

题目：洗衣机的行星齿轮减速器的可靠性优化分析

摘 要

现在,我国的洗衣机制造商所生成的洗衣机多采用行星齿轮传动的传动方式,行星齿轮传动相较于传统齿轮传动,它具有扭矩范围非常的大,其结构非常的紧凑合理,它的体积也比以前的小得多,质量也有所减小,与此同时它的噪音也比较小,可以使洗衣机运行平稳,不会出现洗衣机抖动,打桶等情况。传统的机械设计往往是根据经验设计,通过强度校核,刚度校核,来确定各零件的几何尺寸,但是这造成了材料过剩和浪费,也增加了经济成本。传统设计方法进行行星齿轮设计,设计者需要反复计算,查表,这往往也会增大设计难度,造成一些设计误差。随着科技不断发展,最优化思想在机械方面的不断发展,设计者可以通过对行星齿轮进行机械优化设计,可以使洗衣机的行星齿轮减速器实现轻量化的减速器设计的发展趋势。本项目主要研究以家用洗衣机的 NGW 型行星齿轮减速器为基础的物理设计模型,在已取得的所有行星齿轮研究成果和行星齿轮设计实践经验的综合基础上深入地分析和研究了减速器在洗衣机的机械系统的可靠性和结构优化中存在的不少问题,根据 NGW 型行星齿轮减速器的设计特点,建立了以行星齿轮体积最小为设计目标的函数,在一定的约束条件中考虑等强度的设计原则和对可靠性的要求。

关键词: 可靠性分析; 机械优化设计; 行星齿轮传动

Abstract

Now, our washing machine manufacturers produced more washing machine adopts planetary gear transmission mode of transmission, planetary gear transmission compared with the traditional gear transmission, it has a torque range is very large, its structure is very compact and reasonable, its volume is much smaller than before, quality is reduced, meanwhile the noise is small, can make the washing machine is running smoothly, there will be no washing machine jitter, play barrels, and so on and so forth. Traditional mechanical design is often based on the experience of design, through strength check, stiffness check, to determine the geometric size of the parts, but this caused the material surplus and waste, but also increased the economic cost. Traditional design methods for planetary gear design, designers need to repeatedly calculate, look up the table, which will often increase the design difficulty, resulting in design errors. With the continuous development of science and technology, the constant development of optimization thought in the mechanical aspect, designers can carry out mechanical optimization design of planetary gear, can make the planetary gear reducer of washing machine realize the development trend of lightweight reducer design. This project mainly studies on household washing machine NGW modeled physical design model of planetary gear reducer based on research achievements of all planetary gear and planetary gear design based on the practical experience of comprehensive thorough analysis and research the reducer in the washing machine mechanical system reliability and some problems existing in the structure optimization, according to characteristics of NGW modeled the design of the planetary gear reducer, set up the minimum volumes of planetary gear as the function of the design goals, in a certain constraint conditions such as strength design principle and the requirement of reliability.

Key Words: Reliability analysis ; Mechanical optimization design ; Planetary gear drive

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