Review on Conversion of Manual machine into CNC Machine

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Abstract -This paper discussed of literature review of different author who have tried to build the CNC machines from the manual machine. CNC machine contributed to better accuracy and higher productivity 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. After conversion, setting time was reduced and achieve higher productivity, achieved higher accuracy, minimize the rejection due to size variation, good quality finishing was achieved

***Key Words*:**CNC

1.INTRODUCTION

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. Due to high targets, if settings are done on conventional machines for product changeover, it takes a lot of time. The conversion of conventional machine into a CNC machine will meet all the requirements. It is not a good decision to replace the old machine with a new CNC machine because if the old machine is replaced with CNC machine then the old machine will get deteriorate. so conversion of manual machine into CNC machine is useful.

2. LITERATURE REVIEW

Kadamet al.(2014)said that as per the customer requirements, Company wanted to convert conventional gear hobbing machine in to the NC machine due to demand for improved performance of gears, to manufacture better quality gears preferably without using a further finishing process, such as grinding. So, by converting the conventional gear hobbing machine in to the NC machine the results showed that numerical control, helped improve efficiency, accuracy, life span of old machine and minimizes complexity for the operator.

Kulkarni et al. (2015) said that as there was demand for higher productivity and also tolerances should be tight it requires machine tools which was faster and very accurate at feed drive systems. As ball screw drive systems was used majority of machines, this system was tested several time. And it was used vastly because of its low cost and higher accuracy.

Delvadiya et al. (2017) said that instead of buying a new CNC gear hobbing machine it was more convenient to convert the old conventional machine into CNC by programmable logical controllers and servo mechanisms. This will lead to higher productivity and as well as more economic.

Nayak (2018)said that gear Hobbing was a special machining process for gear cutting, cutting splines, and cutting sprockets on a hobbing machine. Compared to other gear forming processes it was relatively inexpensive but still quite accurate, thus it was used for a broad range of parts and quantities. In this report we had done an extensive study over the advantages of Recirculating ball screw system over lead screw systems. The accuracy level was high by this Conventional gear hobbing machine compared to a lead screw type of system. Backlash error eradication as well as high work piece job accuracy had been achieved due to implementation of this Ball screw system. A Radial Feed drive system was designed for a CNC P320 gear Hobbing machine carried out various design validation processes to provide high results. On the basis of the feed system, a suitable Recirculating ball screw system was selected from the catalogue. Recirculating Ball screw system for a conventional Gear Hobbing machine in order to increase accuracy of the work piece as well as eradicate backlash error caused due to lead screw system drive.

Radu and Andrei (2018)said thatgears was one of the most important elements in power transmission systems. Theiruse was present in many industries due to their various advantages. Durability, constanttransmission ratio, reduced size, high efficiency, suitability for a wide range of powers wassome of the benefits. But gears also featured a number of drawbacks like vibration of the gearmeshing system generating an undesirable noise. The main source of such a noise was thetransmission error that result from misalignment of the gear, tooth profile errors and tooth deflections. Another undesirable consequence that would be present even if tooth deflectionswere insensitive is caused by manufacturing errors such as

profile, eccentricity, pitch or evenassembling errors. One of the best known methods of reducing transmission error of a gear pair was the profile correction. This paper described the main differences between static and dynamic transmission errors. It showed the most common methods of detecting the transmission error using analytical methodology, optimization algorithms, hybrid numerical/ Finite-Element Analysis and experimental researches in order to establish the dynamic behaviour of the gear pairs under different operating conditions

Thakare et al. (2019)said that the present world was heading towards automation for accurate production. CNC hobbing was an excellent technique use for production of gears with high accuracy. If industries was using conventional gear hobbing process then there was a need to replace it with a CNC gear hobbing by using NC codes and program logic.

.Stepanic et al. (2020) presented one example successful retrofitting of conventional horizontal milling machine into full automatic control milling machine. In addition to the new way control of machine also kept the old way with manual control of machine as provided with switch selector. The great accuracy of machine tool was performed using compensation of measuring system errors and sag compensation. Installation of computer numerical control compared to conventional control, significantly was improved efficiency and accuracy of machining and safely handling of milling machine. A retrofit of horizontal milling and boring machine W250 HC was introduced by manufacturing of Skoda.

