Effects of Load Distribution on Life of Radial Roller Bearings

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An external load applied to a radial rolling bearing is distributed among the rolling elements. In many applications, the bearing internal load distribution may be altered by the elastic deformations of bearing rings. This alteration can have effect on bearing life. The objective of this study is to investigate the effect of load distribution on bearing life both theoretically and experimentally using several housing models which provide different contact conditions between the housing bore and the outer ring. This paper first presents a newly developed method of determining dynamic load distributions with an optical fiber strain sensor. The measurements of load distribution for the housing models by using this method have shown that the contact condition between the housing bore and the outer ring affects the load distribution, and the effect of load distribution on bearing life has been confirmed by the theoretical calculation of bearing life. Furthermore, the endurance tests using dented bearings were performed to validate the effect of load distribution on bearing life. The results of the tests have substantiated that the bearing life is substantially affected by the load distribution; moreover, it has been shown that there is a linear relationship between the calculated lives and the experimental ones.