

# Current Status and Innovative Research on Fault Diagnosis and Maintenance Technology for New Energy Vehicles in the New Era

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**Keywords:** New energy vehicles; Fault diagnosis; Current status of maintenance technology; Innovate

**Abstract:** The power drive system of new energy vehicles has both practical and environmental value due to traditional energy vehicles. However, if it is well maintained during use, it is also prone to malfunctions, which can affect the practicality of new energy vehicles. This article studies the current status and innovation of fault diagnosis and maintenance technology for new energy vehicles. Based on the actual situation, faults can be divided into two types: mechanical and electrical faults. During the operation of a car, all components of the transmission will be in a state of high load and high-speed operation, leading to damage to internal components and transmission failure, which in turn poses a threat to the driving process. On the basis of ensuring insulation, standardized operations are carried out to ensure the safety of the entire testing process. At the same time, maintenance personnel can use a megohmmeter to measure the insulation of the high-voltage system inside the car, in order to ensure the absolute safety of the vehicle. Then, based on the experience and control principles of the staff, as well as measures such as a multimeter, the status of the battery is determined to maintain the normal operation of the components, ensure the value of the drive, and ensure the stability of the car's operation.

## 1. Introduction

In recent years, with the increasing income level of people, cars have gradually become an indispensable means of transportation for contemporary young people, and China's automobile industry has also ushered in one opportunity after another in recent years. While the traditional automobile industry brings convenience to people's transportation, it poses a certain threat to China's non-renewable resources, and the automobile exhaust emissions are increasing day by day, which has caused serious damage to people's living environment and health. Now, with the improvement and development of the quality of life of young people in China, the traditional automobile can no longer adapt to the pace of people's life [1]. The introduction of new energy has effectively improved the traditional situation that gasoline is the main power of the engine, alleviated the current crisis of gasoline shortage, and the application of new energy can also reduce the emission rate of pollutants, which is in line with the policy of sustainable development and energy conservation and emission reduction in China. It can be said that new energy vehicles are the main trend of the future development of China's automobile industry [2]. The power drive system of new energy vehicles is due to the traditional energy vehicles in terms of use value and environmental protection value, but if it is well maintained during use, it is also prone to failure, which will affect the practicality of new energy vehicles. The market share of new energy vehicles in China is the electric vehicle, and the maintenance personnel need you to face the problems of excessive current intensity and excessive voltage in the vehicle when detecting vehicle faults. If effective protection measures are not taken in the maintenance process, it will have serious consequences for the health of the staff [3]. Therefore, in today's new energy vehicle maintenance work, we should pay attention to improving the safety awareness and work skills of the staff, and adopt scientific and effective ways to improve the safety guarantee of the maintenance personnel. Therefore, once the new energy vehicle fails, the related diagnosis technology and maintenance technology are also different from the traditional vehicles [4]. In order to ensure the normal and practical use of new energy vehicles, it is necessary to analyze their faults in time in daily use and

adopt effective maintenance technology to repair them. The maintenance and fault diagnosis technology of new energy vehicles is related to the stable operation and service life of vehicles. By studying the diagnosis and maintenance technology, the problems caused by faults can be alleviated to a great extent, and the frequency of faults can be reduced, so that the incidence of faults can be effectively reduced in the future use, the after-sales cost can be reduced, and the rapid development of the new energy automobile industry can be promoted [5].

## **2. Common Fault Analysis of New Energy Vehicles**

### **2.1. Battery failure of new energy vehicles**

The main new energy used by new energy vehicles refers to electrical energy, which is environmentally friendly. Due to its energy-saving characteristics, it is deeply loved by automotive users. In addition, the power system of pure electric vehicles is different from the power system of traditional cars, and its operation relies entirely on the power provided by batteries. When a single lithium battery provides kinetic energy for a car, it may have inconsistent performance with other lithium batteries, which can lead to excessive discharge or insufficient charging of the lithium battery [6]. This not only has a direct impact on the lifespan of lithium batteries, but may also cause the entire lithium battery pack to malfunction, thereby reducing the value of pure electric vehicles. The management system in new energy vehicles also monitors the use and safety of the battery pack. When the management system fails and cannot monitor the battery pack, it may cause problems such as overcharging, discharging, and overloading of the battery, leading to battery failure [7]. As the usage time of electric vehicles increases, the insulation layer of high-voltage ignition wires is prone to aging and softening, leading to leakage and short circuit problems.

