. CONCLUSION-

The Conversion of manual machine into CNC machine is successful and the objective was that the machine should be reliable, high accurate, easy to operate, required low maintenance and reduces operator's fatigue. As the final result, the machine has performed according to our design and requirement.

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