

inside the car and the weight of the car itself. The integrated drive system is an important structure of the new type of energy-saving vehicle in the actual operation [2].

2.2. The design of the structural framework of the three-dimensional permanent magnet energy-saving drive system

New car stereo permanent magnet drive system research and development of energy conservation are the first work of setting drive system internal electromagnetic structure, according to the structure of motor design and calculation of the reasonable use of the status of the analysis method to identify the basic framework of new energy three-dimensional energy-saving drive system permanent magnet [3]. As a three-dimensional energy-saving drive system of permanent magnet rotor magnet structure, it is an important part that in the process of the design the motor should be a priority. The structural performance of different rotor will produce great influence on the performance of the motor. Mode of clear and reasonable analysis and selection of magnetic field period in the form of electromagnetic structure and isolation structure, all of them improve the performance of three-dimensional permanent magnet energy-saving driving system in order to achieve the purpose, to make it better adapting to the new motor drive system design requirements of contemporary energy saving automobile. When designing the structure of magnetic circuit, the factors such as the amount of permanent magnet, the missing coefficient of magnet and the induction coefficient of motor should be taken into full account. If the stereo permanent magnet motor is set under a certain condition, its power density increases while the permanent magnet volume in the structure are increasing. However, the range of permanent magnet of motor is limited. It's better to have larger permanent magnet. For the rotor with different magnetic circuit structures, the electromagnetic induction coefficient of the system is different.

In addition to the three-dimensional system, it should also be considered in the design of the motor size of permanent magnet energy system, including the overall length of the motor and motor stator inner and outer straight etc., therefore, the motor size calculation formulas in the entire design process is of vital importance. The calculation formula of the dimension of the three-dimensional permanent magnet energy-saving driving system is as follows:

$$P = \frac{P}{60} \cdot I \cdot MB \cdot Mdp \cdot Di1 \cdot \frac{L1}{N \cdot A1}$$

In formula 1, P represents the electromagnetic power (kw) of the motor. I represents the arc length coefficient; MB represents the magnetic field wavelength coefficient; Mdp represents winding coefficient; Di1 represents the inner diameter (m) of the stator; L1 represents the axial

length of iron core (m); N represents the motor speed (RPM); A1 represents electrical load (A/m).

2.3. The Internal design of 3D rare-earth permanent magnet electric motor drive system

Three-dimensional permanent magnet drive system energy-saving system research and development has two types of important contents. Firstly, motor drive system and the electromagnetic and interrelated coefficient are closely related to the energy saving motor structure parameters. Unlike other kinds of motors, the three-dimensional magnetic field of permanent magnet motor was produced due to the irritation of the rare earth permanent magnet, and the performance of the magnet can be as the magnet material, production technology, changing with different shapes. In addition, the different structures of the motor rotor magnet performance show that each of them is not identical, therefore, the three-dimensional energy-saving design method of drive system mainly adopt permanent magnet effect of equivalent magnetic circuit analysis method and the equivalent effect magnet grid analysis method. The drive system is one part of the new energy automobile which determined the overall power, economy and reliability of the automobile as an important part of new energy vehicle, battery and motor have great influence on the data of drive system. On the contrary, the determination of the drive system will also form a boundary condition for the selection of battery and motor. The motor power is so small, which will reduce the performance of functions such as climbing high slope and acceleration. Too much power of the motor will lead to the loss of efficiency. As far as batteries are concerned, battery pack is too small to meet the needs of the high-power motor operation, which greatly reduces the performance of the car. Too many batteries will cause difficulties in layout and heavy load [4]. And three-dimensional energy-saving drive system of permanent magnet design can reasonably control power and resistance, and be fast charging and release electricity deeper. Timely adjustment of the power is made to let cars of new energy goes much further, which has greatly improved on vehicle performance. Three-dimensional permanent magnet drive system energy-saving system adopts efficient three-dimensional permanent magnetic material, and improves the power density. Relative to the stereo permanent magnet drive system energy-saving system which outputs the rated power, it has been largely reduced on the quality and volume. At the same time, due to its low rotor loss and large controllable range, its efficiency is higher than that of traditional system of drive motor [5]. To consider the vehicles of new energy driving efficiency and reliability of the system operation, it should be paid highly attention to design, it should be more limited in the increase of the DSPM motor system in the whole motor running area occupying