### **2.2. New energy vehicle transmission failure**

The new energy vehicle relies on the transmission to realize the functions of speed change, reversing and direction switching, so as to facilitate the new energy vehicle to change its driving demand according to various environments and driving conditions during driving, thus ensuring its safe driving. In different environments, the problems of system failure are quite different, and it will obviously increase the difficulty of fault diagnosis. If the fault problem cannot be diagnosed and solved in time, it will affect the service life of the car and even expand the scope of the problem [8]. According to the actual situation, faults can be divided into mechanical and electrical faults. In the process of automobile running, all parts of the transmission will be in a state of high load and high speed operation, which will lead to the damage of internal parts and the failure of the transmission, thus threatening the driving process. When the problem occurs, it is necessary to diagnose the motor operation in time, find out the fault, and detect related systems, such as the bearings and related components of the drive system, so as to ensure the stability and safety of the motor drive system [9].

### **2.3. New energy vehicle motor failure**

The electric motor drive system can achieve the conversion between mechanical and electrical energy, and there are many factors that affect its occurrence of faults, mainly including circuit system faults, mechanical system faults, and magnetic circuit system fault lights. Any system fault will cause the electric motor drive system to not operate normally, which will also affect the safety and stability of the drive system operation [10]. As shown in Figure 1, when the car is first powered on, the combination instrument occasionally prompts the EV function, and at this time, it automatically switches to HEV. Unable to switch to EV mode again, the fault phenomenon will automatically disappear after less than 5 minutes. After disappearance, the EV mode can be used normally.



Figure 1 New Energy Function Restricted Fault

Specifically, there are two types of motor system faults: electrical faults and mechanical faults. Electrical faults are mainly reflected in poor contact or short circuit between stator windings and rotor windings. Mechanical failures are mainly reflected in the components of the drive system, such as bearing failures and iron core failures. Because of its different running state and running environment, the failure problems are not the same. If it is not analyzed, it is difficult to diagnose the faults effectively. If there is a short circuit or poor contact of the motor, it may be an electrical fault, and if there is damage to bearings, iron cores and rotating shafts, it may be a mechanical fault.

### 3. Innovation in Fault Maintenance of New Energy Vehicles

#### 3.1. Battery failure repair

The battery is in a state of low power, which can easily lead to sulfation of the battery, affecting the adsorption of aluminum sulfate crystals on the battery electrode plate, blocking ion channels, and not only unable to provide electricity to the car normally, but also reducing the battery capacity for a long time, thereby affecting the normal application and energy supply of the battery. Therefore, when the battery is idle, it should also be regularly charged. Regular charging of lithium batteries is necessary to ensure that they are in a fully charged state. Pay attention to daily maintenance work and ensure that lithium batteries are in a closed state when they are idle. In addition, it is necessary to ensure that the air conditioning, lighting, and audio equipment in the car are turned off. If there is a malfunction in the controller part of the lithium battery, it is necessary to diagnose and repair it based on the power outage. In this process, it is necessary to first establish a testing and maintenance cycle. Usually, a comprehensive inspection should be conducted every 3 months. In battery fault diagnosis, it is generally judged through fault indicator lights, low SOC indicator lights, etc. The reasons for this problem are low battery power and untimely data collection of individual batteries. To address this issue, a display screen can be used to view the issues with individual batteries and battery packs, and a diagnostic instrument can be used to read fault codes to ensure normal operation. Inspect the controller section in the event of a power outage to confirm if the controller is in a normal state. During the maintenance process, it is also important not to arbitrarily change the wiring of the controller. It is also necessary to clean the dust and waste on the surface of the controller. For the cleaning of the controller, pure water should be used, and high-pressure gas and brushes should be used to remove dust.

#### 3.2. Transmission fault repair

Observe the circuit of the new energy vehicle to see if there is smoke, sparks, abnormal sound and fever in the circuit. According to the abnormal position, the faults are investigated one by one, so as to find the fault point, and then infer the cause of the fault and realize the fault investigation again. Sensory method and instrument method can be adopted in diagnosis and maintenance. Sensory method needs to be observed by the maintenance personnel to judge whether there is smoke, sparks, abnormal sound and other phenomena in the circuit of new energy vehicles, and then combine the experience, specific situation and system principle of the staff to judge the fault point, infer the fault factors and eliminate the fault content. Carry out standardized operation on the basis

of ensuring insulation to ensure the safety of the whole detection process. At the same time, maintenance personnel can use megohmmeter to measure the insulation of the high-voltage system in the car to ensure the absolute safety of the car. Then, combined with the staff's experience and control principle, multimeter and other measures to judge the state of the battery, maintain the normal operation of the components, ensure the value of the drive, and ensure the stability of the automobile operation.