Yang et al (2020) proposed that reliability of CNC gear hobbing machine was the basic factor for ensuring the quality, which was the most important factor that constituted the market competitiveness of products. Therefore, a hybrid model of dual Weibull distribution was proposed to analyze the malfunction characteristics of CNC gear hobbing machine. By using the actual experimental data from working-sites, the parameters for hybrid model of dual Weibull distribution were estimated through Weibull Probability Paper and mathematic software. Comparisons were carried out between single Weibull distribution with dual parameters and the proposed method. The results showed that the proposed method provide higher agreement with experimental data plot.

Zhu (2015)carried out a research work on analysis tool axis and workpiece axis motion relation principle of gear hobbing and synchronous control, interface input using the key parameter, the realization of programming automatically parameters of CNC system, To realize the parameterized hobbing programming, depending on the compiler could complete the programming function, namely according to the work piece, the tool data, process data and related parameters of cutting machine to automatically generate G code function. Automatic programming to the operator for processing through the processing parameters of gear control panel input, NC machining program of gear machining CNC system could identify and automatically, to simplify the process of the operator's operation

Jayachandraiah et al (2014)presented aboutincrease in the rapid growth of Technology significantly increased the usage and utilization of CNC systems in industries but at considerable expensive. The idea on fabrication of low cost CNC Router came forward to reduce the cost and complexity in CNC systems. The development of a low cost CNC router which was capable of 3-axis simultaneous interpolated operation is discussed . The lower cost was achieved by incorporating the features of a standard PC interface with micro-controller based CNC system in an Arduino based embedded system. The system also featured an offline G-Code parser and then interpreted on the micro-controller from a USB.

Parmar et al. (2014) proposed that products can be produced by modern technology, which used computer software, hardware and firm ware in industries. It was needed to use CNC lathe machine to get more accurate dimensions and irregular shape. So, CNC machines was becoming more and more important in modernized industrialization. It was required to convert conventional lathe machines into semi-automatic control lathe machine by retrofitting. Developing and changing into semi-automatic control lathe machine, there were three required portions, namely, mechanical electronics and hydraulic. In this project, they converted theconvention lathes which had 5ft bed length in to the semi-automatic lathe. In mechanical side they replaced the ball screw in place of lead screw for better accuracy and remove some unnecessary component like gears for providing space for motors. They add an extra plates or structure for installation of motors. Also provides a hydraulic circuit for coolant. In electronic side they used a servo/ stepper motor for both Z and X axis and provide controller for the efficient operation.

Li and Yao (2015) presented the error compensation technology to reduce thermal errors of a gear hobbing machine, and one experiment was carried out to verify the compensation effect. Different thermal sources were used as modeling variables, and a prediction model of thermal errors was presented based on back propagation [BP] neural networks. In order to solve local minimum problem of BP neural networks, ant colony algorithm was used for training its link weights. Finally, one test system was developed based on the presented model, and an experiment was fulfilled. The result shows that prediction performance of the model is very well, and the residual error was less than 5 μm after compensation.

Win et al. (2008) presented that CNC machines was becoming more and more important in modernized industrialization. It was required to convert conventional lathe machines into semiautomatic control lathe machine. Developing and changing into semiautomatic control lathe machine, there was three required portions, namely mechanical, electronics and mechatronics. From the

mechanical point of view, the design of hydraulic circuit was dramatically needed. These consist of changing the tool, working the machining processes and locating the tool in turret. The hydraulic circuit design which could be changed four kinds of tools by using hydraulic motor was made and also constructed. The hydraulic circuit comprises vane pump, hydraulic motor, and two directional control valves for changing the tool; 4/3- way valve and 4/2-way valve.

Mardane et al. (2016)introduced a special purpose attachment for drilling machine, which convert manual drilling machine into automated drilling machine. This machine served as a new solution in industry. An automated attachment for drilling machine to position worktable with reference to CAD model. The drilling and positioning as per coordinate extraction program could achieve accurately with the precision of 1mm point to point. The drilling operation could be performed once points are selected and 'RUN' radio button click with delay less than 3 seconds. This system was designed for small scale industry for drilling plastics and aluminum parts, like heat sink of LED as an alternate solution to CNC machine at low cost.

3. CONCLUSION

After reviewing above papers we can say that, CNC machine must be better designed and constructed, and must be more accurate than conventional machine. Conversion in to CNC machine have undoubtedly contributed to better accuracy and higher productivity. However high productivity and accuracy might be contradictory.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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