Research and Development of Measurement and Control System of New Energy Vehicle Computer Technology Test Bed

Lesheng Liu*
Wuhan Business University, Hubei, China, 430056

*E-mail: 2376745768@qq.com

Abstract. At present, with the increasingly prominent environmental problems, the automobile industry is gradually transforming to meet the increasingly stringent environmental requirements, and more and more new energy vehicles are put into use. This paper analysis the function of the new energy automobile test-bed: after combined with computer technology, research and development of multi-channel real-time dynamic data acquisition and analysis system. Finally the article discusses the combination of computer technology test measurement and control system design are verified. It provides a reference for measurement and control research of new energy automobile test-bed.

Keywords: New Energy Vehicle, Test Bench, Measurement and Control System, Computer Technology

1. Introduction

With the increase of people's demand for environmental protection, the automobile industry has gradually transformed from traditional fuel vehicles to new energy electric vehicles. As new energy vehicles are still in the initial stage of development, many supporting measures and facilities still need to be further improved. Therefore, strengthening the research on the measurement and control system of the new energy vehicle test-bench is helpful to promote the development of the new energy vehicle industry, reduce the development risk of the new energy vehicle, so as to promote the further upgrading of the automobile industry in China, as well as the effective implementation of the national energy conservation and emission reduction policies. In a word, no matter from the perspective of ecology or industry, it is urgent to carry out relevant research on the measurement and control system of new energy vehicle test-bench. Therefore, we need to continue to strengthen efforts to carry out in-depth[1].
2. Function analysis of new energy vehicle test bench

2.1. Structure of new energy vehicle test bench

The basic structure of the new energy vehicle test-bench system mainly includes two parts: mechanical part and measurement and control part. The measurement and control content of the new energy vehicle test bench mainly includes simulating the operation of the vehicle under different working conditions, testing key systems and components, etc., and it can comprehensively verify and test the overall performance of the new energy vehicle. Its basic structure is shown in Figure 1.

![Figure 1. Basic structure of the new energy vehicle test bench](image)

2.2. Principle of new energy vehicle test bench

The power system of the test-bench mainly consists of power supply and engine, in which the clutch is used to realize the power output of the driving system. In the simulation of the whole vehicle, the torque output of the engine and the motor is realized through the accelerator, and the brake is realized through the brake pedal and the motor re brake. In the process of braking, the motor will recover energy and charge the power supply until the end of the cycle.

2.3. Function of the new energy vehicle test bench function

The new energy vehicle test platform mainly tests the vehicle system components and the whole vehicle. As the premise of the new energy vehicle test platform measurement and control system, functional analysis will have a direct impact on the performance of the new energy vehicle test platform system. Therefore, in the new energy vehicle development system engineering, the function analysis of the test platform is essential. The engineering process of new energy vehicle development system is shown in Figure 2, which is a typical V-model structure. In addition, the construction of the development process is based on software simulation, bench test and road measurement, among which bench test can simulate the operation of vehicles under any working condition, so it can replace many vehicle road test contents[2].
2.4 Function module of new energy vehicle test bench

At present, in order to reduce costs and improve efficiency, more and more modular design is used in the automobile industry. The different functions of products are divided into modules, which can not only meet the personalized needs of customers, but also ensure the universality of products. In the same way, due to the diversity and complexity of the tested vehicles, in order to reduce the cost of test and improve the efficiency, it is necessary to adopt modular design scheme for the new energy vehicle test bench, which can not only ensure the universality of the test bench, but also meet the requirements of vehicle diversity test. Generally speaking, the functional modules of the new energy vehicle test bench mainly include several parts as shown in Figure 3.

3. Development of multi-channel real-time dynamic data acquisition and analysis system

3.1. Data acquisition

Because basically the output signals of the sensor are analog signals, and the computer can only calculate
digital signals, therefore, in order to make the computer have the ability to process analog signals, it is necessary to convert the analog signals collected by the sensor into digital signals that can be processed by the computer. Usually, the data acquisition card is used to realize the conversion process. In addition, since the signal data acquisition card only receives voltage information, in order to ensure the accuracy of the measurement results and ensure the safety of the equipment, the information of the acquisition card must be configured based on the operation principle of the data acquisition card[3].

3.2. Design of multichannel data acquisition system

The data acquisition system needs to collect the output information of key components including motor, transmission mechanism and engine through the test bench. In addition, as a single measured signal only needs a single wire to connect to the analog input port of the acquisition card, the other end only needs to be grounded. Therefore, the information setting of the initialization of the board is prior to the data collection. Then select the equipment, set the starting channel, channel number, voltage input range, channel gain value and other parameters.

3.3. Data signal processing

In order to eliminate the signal noise caused by environmental factors in the measurement and control system, so as to ensure the measurement accuracy and the smooth operation of the system, the collected signal needs to be processed. Because of the key role of filtering technology in signal acquisition and processing, it is usually used to process signal noise and select frequency. Through filtering technology, we can filter the unwanted frequency and only transmit the specified frequency components. At present, most of the signals are processed by digital filter to increase the proportion of the required signals and eliminate the unwanted noise signals[4].

4. Test and verification design of measurement and control system

After completing the development of the whole measurement and control system, in order to verify the feasibility of the measurement and control system, we need to test each module of the system, so as to improve the measurement and control system. In addition, the mechanical components and electronic control system of the test-bench will have interference errors, which mainly include electromagnetic interference, transmission interference and vibration noise. Because these interferences will lead to errors in data acquisition, it is necessary to adopt grounding anti-interference technology and shielding technology to eliminate the noise impact, so as to ensure the accuracy of the collected data, as well as the test accuracy of the new energy vehicle test bench, and objectively reflect the working characteristics of the whole vehicle and the system of the new energy vehicle.

5. Conclusions

The research and development of the measurement and control system of the new energy vehicle test-bench is helpful to obtain the key data of the new energy vehicle research and development, and get the key parameters of the vehicle, so as to improve the scientific basis for the improvement of the vehicle[5]. In this paper, a multi-channel real-time dynamic data acquisition and analysis system is designed based on the development platform of virtual instrument LabVIEW, which realizes the bench simulation of electric control and driving load of engines, motors and electric dynamometers. Finally, the reliability
of the control system is verified by bench test. In order to find out the factors that affect the accuracy of the test bench, some measures are proposed to improve the accuracy of the test bench[6].

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