### 3.3. Motor fault repair

During the operation of new energy vehicles, there are two power sources: an internal combustion engine and an electric motor, which reduce the problem of low battery storage during the operation of the vehicle. It can be charged while running. However, this type of new energy vehicle requires the installation of two types of driving power sources, and the internal structure of the vehicle is relatively complex, which to some extent is not conducive to promoting the discovery of problems in the maintenance process of new energy vehicles, making maintenance difficult. For some new energy vehicles with the function of fast charging, there may be faults such as the inability to communicate between the fast charging pile and the vehicle during use. This requires pre judgment of the contact position of the fast charging pile or the fast charging port to determine whether it is effectively connected to the vehicle body. The diagnosis of motor system faults mainly includes sensory diagnosis and instrument diagnosis. As shown in Figure 2.

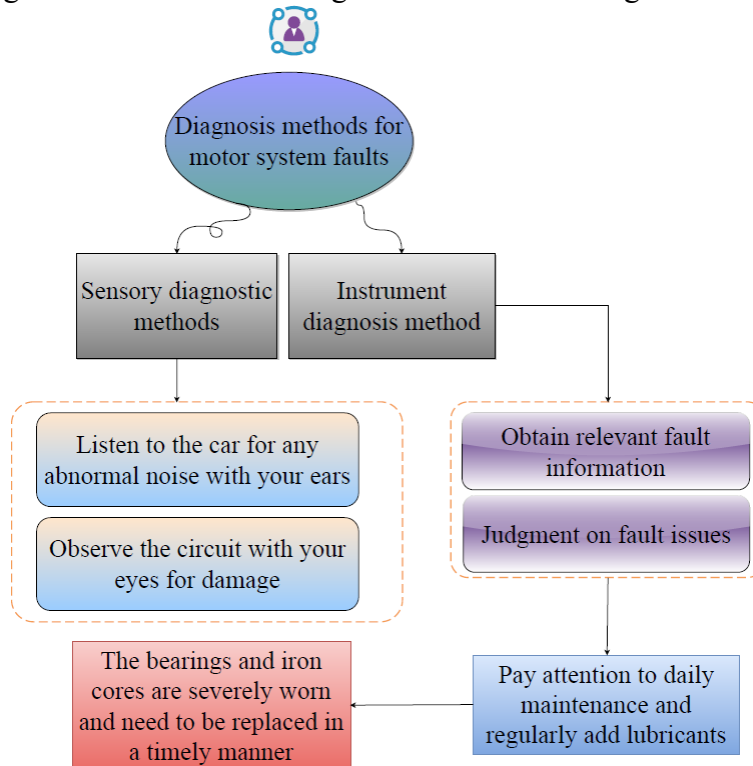


Figure 2 Diagnosis Method for Motor System Faults

In the daily use and maintenance of new energy vehicles, we should pay attention to the power supply, bearing wear, circuit problems, lubricating oil problems, etc. Therefore, it is necessary for users to diagnose, troubleshoot and maintain these possible problems in time on a regular basis to ensure the stability and safety of new energy vehicles in use. In order to improve the effect of fault diagnosis and maintenance, sensors should be used together and fully applied to ensure the fault and maintenance results, so as to understand the running state of the vehicle, avoid the increase of fault probability and improve the service efficiency and quality of new energy vehicles.

### 4. Conclusions

In summary, with the improvement of people's living standards and changes in their lifestyles,

people are paying more attention to their physical health in daily life, and new energy vehicles are gradually receiving more and more attention. The energy used in the traditional automotive industry is mostly non renewable natural resources, and new energy has higher environmental and energy-saving value compared to traditional energy. However, considering the characteristics of new energy vehicles, as electricity is the main source of energy, the system of the vehicle will involve multiple structures such as batteries, drive systems, and air conditioning. In this regard, relevant enterprises should actively seize the development opportunities in the context of the new era, strengthen technological reform, continuously develop new energy vehicle maintenance technology and fault detection technology, use professional knowledge to reasonably analyze and diagnose common faults that may occur, and then provide specific repair and maintenance measures based on the cause of the fault. In order to further improve the diagnostic and maintenance effectiveness of new energy vehicle faults, various sensors can be configured for new energy vehicles, and these sensors can be used as the key to maintenance and fault diagnosis, in order to timely grasp the working status of new energy vehicles and effectively reduce the occurrence rate of new energy vehicle faults. Adopting scientific and reasonable diagnostic and maintenance techniques to effectively enhance the value of new energy vehicles.

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