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GB/T 44846-2024

Calculation of load capacity for plastic gear

塑料齿轮承载能力计算

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Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for standardization work Part

1.Structure and drafting rules for standardization documents" Drafting. Please note that some of the contents of this document may involve patents. The issuing organization of this document does not assume the responsibility for identifying patents. This document is proposed and coordinated by the National Technical Committee for Standardization of Gears (SAC/TC52). This document was drafted by: Beijing University of Technology, Shenzhen Zhaowei Electromechanical Co., Ltd., Shenzhen Sanduole Intelligent Transmission Co., Ltd., Suzhou Xingnuoqi Technology Co., Ltd., Guangdong Desheng Intelligent Technology Co., Ltd., Zhengzhou Machinery Research Institute Co., Ltd., Zhejiang Jiezhong Technology Co., Ltd., Dongguan Xinghuo Gear Co., Ltd., Dongguan

Yujia Precision Hardware and Plastic Products Co., Ltd., Guangdong Jinli Intelligent Transmission Technology Co., Ltd. Technology Co., Ltd., Ningbo Gree Plastic Industry Co., Ltd., Ningbo Shuanglin Auto Parts Co., Ltd., Zhongshan Yishang Gear Technology Co., Ltd. Co., Ltd., Zhejiang Jiechang Linear Drive Technology Co., Ltd., Hunan Panco Transmission Technology Co., Ltd., Chongqing University, Zhongshan Xiangshan Transmission Technology Co., Ltd., Guangdong Ocean University. The main drafters of this document are. Shi Zhaoyao, Li Qing, Yu Bo, Xin Dong, Wang Zhigang, Yang Dongping, Luo Tingde, Zhou Changjiang, Sun Kun, Liu Huihua, Tong Aijun, Sun Yongping, Wang Xiaowen, Wang Shifeng, Xu Pingjun, Zhang Guangyan, Han Yinan, Liu Huaiju, Li Ping, Dong Jianjiang, Lu Yongfang, Wang Defeng, Gu Laifa, Han Chao, Shen Changjian, Gong Zhichao, Ding Hongyu, Li Sheng, Lu Zehua, Xia Ningwei, Li Haixia, and Fan Ruili.

Since plastic gears are quite different from metal gears in design requirements, manufacturing methods, and application areas, this document is based on the The material properties, common failure modes, and transmission types of the gears are different (compared to metal gear transmission), with emphasis on the following aspects.

--- Considering that the strength of plastic gears is greatly affected by temperature, the tooth temperature verification method is described, and the calculation method of tooth root and tooth profile temperature is given. formula;

--- Considering that wear is one of the main failure modes of plastic gears, the friction wear verification method is described, and the wear of some materials is given. coefficient;

--- Considering the small elastic modulus of engineering plastics and the need to transmit power, a method for checking gear tooth deformation is described;

--- Describes the peak load verification method;

--- Considering that there are many factors affecting the transmission efficiency of plastic gears, the fluctuation range is large, and it has a significant impact on temperature rise, the transmission efficiency estimation is described. Calculation method, and includes transmission efficiency design;

--- describes the calculation method of the load capacity of staggered helical gears (for steel-plastic paired staggered helical gears, failure is almost only Limited to plastic gears, verification can be performed using characteristic load values, tooth root strength, and tooth surface contact fatigue);

---The failure modes and causes of plastic gears are given. Calculation of load capacity of plastic gears

1 Scope

GB/T 44846-2024 gives the Chinese method for calculating the load capacity of plastic gears. Plastic gears are now used far beyond toys and appliances, in automotive actuators,

power tools, medical devices and office machines, and they fail in ways a steel gear does not: the tooth temperature rises under load because the material is a poor conductor, the modulus falls as it does, the tooth deflects enough to change the contact, and wear and creep compete with the classical bending and pitting mechanisms. The standard follows that reality. For parallel-axis cylindrical gears it sets the general principles and the basic parameter calculation, then requires a tooth temperature check before anything else, and then the tooth root bending fatigue strength check, the tooth flank contact fatigue strength check, the friction and wear verification, the peak load verification and the gear tooth deflection check. It then covers the load capacity calculation for the other gear arrangements the series addresses. For a designer specifying or verifying a plastic gear against Chinese requirements, this is the calculation the design will be assessed against.

This document describes the calculation method for the load carrying capacity of plastic parallel-axis cylindrical gears and staggered-axis helical gears. This document is applicable to the design and verification of gears made of semi-crystalline thermoplastic materials, whose basic tooth profile complies with GB/T 1356 or GB/T 2362, and is.

--- Parallel shaft spur and helical cylindrical gears with a module mn >=

0.1 mm; or

--- Module mn >= 0.3mm, axis angle Sigma <= 90° and metal worm (number of heads z1 < 6, worm basic tooth profile conforms to GB/T 10087 or GB/T 10226) paired helical gears.

2 Normative references

The contents of the following documents constitute the essential clauses of this document through normative references in this document. For referenced documents without a date, only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies to This document.

GB/T 1356 Standard basic rack tooth profiles for cylindrical gears for general and heavy machinery

GB/T 1357 Module of cylindrical gears for general machinery and heavy machinery

GB/T 2362 Basic tooth profile of small module involute cylindrical gears

GB/T 3374.1-2010 Gear terms and definitions Part

3.1 Terms and Definitions The terms and definitions defined in GB/T 3374.1-2010 and

GB/T 3374.2-2011 apply to this document.

3.2 Symbols and abbreviations The symbols in Table 1 apply to this document. Table

1 Symbols and units Symbolic terms or units of description Af fracture area mm2 AG gearbox heat dissipation area m2 Atau shear area mm2 AE meshing line length mm a Center distance mm ah semi-major axis of the contact ellipse (mm)