Research on Intelligent Fault Diagnosis Technology of Power Electronic Circuit

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Abstract: With the rapid development of economy, power electronics are widely used in many fields. The use of these power electronic products, the development of many industries and fields in China have played a great role in promoting, but also effectively improve the quality of people's living standards. It is undeniable that the use of power electronic products improves the production efficiency of various industries to a certain extent, and promotes a series of industrial chain reform. But we also need to realize that there are still a series of problems in the use of power electronics, which greatly affect the daily production. In many problems, the problems caused by the fault of nonlinear circuit and tolerance circuit are focused on and studied by us. Because the impact of these two failures is greater, and generally difficult to solve. Only by properly solving these faults can we play a better role in power electronic circuits and ensure the smooth use of products. This paper takes intelligent fault diagnosis technology as the basic argument, analyzes its application in power electronics, and puts forward some suggestions, hoping to provide some help to relevant personnel.

1. Introduction

In our daily life, electronic equipment is widely used. In these numerous electronic devices, there are some particularly novel electronic components, which improve our daily life and bring us great convenience, and the related industries also benefit a lot. But these components in the use of the process will also appear a variety of problems, and once any form of problems, will give people's lives and the development of related industries have a great impact, so we should focus on the development of power electronic intelligent fault diagnosis technology. Only with the development of this technology, the life of the electronic components we use will be improved, the quality of people's life will be better guaranteed, and the development of related fields in the country will become more stable.

2. Fault Diagnosis Technology of Power Electronic Circuit

Generally speaking, the diagnosis of electronic circuit is from the circuit simulation. With the

continuous change and development of the electronic industry, analog circuit fault diagnosis has gradually become our daily use of power electronic circuit diagnosis. From this point of view, the development of power electronics is of epoch-making significance. Because its development has fundamentally promoted the development of analog circuits, and opened a new chapter in the development of power electronics technology. It is worth mentioning that the development of electronic diagnosis in China is relatively late, far behind the western countries. As early as several decades ago, the United States began the research on electronic diagnosis, which also shows that our current research on electronic diagnosis is based on foreign related technologies. In the early days, the main contents of electronic circuit diagnosis were electric field current and voltage. However, with the gradual complexity of the circuit and the diversification of the functions of electronic components, the content of diagnosis is also increasing. Now many experts in electronic diagnosis will focus on the diagnosis of the radio waves of the relevant electric field and the acceleration of the electrons in the electric field, or the sound waves of the surrounding environment. These factors may affect the diagnosis, which is new We should pay attention to the diagnosis in the new era.

3. Significance and Difficulties of Power Electronic Circuit Diagnosis

3.1 Research Function and Significance of Intelligent Fault Diagnosis for Power Electronic Circuits

The components of power electronics are relatively small and fragile, so a series of problems often appear in the process of use. But we have higher requirements for these components, because any problems will seriously affect our production efficiency, so it is very meaningful for intelligent fault diagnosis of power electronic circuits. What we pay attention to in this paper is the intellectualization of diagnosis. The so-called intellectualization is to be able to find the problems independently. In the continuous development, our requirements for intelligence have also been improved. Now intelligence also has the function of prevention, that is, it can detect the possible problems of electronic components in advance. In this way, we can take measures in advance, prepare for maintenance, and reduce unnecessary trouble. And the wide application of this technology can also reduce the workload of the staff, making the inspection and maintenance work become very simple, and there is no need to send more professional personnel to carry out a single maintenance work. This process will also reduce the use of a large number of human and material resources, and improve the economic benefits of related enterprises.

Electronic components occupy a very important position in the whole device, its failure will directly lead to the device can not work normally. For the failure of electronic components, if it can not be properly solved in time, then the loss is huge. In addition, there are some more dangerous areas, which will also apply to a large number of electronic products. If the related components of electronic products in this field have problems, it may directly affect the life safety of the staff. For example, if there are problems in the electronic machine components of mining personnel, it is likely to lead to the people in the mine cave can not get out, and the life safety of the personnel inside is greatly threatened, which is not conducive to the mining work, or even the further development of the mining industry.

3.2 Difficulties in Fault Diagnosis of Power Electronic Circuits

At present, the development of electronic industry is relatively rapid. This also shows that the components in the electronic equipment will be more and more complex, the composition will be more and more, and the relationship between them will be more and more intertwined. This brings

convenience to people's life, but also makes the repair and maintenance work more difficult. At the same time, the on-line diagnosis of circuit fault is more difficult, it has higher requirements for both the diagnostician and the diagnosed. And a large number of data also prove that the so-called test incentive is difficult to choose a better standard, which leads to the specific diagnosis is difficult to appear a unified system, resulting in the development of power electronic circuit fault diagnosis is hindered, the diagnosis work is also difficult.

We put forward three main reasons for the difficulty of fault diagnosis. The first is nonlinear fault diagnosis. Generally speaking, the electronic equipment we use is non-linear, which focuses more on the acceptance of the wave, and the wave is invisible to our naked eyes, so it is difficult to establish a single model, which leads to the work can not be carried out smoothly. Second, the functionality of our commonly used test nodes is weak. Generally, nodes can only output some specific load voltage, and it is difficult to make accurate diagnosis only by these output load voltage. Moreover, if the load voltage is at a relatively reasonable threshold, our diagnosis can not be carried out at all. Some experts believe that the corresponding test nodes can be added, but these additional nodes will increase the complexity of the circuit itself, and the output voltage will fluctuate due to the different locations of many nodes, which can not be stabilized in a value, which increases the difficulty of diagnosis. Finally, it is not easy for us to control the fault information. This reason is also easy to understand, the fault information generally exists only in hundreds or even tens of milliseconds before the current does not work. These times are very, very short. If you don't monitor in real time, it's difficult to find out the problem. Some enterprises increase the function of online diagnosis, but online diagnosis means that more complex devices need to be added, and these devices are very expensive, which increases the budget of enterprises and affects the economic benefits.

4. Difficulties in Fault Diagnosis of Power Electronic Circuits

In the middle of last century, a thyristor appeared in front of the world, which also represents the birth of power electronics technology. Up to now, power electronic technology has become one of the core competitive technologies in various countries. Its development has further improved people's quality of life, so that people can really feel the beauty of electricity. But on the whole, although power electronics technology has developed for decades, it is still in a relatively primary stage. In this stage, there are many problems, and these problems exist in all aspects of the components, it is difficult to eliminate or solve in a time, which seriously hindered the further development of the electronic power industry.

The present era is an information age. In the information age, all fields that are not in line with information will be eliminated by the times. Therefore, the application of artificial intelligence technology in power electronic technology is inevitable. It can effectively diagnose faults, which is an urgent function of electronic power technology. We can say that the application of intelligent technology in electronic circuit fault diagnosis is not only the demand of the times, but also an inevitable trend of its development in the future.

5. Conclusion

Generally speaking, the theory of power electronic circuit fault diagnosis has been developed for more than 50 years, but in the specific diagnosis process, there are still huge problems. Through research and comparison, we divide these problems into two categories, one is the diagnosis of nonlinear circuit, the other is the diagnosis of tolerance circuit. So far, there is no unified and scientific standard for the diagnosis of these two circuits. Based on this, we can appropriately introduce the relevant network of artificial intelligence to specifically diagnose these faults. The

application of artificial intelligence not only improves the efficiency and accuracy of diagnosis, but also greatly liberates human resources, which is of great significance to promote the development of power electronics. It is believed that in the near future, intelligent fault diagnosis technology will be more widely used in power electronic circuits, so as to promote the further development of China's electronic power industry and help China's economy take off.

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