Research on Power Motor Test System of Energy Vehicle Based on Computer Control

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**Abstract.** With the increasingly serious problem of energy shortage, new EV (hereinafter referred to as EV) research has become an important research field, which can help alleviate the energy crisis and environmental pollution. New EV is a way based on electric energy as the power source, which is a kind of vehicle with motor as the core. Therefore, the performance of the motor is directly related to the operating efficiency, which requires us to test the motor. Therefore, this paper designs an automatic test method, which can simulate the running time and load of new EVs, which can better ensure the stability under different working conditions. With the development of computer, can bus technology has been applied to various industries, especially in the automotive field. Firstly, this paper analyzes the CAN bus technology of new EVs. Then, this paper analyzes the motor model and file ion battery model. Finally, this paper puts forward the motor test scheme.

**Keywords:** Computer Control, Energy Vehicle, Power Motor Test

1. Introduction

At present, the fuel automobile industry is still the key production field [1]. However, with the increasing demand for environmental pollution, low-carbon economy will be the future development mode of our country, which requires our country to increase the research and development of new EVs, which will better formulate the direction of the future development of the automobile industry. Motor is the driving system of new EVs, which will directly determine the power performance of new EVs [2]. At present, the country has not established a perfect industry standard, which requires us to continuously develop motor test system, which will more comprehensively evaluate the power motor of new EVs. Among them, can bus technology is an important technology applied to computer control, which can scientifically manage hierarchical structure, message frame, fault definition and bus management. Through the CAN bus technology, the motor controller can communicate better, which will better realize the two-way communication of the host computer [4-5]. Then, this paper analyzes the motor model and file ion battery model, which can be more detailed analysis of motor performance. Finally, this paper puts forward the test scheme [6-8].
2. New EV can bus technology

2.1. Overview of CAN bus

Can bus was officially released by SAE in 1986. The first can controller chip in the world was jointly developed by Intel and Philips. Bosch has released a variety of CAN protocol specifications. The specification has two parts: one is the standard version with 11 bit identifier, which is usually called CAN2.0A. The other part is the extended version with 29 bit identifier, which is usually called CAN2.0B [9]. In 1993, the ISO issued the general can protocol standard ISO 11898, in which the data link layer of can is added in ISO 11898-1 standard, the physical layer definition of high-speed can is added in ISO 11898-2 standard, and the low-speed physical layer of can is added in ISO 11898-3 standard, which also enhances the fault-tolerant ability of CAN communication [10].

2.2. Application of CAN bus in automobile

In modern times, a car usually has as many as 70 electronic controllers, among which the most complex control unit is the engine control unit, and the communication between the control units of these subsystems is essential. The control unit of each subsystem needs to control the data feedback of actuators or sensors in the vehicle. The traditional point-to-point transmission mode can not meet the requirements. The advantage of CAN protocol is that a single node can communicate with multiple nodes at the same time, which can ensure the security, economy and stability of communication. The application of CAN bus in each subsystem of automobile is as follows. First, automatic start stop device. By taking the sensors around or inside the vehicle as input, the CAN bus sends the data of each sensor to the engine control unit [11]. Therefore, the engine control unit will judge whether the engine can be shut down according to the established rules, which can improve fuel economy and reduce emissions. Second, electric parking brake device. The electric parking brake device can judge whether the current vehicle stops on the slope from the tilt sensor and speed sensor through CAN bus. In this way, we can decide whether the device will start or not. Third, park assist system. When the driver is reversing, the transmission control unit can send a signal through the CAN bus, which can activate the auxiliary parking sensor system. The door control module of the passenger's door mirror tilts down, which shows the position of the side of the road. The CAN bus also receives input from the rain sensor, which triggers the rear windshield wiper when reversing. Therefore, the parking aid system is more convenient for the driver, and the reversing perspective is not affected [12].

2.3. Characteristics of CAN bus

At present, all the communication networks in automobiles are based on CAN bus standard, and the most commonly used standard is ISO11898 international standard. Can bus usually adopts double shielded wire. There is a copper net around the internal signal line to prevent interference, which makes the CAN bus work normally in a relatively poor environment. The maximum speed of CAN bus is 1MB /S [13]. The maximum transmission distance between two nodes in CAN bus is related to its transmission rate, as shown in Figure 1.
Figure 1. The relationship between the maximum transmission distance of CAN bus and bit rate.

3. Motor model and file ion battery model

3.1. Motor model

The simulation process of the motor model is as follows. First, it belongs to all kinds of parameters, such as demand torque, speed, input power, etc. Then, after the speed limit module, the speed enters the motor input power two-dimensional map look-up module. The actual input power of the motor outputs the actual drive torque and speed of the motor, which is returned to the gearbox model. In this way, we can achieve closed-loop simulation. The required power of the motor can be obtained by combining with the required speed of the motor, and the power data stream can enter the simulation model. Based on the motor model, this paper establishes the motor assembly model, as shown in Figure 2.

Figure 2. Motor model.

3.2. Battery model

The battery simulation model assembly in sor includes several modules, such as battery temperature simulation module, current calculation module, state of charge simulation module and so on. The state
of charge of the battery can be calculated approximately according to the load current and the battery temperature. The battery model is shown in Figure 3.

![Battery model](image)

**Figure 3. Battery model**

4. **Control strategy of AC power dynamometer**

4.1. **Constant torque mode**

In this paper, the torque closed-loop control mode of AC power dynamometer is established, as shown in Figure 4. AFE rectifier system and ASD inverter system control two AC dynamometers, which can take torque regulation as closed loop. By adjusting the excitation current of two AC dynamometers, we can achieve constant torque control. AFE rectifier system and ASD inverter system can adjust the excitation current of two AC power dynamometers, which can ensure the constant torque output of two AC power dynamometers.

![Torque controlled loop control mode of AC power dynamometer](image)

**Figure 4. Torque closed loop control mode of AC power dynamometer**

4.2. **Constant speed operation mode**

In this paper, the speed closed-loop control mode of AC electric dynamometer is established, as shown in Figure 5. AFE rectifier system and ASD inverter system control two AC dynamometers, which can be closed-loop by speed regulation. By adjusting the frequency of two AC dynamometers, we can achieve constant speed control. AFE rectifier system and ASD inverter system can adjust the control frequency of two AC power dynamometers, which can ensure the constant speed output of two AC power dynamometers.
Figure 5. Constant speed operation mode

5. Conclusion

In the context of globalization, a recognized motor test system can seize the commanding height of the market, which will also be better modeling. This paper puts forward two schemes for motor test, which can be better controlled.

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