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AN APPROACH FOR IMPROVING ROLLING CONTACT FATIGUE OF BEARING STEEL THROUGH ENHANCED COMPRESSIVE RESIDUAL STRESS

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Abstract

Hardened steels are attractive materials due to their desirable properties such as wear resistance and fatigue strength. They are widely used in transportation, energy generation and general mechanical engineering applications. The components in these applications are often loaded near their physical limits. Therefore, they have to be thermally treated to the desired mechanical properties and then finished in the hardened state in order to achieve surface integrity, dimensional accuracy, and shape. Hardened steel have traditionally been machined to finished geometries by abrasive processes such as grinding. Hard turning as a replacement for grinding becomes more and more attractive due to lower production cost, shorter cycle time, fewer process steps, and higher flexibility in machining the complex work piece geometry. However, there are still several fundamental issues to be solved in order to replace grinding with hard turning. Rapid tool wear remains an impediment to the process being economically viable due to the high cost of CBN cutting tools and large down time due to frequent tool change. Another issue is related with surface integrity. A hard and brittle white layer, which is detrimental to part performance, will be generated at the machined surface under certain conditions. This white layer has to be avoided. In this research paper, we aim to develop hybrid process with carefully design. It takes the advantages of both shot peening and hard turning processes that result in the extension of fatigue life, elimination of white layer and minimization of tool wear with acceptable surface finish.

Keywords: Rolling contact bearings, Residual Stress, white layer