# Research on the Load Sharing Characteristics of Split torque-combining power Gear Transmission with comprehensive transmission error

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## 1. Introduction

The split torque-combining power gear transmission structure is an advanced configuration of gear transmission system. It has the advantages of compact structure, small quality and high efficiency, and has widely application prospects in industrial equipment, heavy machinery, wind power installations and other industries. The high speed, high efficiency and high bearing capacity of the split torque-combining power gear transmission system puts high demands on the transmission performance of the gear. However the gear transmission error is an important indicator to evaluate the gear transmission performance, which directly affects the working accuracy, reliability and life of the transmission system. Therefore, it is very necessary to study the comprehensive transmission error.

A lot of research work has been done by domestic and foreign scholars. Bodas et al. used the planar finite element-contact model and the three-dimensional GSAM model to study the influence of the manufacturing error of the carrier and gear on the static uneven load coefficient of the system. The experimental results show that the model is feasible. However, the randomness of manufacturing errors increases the workload of modeling [1]. Sweeneyp has established a pair of gear transmission models with error based on the consideration of meshing stiffness, microscopic shape and tooth shape error, but the model is simple and rough[2]. Zhu Zengbao analyzed the influence of error on the load-carrying characteristics of herringbone gears. The research work has certain reference value for the selection of precision control and processing methods for the gears of closed differential herringbone gear transmission system [3]. Ren Fei carried out research on manufacturing load on the uniform load characteristics of planetary transmissions, and pointed out that reduce the error or adopt the floating mode play an important role in the load distribution of the herringbone planetary gear system [4]. The research on the uniform load characteristics mostly focuses on the single-pair gear meshing and planetary transmission system, and the research on the influence of manufacturing error on the load-carrying characteristics for the split torque-combining power gear transmission system is still not too many [4-7] .

Gear manufacturing and installation errors are often ignored, but the above factors have a significant impact on the accuracy of the dynamic model. The gear pair is unevenly distributed due to manufacturing and installation errors during the meshing process. Load balancing is important to improve the life of split torque-combining power gear transmission system. Vibration control is extremely important. In this paper, the problem of uneven distribution of load due to manufacturing and installation errors is studied, and the reference for the design of the transmission system is provided.

## 2. Body of abstract

The split torque-combining power gear transmission system has the advantages of compact structure, small mass and high efficiency, and has broad application prospects in the fields of aerospace and modern ship power transmission. Due to the inevitable manufacturing and installation errors, the load distribution between the gears of each stage is not balanced, making the advantages of split torque-combining power gear transmission system difficult to play. Aiming at the problem of unbalanced load distribution, based on the lumped parameter theory, the dynamic equation of split torque-combining power gear transmission system is established, which takes into account the manufacturing error and installation error of the components of the transmission system. The load caused by manufacturing error and installation error is not. The dynamics analysis is carried out, and the influence of the transmission error of each meshing pair on the unbalanced load distribution is discussed. It is theoretically and technically supported to improve the dynamic characteristics of the transmission system.

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