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STUDY OF THE CYCLOIDAL GEAR CHARACTERISTICS FOR OPERATION IN GEAR AND MULTIPLIER MODES

С. А. ЗЫЛЬ
Научный руководитель М. Е. ЛУСТЕНКОВ, д-р техн. наук, проф.
Консультант Е. Н. МЕЛЬНИКОВА
Белорусско-Российский университет
Могилев, Беларусь

The present paper deals with the study of the cycloidal gear characteristics for operation in gear and multiplier modes.

The literature and theory on the use of cycloidal gears in modern drive systems were reviewed to obtain the results. The method of creating all the geometry and interrelationships was clearly defined. Subsequently, advanced computer skills in 3D modeling and simulation were developed.

Due to the complexity of the cycloid wheel profile, computer modeling was used to obtain appropriate results. There was also a need to utilize the help of computer software due to the time limitation that was insufficient for analytical calculations.

NX software is a CAD (computer-aided design) environment that enables the creation of three-dimensional solid models. The entire process of creating an assembled product involves two steps: parts and assembly fabrication. The first and in fact the main step is to create parts (solids) from existing sketches using “features”.

The most important step is the creation of the epicycloid wheel (disk).

A special sketch feature called «equation driven curve» – a law defined spline – is used to create a parametric equation for the desired curve or, in this case, profile. As a result, a perfect epicycloidal curve is obtained. Using the feature «extrude», the epicycloidal wheel is created.

The second step makes it possible to arrange the solid parts in a certain order, respecting the interrelationships necessary for the proper operation of the mechanism.

A feature called “motion” is used for modeling, where the rotational speed is added along a specific axis.

The following gear parts were designed: an input shaft, an output shaft, a cycloidal disk (satellite), a center pinion.

Using the NX’s potential, a prototype/model was built and tested.

The obtained results are as follows:

The cycloidal gearbox was thoroughly studied. A complete process for calculating the geometry of a cycloidal gear was presented.

The efficiency for gears with different characteristics was determined.

A computational model was studied using advanced CAD software, which showed many advantages of the mechanism.

In the future, the obtained gears will be tested for a wide range of parameters: durability, strength, static and dynamic analysis. In addition, an experimental prototype of a mechatronic module with cycloidal gear will be developed.