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论文

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航空发动机滚动轴承的载荷分布研究

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Research on the Load Distribution in Aeroengine Ball Bearings

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摘要

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摘要 滚动轴承载荷分布的研究大多应用基于Hertz接触理论的拟动力学法进行。由于Hertz接触理论半无限空间的边界条件,以及分析时采用刚性套圈假设,拟动力学法的计算结果与实际情况有较大出入。近年来随着有限元、边界元等数值计算方法的发展,使考虑套圈变形和边界条件影响的滚动轴承载荷分布的研究成为可能。建立滚动轴承载荷分布的有限元分析模型,分析载荷参数对轴承接触应力、接触角和变形的影响规律,并将有限元法的计算结果与拟动力学法及实验结果进行分析比较。研究表明:由于有限元法考虑套圈变形以及边界条件的影响,与实验结果更为接近。

关键词: 滚珠轴承 载荷分布 有限元法 接触应力 接触角

Abstract: The quasi-dynamic method based on the Hertz contact theory is usually used in the research on load distribution in ball bearings, but this method has a big discrepancy with the actual condition due to the semi-infinite boundary condition of the Hertz contact theory and the rigid ferrule hypothesis used. With the development of the finite element method and boundary element method, it is possible to research on the load distribution in ball bearings considering the ferrule deformation and boundary condition. The finite element method is used to research the load distribution in ball bearings in this paper. The regulars of the load distribution in different load cases are obtained by calculation. The results are compared with those obtained by the quasi-dynamic method and the experiment. It is found that the results of finite element method are close to the experiment values because the ferrule deformation and boundary condition are considered.

Keywords: ball bearing load distribution finite element method contact stress contact angle

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