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A Review: Ovality Problem in Bearing

Trivedi Achyut
Assistant Professor
Marwadi Education Foundation Group Of Institution, Rajkot

Anand Khokar
Student
Marwadi Education Foundation Group Of Institution, Rajkot

Sagar Savaliya
Student
Marwadi Education Foundation Group Of Institution, Rajkot

Kuldeep Sarvaiya
Student
Marwadi Education Foundation Group Of Institution, Rajkot

Uveshkhan Pathan
Student
Marwadi Education Foundation Group Of Institution, Rajkot

Abstract

Ovality in bearing occurs in the outer ring during the grinding process. Grinding is a commonly used finishing process to produce components of desired shape, size and dimensional accuracy where the ultimate goal is to have the maximum quality, minimum machining time and high energetic efficiency. The focus of this study arose from a limitation that challenges the grinding process of bearing ring and damages arising during grinding process. Damages may reduce the life of critical components that are often subjected to severe working conditions with repeated loading and vibrations. So it is necessary to focus on the potential failure occur during grinding process. Project shows the possible cause and its solution to respective problem. The main objective of this project is to find out the possible cause of the failure of the bearing ring and solution to the respective problem. The purpose of the investigating is to determine the causes of the rejection and uneven shape and ovality of the outer ring of the bearings during the grinding process by using magnetic plate and to decrease the wastage of lubricating oil used after the final inspection.
Keywords: Bearing, Ovality in Bearing

I. INTRODUCTION

By far, the most common bearing is the plain bearing, a bearing which uses surfaces in rubbing contact, often with a lubricant such as oil or graphite. A plain bearing may or may not be a discrete device.

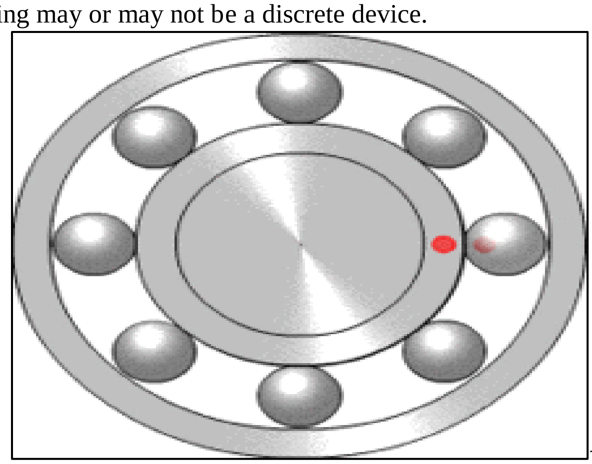

Fig. 1: Bearing Work

It may be nothing more than the bearing surface of a hole with a shaft passing through it, or of a planar surface that bears another (in these cases, not a discrete device); or it may be a layer of bearing metal either fused to the substrate (semi-discrete) or in the form of a separable sleeve (discrete). With suitable lubrication, plain bearings often give entirely acceptable accuracy, life, and friction at minimal cost. Therefore, they are very widely used.However, there are many applications where a more suitable bearing can improve efficiency, accuracy, service intervals, reliability, speed of operation, size, weight, and costs of purchasing and operating machinery.Thus, there are many types of bearings, with varying shape, material, lubrication, principle of operation, and so on.

II. LITERATURE SURVEY

Anton Panda al[1]., 2012 have made effort for reducing the Ovality of bearing ring and obtained his result by using ring of taper roller bearing made up of 100Cr6 (SAE 52100) material. It was found that Ovality results from nonsymmetrical distribution of internal tensions before hardening and uneven heating and cooling.

It was also observed that after grinding the similar deformation can occur. It was found by experiment that tampering has greater impact on ovality and tampering is done in order to obtain fine martensitic structure due to re distribution. Hence concludes that re tampering must be done between pre grinding and fine grinding of the bearing rings.

Jens Sölter al., 2008 have done experiment on the continuous wall thickness can be optimized using proper clamping sequence.It was stated by him that an almost constant wall thickness can be produced for an angular shift of 60° and a strong decrease of the clamping force of inner clamping.Lastly concluded that if rings are holded on the outside with a 3-jaw-chuck and from the inside with segment-jaws the resulting elastic deformations and stresses are the same for different angular shifts and can be explained by the area contact of the ring with the segment jaws. the out of roundness of the inner surface will be transferred to the outer surface which would lead to a constant wall thickness after machining.

Holger Surm al., 2009 have found that the change in roundness deviations of bearing rings due to quench hardening was exclusively determined by the clamping technique during turning, these led to a characteristic manufacturing residual stress state. It was found by him that Rearrangement of stresses in the complete ring can be correlated to temperature dependent change in roundness deviation.He simulates the result for the SAE 52100 ring with use of different chucks for clamping purpose. The result shows that with increasing temperature, these plastic zones extended according to stress distribution in direction of lower stress levels.The progressive stress relief affects the development of roundness deviation: At 400 °C, increase of roundness deviation is calculated, which can be correlated with the additional expansion of the plastic zones. Lastly he also concluded that results of his roundness are more sensitive to clamping force.

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