

# Automation of Gear Hobbing Machine

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**Abstract**— now a days, gear manufacturing industry need a CNC hobbing machine for accurate gear production. If industries have conventional hobbing machine than conversion of conventional gear hobbing machine in to CNC machine with programmable logic controller and servo mechanism for better production of gear is economic and easy. By using PLC in gear hobbing following transformations has done. In hardware transformations, to minimizes the defects of traditional gear hobbing transmission: use of more motor driving mode control process; replacement of middle transmission mechanism; direct connection of motor shaft for movement; reduce transmission error so as to improve the machining accuracy. For better control, adopted the sensors to follow movement process; use of PLC & feedback better control process. Enhancing the function of gear-hobbing after reforming, adopt MCP man-machine interface for exchange. After transformation in gear hobbing machine the test results show that computerized numerical control transformation, helps improve efficiency, accuracy, life span of old machine and minimizes complexity for the operator.

**Index Terms**— gear hobbing machine, Siemens power pack, servo motors.

## I. INTRODUCTION

Recently every manufacturing industry is very much conscious about improvement in equipment performance and in this techno part computerized Numerical Control Technology is playing most important role. It is not economic for industry to install in machine at a time they have old machine so that retrofitting is useful. Retrofitting refers to the addition of new technology or features to older systems this definition gives an almost all information about the word retrofitting. When we say that retrofitting related to some component that mean we try to upgrade that component and improve their efficacy through a present technology. Rebuilding and remanufacturing typically include a CNC retrofit. The anticipated benefits include a lower cost investment than purchasing a new machine and an improvement in uptime and availability. But there are often other unanticipated benefits to retrofitting including lower energy costs, higher performance and a new level of manufacturing data accessibility.

The gear hobbing machine is the main gear processing equipment, which is used to manufacture large volumes and high efficiency production of spur and helical gears. Now question comes when there is need to manufacture variable transmission ratio of gears, at that time we need frequently to produce and replace the driving change gears, which bring inconvenience for the industry. This inconvenience results in decrease in production efficiency, precision, accuracy and processing flexibility. To avoid this major inconvenience we are re- equipping this gear hobbing machine tool with computerized numerical control technology.

## II. PRINCIPLE OF SYKES H 160 GEAR HOBGING MACHINE

The SYKES H 160 universal gear hobbing machine was originally a standard mechanical transmission machine. SYKES H 160 machine includes hob spindle, disk regulator, commonplace hob head, work table, modification gears, hydraulic driving and cooling system, electrical system and so on. It drives by one main motor, with all motions of the machine, like rotation of the hob and work table achieved by exploitation mechanical modification gears and corresponding index ratios. The main drive motor is a single speed three phase AC 2.2 kW induction motor. Totally different speeds will be achieved through a pulley-block belt. Index quantitative relation between the work table and the hob gear modified by using index gears that are settled within the back of the machine. The right constant timed relationship between the revolution of the hob and the work table maintained with help of index modification gears and feed modification gears. Separate system is employed to affects the rotation of the work gear and correlates the feed motion through a separate modification gear system (known as differential change gears) for getting the right lead. The differential imparts slight supplemental increment or decrement motion of the work table freelance of index modification gears and feed modification gears. Work table is mounted on giant bearing surface to enhance the damping against the intermittent cutting action of a hob. A worm wheel of a size larger than maximum size of gear to be hobbled drives the work table on the machine. The mechanical drive to work table is via one worm-wheel, and suits right and left hobs, achieved by an additional gear within the indexing arrangement: - The arrangement is additionally suitable for each climb cutting and traditional hobbing. Cutter spindle holds the hob arbor and ensures that the hob arbor and cutter assembly run true on its own axis throughout cutting. To reduce the result on the intermittent cutting action of the hobbing method, hob shift arrangement has done including the regulator. Limit switches get used as a security cut out or primarily as signal switches. An electrical pump provides the coolant oil to the hob head while cutting. The electrical control gear cabinet is mounted on the machine rear and has the whole contactor switch gear and machine control relays. In the front of the machine, a switch panel has settled. Principle behind hobbing i.e. a nonstop generating method, in which the cutter (the hob) rotates continuously in mesh with the gear being hobbled, progressively cutting all the teeth at constant time. because the hob rotates, its multiple cutting edges, that all lie on associate degree enveloping helicoid worm surface, cut move into house the flanks of a virtual generating rack of infinite

length that continuously rolls with the gear blank to generate the desired tooth type. Rotation of the hob in mesh with the work piece during this approach, with no different relative motion, would generate conjugate teeth on the gear. The transmission principle is shown in Fig.1. Within the method of cutting different teeth of substances or different ratio of substances combine, the gear should be adjusted. Fig.1 showing modification gears, which should be adjusted with the transmission quantitative relation of the created gear couple and therefore the teeth number of created gears. During this complete method modification gears are essential to hob totally different gears since the index ratio depends on the quantity of teeth of the gear and therefore the hob and the variety of gear that must be manufactured. Once the produced gear is modified, the modification gears should be calculated and manufactured. This will increase not solely complexity however additionally the process prices and adjusting time for producing and fixing the modification gears and results inconvenience.

