

Introduction and Analysis of Electric Vehicles

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Abstract: This essay introduces the basic concept, classification, advantages and disadvantages of electric vehicles. Focus on the power composition of electric vehicles. At the same time, the development prospect of electric vehicle is also envisaged.

Keywords: Electric vehicles; Motors; New energy technology

1. Introduction

Electric vehicles refer to vehicles that are powered by on-board battery supply and drive wheels with motors, which Comply with the requirements of road traffic and safety regulations. Because the impact on the environment is relatively small compared with traditional cars, its prospects are widely optimistic.

There are three types of electric vehicles: pure electric vehicles (PEV), hybrid electric vehicles (HEV), and fuel cell vehicles (FCV).

Compared with fuel cars, pure electric cars are mainly different in four parts: drive motor, speed control controller, power battery and on-board charger. The quality difference of pure electric vehicles depends on these four components.

Hybrid electric vehicles refer to vehicles that can be powered at least from consumable fuel or rechargeable energy storage devices.

Fuel cell vehicle is a vehicle powered by fuel cells. Fuel cell chemical reaction process will not produce harmful products, so fuel cell vehicles are also pollution-free vehicles.

2. Power System Structure of Pure Electric Vehicle

The special structure of electric vehicle includes power supply, motor, motor speed control device, transmission device and so on. Other devices of electric vehicles are basically the same as internal combustion engines.

2.1. The power supply

The power supply provides electric energy for the driving motor of electric vehicles. At present, the most widely used power supply in electric vehicles is lead-acid battery. The developing power supply mainly includes sodium sulfur battery, nickel-cadmium battery, lithium battery, fuel cell, flywheel battery and so on.

2.2. Motor

The purpose of driving the motor is to convert the electric energy of the power supply into mechanical energy, and drive the wheels and working devices directly through the transmission device. The motor will be further introduced later.

2.3. Motor speed control device

Motor speed control device is set for the speed change and direction change of electric vehicles, its role is to control the voltage or current of the motor, complete the motor drive torque and rotation direction control.

2.4. Transmission device

The role of electric vehicle transmission device is to transfer the driving torque of the motor to the driving shaft of the car. When using electric wheel drive, most parts of the transmission device can often be ignored. Because the motor can start with a load, electric cars do not need the clutch of traditional internal-combustion vehicles. Because the rotation of the driving motor can be changed through circuit control, electric vehicles do not need to reverse the internal combustion engine in the automotive transmission. When the motor step less speed control, electric vehicles can ignore the traditional vehicle transmission. In the use of electric wheel drive, electric vehicles can also omit the traditional internal combustion engine vehicle transmission system differential.

3. Introduction of Pure Electric Vehicle Motor

Based on the characteristics of electric vehicles, there are also higher requirements for the motors used. In order to increase the maximum speed, the motor should have a high instantaneous power and power density; In order to increase the driving distance of a single charge, the motor

should have higher efficiency. And electric vehicles are variable speed work, so the motor should have a high comprehensive efficiency; In addition, it has strong overload capacity, large starting torque and quick torque response. Electric vehicle starts and climbs the slope when the speed is low, but the request torque is big; Normal operation requires less torque and high speed. At low speed is the constant torque characteristic, at high speed is the constant power characteristic, and the motor speed range should be wide. In addition, the motor should also have a solid, reliable, has a certain dustproof waterproof ability, and the cost cannot be too high.

At present, there are three typical driving motors.

3.1. DC motor

In the early stage of the development of electric vehicles, most electric vehicles use dc motor as the driving motor. Dc motor control mode is easy, excellent speed regulation; However, the mechanical structure of dc motor is complex, the motor speed is low, the mechanical structure will produce loss after working for a long time, the current electric vehicle industry has basically eliminated the dc motor.

3.2. Permanent magnet synchronous motor

The greatest advantage of permanent magnet synchronous motor is that it has high power density and torque density. However, the permanent magnet material of permanent magnet synchronous motor in high temperature, vibration and over current conditions, will produce magnetic decay phenomenon, easy to damage.

3.3. Asynchronous motor

Compared with permanent magnet synchronous motor, asynchronous motor has the advantages of low cost, simple technology, reliable and durable operation, convenient maintenance, and can endure a large range of temperature changes. But in terms of weight and volume, asynchronous motors are not advantageous.

4. Advantages of Electric Vehicles

Torque generation of an electric motor is very quick and accurate.

Motor torque can be measured easily. [1]

Simple structure and low noise.

No exhaust gas is discharged during driving, which does not pollute the environment.

wide range of use, not affected by the environment (such as low temperature environment, high altitude environment).

5. Disadvantages and Existing Problems of Electric Vehicles

Pure electric vehicles have the following disadvantages: short driving range; Long charging time; The battery life is short and needs to be replaced in a few years.

At the same time, there are some problems in the development of pure electric vehicles. Battery is the technical bottleneck of the development of new energy vehicles. There are few supporting facilities, inconvenient maintenance and charging stations in China.

6. Development Prospect of Electric Vehicles

6.1. The smart grid

From the perspective of grid load, it is a troublesome problem to provide power for charging piles of electric cars in the grid, because the charger of electric cars is quite a large load. A common phenomenon is that many electric car owners will go home together at rush hour and charge their cars immediately after going home. In this way, the simultaneous high-power charging behavior will have a serious impact on the distribution system, which will reduce the efficiency of the system and easily lead to power failure due to overload. Fortunately, the development of smart grid communication infrastructure will provide an excellent opportunity to manage this problem with intelligent or smart coordinated charging of PEVs. [2]

6.2. Four-wheel motors

Gearless wheel motor drive systems for fuel cell electric or hybrid vehicles have advantages over the classical construction with one central machine. [3] Gearless wheel motor drive systems for fuel cell electric or hybrid vehicles have advantages over the classical construction with one central machine. Because do not use differential and gear reducer, so also can reduce the weight of the transmission shaft, further reduce the body weight.

6.3. Conclusion

Electric car projects can bring a lot of benefits to the world, especially to alleviate the problem of worsening pollution. This project can reduce the emission of combustion waste gas. Although the research and development of electric cars is not mature and the penetration rate is not high, the government and scientific research institutions have done their best to change this situation. Good projects always go through setbacks, and we should support the development of electric cars.

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