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A Review on Modification in Honing Machine Stone Feeding Installation

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Abstract - *Honing is one of the super finishing process used while bearing manufacturing. The inner and outer race of bearing needs to be honed, to obtain a uniform surface endurance strength. The finishing process takes place due to friction between honing tool and workpiece, which results in wearing of tool. Though this wear of tool is insignificant after honing one component, the cumulative tool wear during mass production is considerable. This relatively large wear will result in degradation of surface finish of component being honed. Hence the tool wear needs to be compensated by feeding the tool against workpiece. This feeding might be manual or automatic.*

In this project work, a mechanism based on ball screw actuator and stepper motor is installed to automate the existing manual feeding. Implementation of this system resulted in reduction in human errors caused by operator as well as increase in the number of bearing rings honed by the honing machine

Key Words: Honing, bearing, surface finish, tool wear, tool wear compensation, ball screw actuator, stepper motor.

1.INTRODUCTION

Honing is an abrasive machining process that machines a precision surface on a metal work piece by scrubbing an abrasive stone against it along a controlled path. The honing stones are held against the workpiece with controlled light pressure. It is desired that the honing stones should not leave the work surface. Honing process is primarily used to improve the geometric form of a surface and also improves surface texture. The surface finish has a vital influence on most important functional properties such as fatigue strength, wear resistance, power losses due to friction and corrosion resistance.

It is a one type of finishing operation employed not only to produce high finish but also to correct out-of-roundness, axial distortion and taper in workpieces. It is employed very frequently for finishing of bores. There are numerous external surfaces which are honed to obtain required properties or gear teeth, valve seating, races of ball and roller bearings etc.

Honing stones also called honing sticks which consists of particles of aluminum oxide, silicon carbide or diamond bonded together with vitrified clay, cork, carbon, metal or resinoid. The abrasive particles which provide the cutting action must be able to withstand the cutting pressure required for the metal removal. The bond must be strong enough to hold the grit, but it must not be so hard as to rub the workpiece and retard cutting. The porosity of the structure of the stick is depending on the mixture of grit and bond. The method and pressure used in forming the sticks, facilitates chip clearance, thereby minimizing the generation of heat.

The size of the grit ranges from 36-600 but the most widely used size ranges in between 120-320. Selection of a particular grit size depends mainly on the desired rate of material removal and the required finish. Coarse grit removes material as fast as possible but result comes out as rougher finish.

2.LITERATURE SURVEY

Henry Brunskill was done Real time measurement of wear, in 2015 P.Harper and Roger Lewis using a method called ultrasonic. In the fields of non-destructive testing (NDT) fordetection ,crack thickness monitoring and medical imaging Ultrasonic reflectrometry is commonly used. A sound wave is emitted through the material using a piezoelectric transducer. This sound wave travels through the host medium at a constant speed and then it is partially or fully reflected at an interface. The signal is then amplified and digitized after picked up the reflected wave by the same sensor. If the speed that sound travels through a host medium is known as well as the time this takes, using the speed, distance and time relationship the thickness of the material can be established.Work has concluded that the ultrasonic method is too inaccurate to measure wear due to the errors caused by temperature, vibration and the experimental arrangement. To minimize these errors this body of work looks at methods, particularly the inaccuracies introduced from the change in temperature caused by change of acoustic velocity and the thermal expansion of the material, which can be significant in many applications. In this, a time domain A-scan electric pulse is studied and time of flight is calculated.Thickness of material can be obtained and change of thickness can be studied by knowing the speed of the pulse, time of flight. Due to temperature and vibration errors are introduced, hence to overcome this reference reflection is created. In the experiment it was necessary to create a situation where a component experiences wear in a controlled manner in order to compare the ultrasonic method to other wear measurement methods. As it is a dynamic wearing Tribosystem a simple sliding configuration was used. A notch was cut on the top of the pin that particularly covered the path of the wave to introduce a reflection into A-scan which accounted changes due to thermal expansion. The change in time of flight due to thermal effects is studied and the weared length is measured (the velocity of pulse is known). By performing a fast Fourier transformation analysis on the pulse the wear measurement can be done. Thus the introduction of a reference reflection reduces the errors due to thermal effects.

Mohammad Malekiana, Simon S. Park, Martin B.G. Jun was done the tool wear monitoring. monitoring of tool wear is critical to avoid excessive wear and maintain tolerances and surface finish. The mechanical removal of materials is done by using miniature tools, known as micro-mechanical milling processes, has special advantages in creating miniature 3D components using a variety of engineering materials, when compared with photolithographic processes. Excessive forces and vibrations significantly affect the overall quality of the part because the diameter of miniature tools is very small. In order to improve the part quality and longevity of tools, the monitoring of micro-milling processes is imperative. This paper examines factors affecting tool wear and a tool wear monitoring method using various sensors, such as accelerometers, force and acoustic emission sensors in micro-milling. The signals are fused through the neuro-fuzzy method,which determines whether the tool is in good shape or is worn out. The tool wear monitoring can be done by various sensors such as accelerometers Kistler 8778A500, AE Physical Acoustics Nano30. The sensor was fused through neuro fuzzy algorithm. fluctuations are created and cutting forces affect the tool wear due to negative rack angle of tool. Tool wear and increase in nose radius will cause increase vibration and finally result in poor quality. The tungsten carbide tools were studied by using various sensors and tool conditions was deduced. The results of neuro fuzzy algorithms alerts the operator to change the tool. The lighting system may affect the accuracy of the edge radii measured by vision system.

"Tool wear prediction in turning" title of research paper published by S.K. Choudhury, P. Srinivas .This paper developed a reliable tool wear model as a function of cutting velocity, feed, depth of cut, variation of normal load with respect to flank wear, wear coefficient, hardness of the cutting tool and the index of diffusion coefficient. Some important factors like the index of diffusion, wear coefficient, rate of increase of normal load with respect to flank wear and the hardness of tool, influencing the flank wear have been used as input parameters to develop the mathematical model. The developed mathematical model was used to relate the wear to the input parameters for a turning operation. The input parameters were established based on the design of experiment technique. These tool wear values were compared with the experimental flank wear values and the correlation coefficient between them was found to be 0.988 which shows the stability of the model. The basic aim of tool wear prediction was fulfilled .The mathematical model formulated can be used to estimate the flank wear by means of the index of the diffusion coefficient, and the other input cutting parameters. It was shown experimentally and empirically that the cutting velocity and index of diffusion coefficient has the most significant effect on the flank wear followed by the feed and depth of cut. Results showed that this flank wear model is reliable and could be used effectively for tool wear prediction

3. CONCLUSIONS

The main purpose of this project was to achieve the specified objectives. To verify that the newly implemented mechanism for honing machine stone feeding completed those objectives various parameters were studied.

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