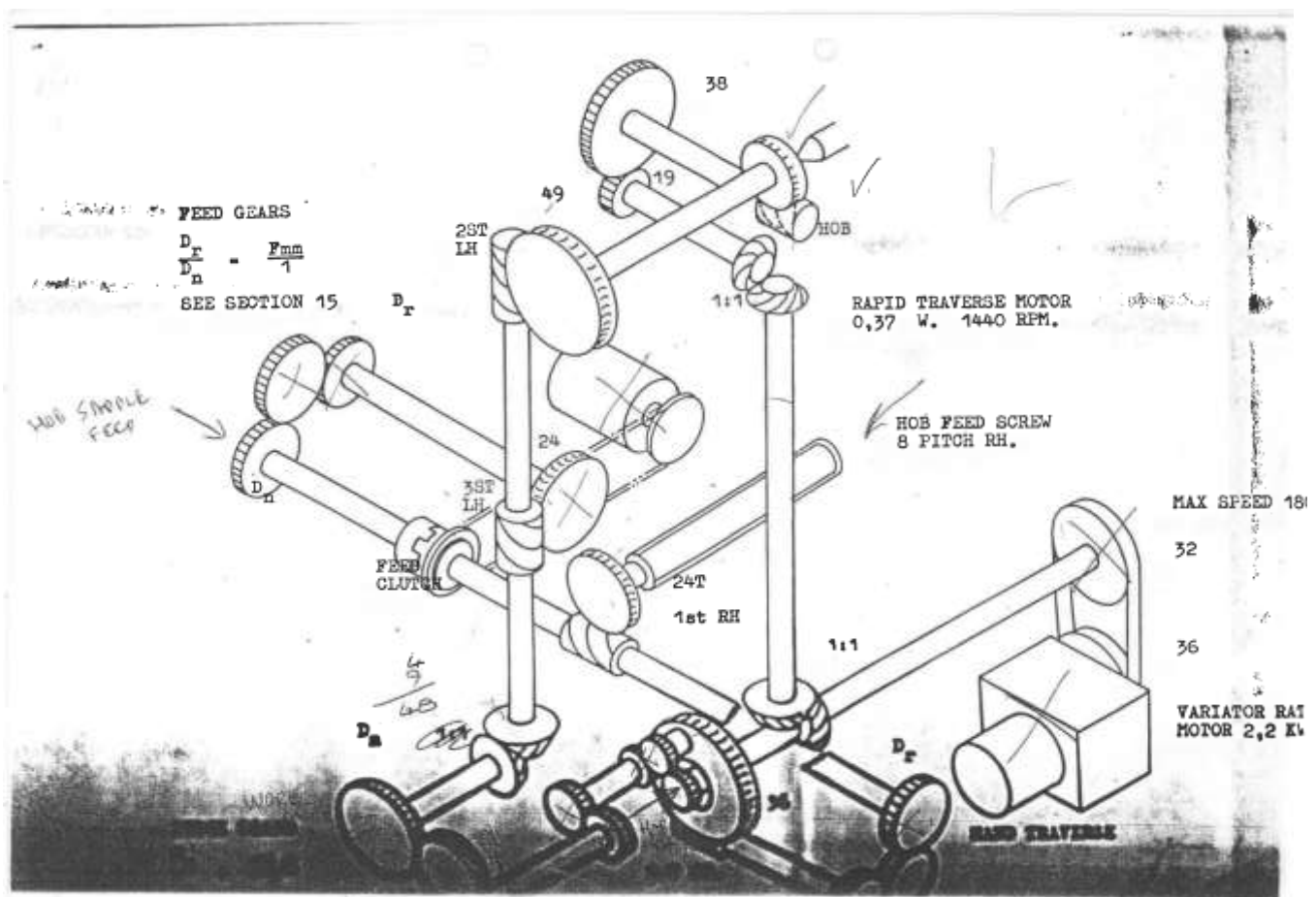


Fig.1 Transmission Principle

### III. SYSTEM DESIGN AND IMPLEMENTATION

The CNC system of mechanical transmission is focused at the motion. Four AC servo motors separately control the rotation of work table, rotation of hob, spindle rotation and table in depth of cut respectively. These four motors help to improve accuracy and provide large enough torque and transmit movement to the work table, hob and depth of cut. Remaining one axis require AC motor which control tool movement in feed/rapid. To achieve smooth motion, efficiency and precision conventional lead screw get replaced by ball screw.

### IV. CONCLUSION

Retrofitting is nothing but replacement or addition of equipment to existing machine tools to improve not only energy efficiency but extend their lifespan. So, ultimately increase their general output also. By developing automation in conventional gear hobbing machine by retrofitting stepper based method, the machine works as CNC trainer for teaching, learning of the student subject. In this paper, we attempted Retrofitting for gear hobbing machine. Addition of new technology or features to older systems helps improve efficiency and accuracy regarding hardware as well software transformations. Also, computerized numerical innovation simplifies the operations and minimizes the complexity for the operator. So, this retrofitting with computerized numerical control innovation has been globally recognized and accepted in the gear production industries.

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