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Investigation on thermal behavior and temperature distribution of bearing inner and outer rings

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Abstract: A measurement method for temperature distribution of bearing inner and outer rings based on fiber Bragg grating is proposed, and a bearing test rig has been established to measure the temperature of bearing rings at multiple points. Then, a calculation method is developed to research the temperature and its distribution of the bearing, which is consistent with the experiment result. The influence of applied load and rotating speed on the temperature distribution of the inner and outer rings is investigated as well. The results indicate that the temperature of the inner ring is higher than the outer ring and the circumferential temperature difference of the stationary ring is greatly affected by the radial load and rotating speed.

Keywords: Rolling bearing; Bearing rings; Temperature distribution; Fiber Bragg grating.

1. Introduction

The operating temperature and its distribution are important aspects of bearing condition monitoring, which directly affect the performance and service life of the equipment. If the heat increases rapidly due to some abnormal reason and it cannot be removed in time, the operating temperature of the bearing will continue to increase, which may lead to the overheating [1, 2]. In addition, bearing overheating will also change the lubrication state and further increase the local temperature of the bearing, leading to premature failure of the bearing components, such as burn-up and seizure[3-5] (Fig.1). Therefore, the investigation for bearing thermal characteristics, such as temperature levels and distributions, is becoming an increasingly important issue in bearing condition monitoring.

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