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A FEA STUDY ON HEAT OF CERAMIC AND STEEL ROLLER BEARINGS

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Abstract— **Roller bearings represent the vital element in many fields of engineering applications such as lathes, drills, internal combustion engines, pumps and turbines etc. The improvement in bearing technology resulted in the reduction of friction, wear, and maintenance expenses. It also improves the durability of machinery. Bearings are important elements in many machines. The temperature is the important property to maintain the fixed durability. Friction in bearings causes an increase of the temperature inside the bearing. To analyse the heat flow in a bearing system a typical roller bearing with rollers made of ceramic and steel rollers will be modelled in PRO – E and analysed using the Finite Element Method (ANSYS 12.0).**

Keywords— ***Heat Generation, Modelling, Thermal Analysis, Static and Steady State***

I. INTRODUCTION

Roller bearings represent a lot of applications in which the bearings operate at relatively high temperatures and under severe tribological conditions. Ren et al [1] describes that silicon nitride roller bearings is produced thermal stress during sintering and mechanical stress during lapping process. Milan ZELJKOVIĆ et al [2], analyses the determination of deformation, stiffness, and change the contact angle. Based on non-linear mathematical model for analysis of the static behavior of roller bearings has been developed.

Daisuke et al [3], describes that increasingly conscious about the global environment, and, car users are demanding improved fuel economy for their cars. Hence, to reduce running torque, size and weight, the roller bearings used in automotive transmissions and differentials are to be designed suitably. Consequently, it is very difficult to establish a bearing design that satisfies all required characteristics under a combination of different loading conditions. Lucian Tudos and Cristina Stanescuc [4], describes that optimized products can make a difference in performance compared to the other producers. The differences between optimal design and conventional design are pointed out by way of a very simple example of mechanical design.

In the optimal design, the correct formulation of the mathematical programming problem will perform the coagulation of all project aspects in a uniform and global picture. All that, in classical design, was a succession of phases becomes a single process when the chosen approach is the optimal design. One might say that now all these phases are executed concurrently. After a rigorous study of the requirements for the specific product (for example a rolling-contact bearing or any other machine element), a set of independent parameters that fully define the product can be identified (type ,geometrical dimensions, materials etc.). Rogelio Sullivan and Tony Taglialavore [5] found that Roller bearings made of silicon nitride not only provide a much lower coefficient of friction due to extreme smoothness, but come with many other advantages, including higher hardness, lighter weight, and increased corrosion resistance. GM bH & Co. KG [6], explains the rolling bearings are reliable even under the toughest condition sand premature failure is very rare.

The literature review reveals that there is a research gap on roller bearing working under high speed applications. Hence, the objective of the present investigation is to evaluate the better material among ceramic and steel for the Roller bearings for the high speed applications.

II. METHODOLOGY

A. About Ansys software

ANSYS software provides designer with particularly strong tools, but to start using any of these applications an "object" with a certain geometric shape and size is required. But this is precisely the question: How and where did these dimensions and this shape come from? The answer offered by the conventional design is often a "covering" pre-sizing and, therefore, the analysis of the state of stress and strain not infrequently finds that the designed object should be further modified to make better use of the available material. In this situation it is necessary to amend, by means of an ANSYS application, the size and sometimes the shape of the designed part in order to near the actual values of the stresses and