the proportion, as well as increasing the power density and the power of motor drive ratio. It guarantees the three-dimensional permanent magnet drive systems of high power and high efficiency energy saving. And motor drive systems of new energetic vehicles conform to the requirements of volume and weight.

3. Experimental Comparison

To test the performance of three-dimensional permanent magnet energy-saving drive system, we selected cars that were produced in Shanghai automobile manufacturers to do the motor comparison experiment. There are two groups in the experiment, what are control group and experimental group. Control group uses conventional motor driven system while the experimental group is a three-dimensional rare-earth permanent magnet electric motor drive system. The differences in r&d cost, energy consumption, reliability, controllability, power density and efficiency were compared.

Note: the data in the table is represented by Numbers between 1 and 10. The smaller the data, the more obvious the advantage of the project in the experimental comparison, 1 indicates the most obvious advantage and 10 indicates the lowest.

Table 1. Comparison Number of Experimental Parameters

Item	Reference group	Experimental group
R&d	10	3
cost	8.7	2
Reliability	5.6	1
Controllability	4.3	1.5
Power density	8	2.5
Efficiency	9	1

As can be seen from the above table, in the electric vehicle drive motor system, the three-dimensional permanent magnet energy-saving drive system has better performance and more obvious advantages. The use of the abundant rare earth resources in our country reduces the high imported material purchases, meanwhile, on the basis of traditional drive motor system optimization and improvement, largely reduces the development costs. Driving motor system of traditional energy consumption is a large waste of the resources, and the permanent magnet drive system energy-saving system internal device can reduce power loss. Low consumption not only is beneficial to save energy, but also makes the motor's service life longer, so that the new type DSPM motor system has higher reliability and controllability. The traditional materials and technologies used in the traditional drive motor system have low powerful density, which reduces the stability and efficiency of the automobile in the actual driving process. The system uses new materials and technology to improve the power density of the

motor and to a large extent enhance its operating efficiency.

By above knowable, vehicles of new energy are a combination of saving energy, simple, environmental protection and a new type of car, and energy-saving driving system have a permanent magnet drive car and its advantage is more obvious, that is, replacing the internal combustion engine with motor driven by electricity and saving automatic transmission. Compared with the traditionally automatic transmission, the structure of the rare earth permanent-magnet motor is simpler, the application of technology is more mature, and it is more reliable in practical operation. The traditional internal combustion engine car needs a complex and huge variable structure, because the structure is controlled within a narrow range of structure, the speed will be affected a lot by them. The rare earth permanent-magnet motor operates in a wide range and can generate torque more efficiently, so its noise is lower and operation is simpler.

4. Conclusions

The main core of new energetic vehicles is its driving device and the development of new electric motor energy-saving drive device. The design of the new driving system has become the latest goal of automobile manufacturers all over the world. With the continuous development of vehicles of new energy, the study design of electric vehicle drive system has become the focus of a high-profile topic in the auto industry, and the three-dimensional permanent magnet drive system energy-saving system has the advantages of energy conservation and environmental protection, less energy consumption, high efficiency and good performance, controllability and high reliability, low noise, low cost, which can not only better save the limited resources, but also promote the improvement of the natural environment. As a result, the three-dimensional advantages that the permanent magnet driving system energy-saving system can adapt to the social demand for vehicles of new energy, providing a powerful motivation for the development of new energetic vehicles, and promote the new development of auto industry in our country which is more in line with the trend of the development of today.

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