Research on Reliability Testing of Electrical Automation Control Equipment Based on Intelligent Optimal Control

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Abstract: At present, the reliability testing of electrical automation control equipment has become an important hot issue for manufacturers. Improving the reliability of electrical automation control equipment is a hot issue that manufacturers and users have been concerned about. Therefore, relevant measures must be taken to enhance the reliability of electrical automation control equipment. Relevant staff need to take targeted measures to enhance the reliability of electrical automation control equipment. With the development of China's electrical industry, more and more electrical automation control equipment is gradually developing in the direction of intelligence and automation. Based on this, the author will analyze the basic status and reliability test methods of electrical automation control equipment based on his own work experience. The paper discusses the reliability test methods and current status of electrical automation control equipment, and discusses in depth the measures to improve the reliability of electrical automation control equipment and the choice of control equipment reliability test methods.

1. Introduction

With the continuous development of China's electrical automation, the reliability of automation control equipment becomes more and more complicated. Therefore, it is of vital importance to master the correct reliability test method and to improve the reliability of China's electrical automation control equipment. 1]. On the one hand, with the continuous development of electrical automation in China, the reliability of automation control equipment becomes more and more complicated. On the other hand, the reliability of electrical automation control equipment has an important impact on the production enterprise [2]. For this reason, the National Quality Supervision and Inspection Center of Electric Control and Distribution Equipment puts forward some methods for the reliability measurement and reliability test of electric control and automation equipment in the light of the actual situation of our country at present [3]. With the development of electronic control technology, electrical automation control equipment has been rapidly and widely popularized, and closely integrated with people's production and life. In order to ensure the safety and stability of people's production and life, and to ensure and improve the reliability of electrical automation control equipment, it has become an important problem that manufacturers and users need to solve [4].

With the improvement of electrical automation, the reliability of control equipment becomes very prominent. [5]. Therefore, it is necessary to master the correct test methods to improve the reliability of electrical automation control equipment. In the actual use process, as a professional technicians, we need to integrate all aspects of the impact factors, and then take targeted measures to continuously strengthen the reliability of electrical automation control equipment testing and research [6]. According to the relevant work experience, the author will analyze the main methods of reliability testing of electrical automation control equipment. With the continuous improvement of the quality of life of our nationals, users have put forward higher requirements for the reliability of products [7]. Through a large number of investigations and studies on the market, it is found that products with good reliability can gain a dominant position in the fierce market competition, so the

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sales volume of the products is also very impressive [8]. This is to evaluate the reliability of electronic control and automation equipment, to identify the key factors affecting the reliability index, and further important to the design and process improvement.

2. Materials and Methods

In the production process of electrical automation control equipment of enterprises, the quality of products is the most important link. Only by continuously improving the quality of production products can we win social and economic benefits. In the automation control production of enterprises, the quality of products is extremely important. Only by continuously strengthening the quality of products can we win the market and credit guarantee, and the improvement of reliability can enhance the quality of products [9]. The laboratory test method utilizes a testable purpose. Controlled, regulated working conditions and conditions for real-time, all-round on-site simulation testing, which is suitable for mass-produced products. Advantages of this method The test conditions are easy to control, the test results can be reproduced, the experimental data quality is high, the shortcoming test is expensive, the test conditions are restrictive, and the test samples are many. The guaranteed test method refers to the work test under the specified working condition of the product before the electrical automation control equipment leaves the factory [10]. Because the electrical automation control equipment contains many components, its faults are not only several main faults, but also show the characteristics of randomness and diversity. Guarantee test method has the characteristic of measuring failure rate with time change and obeys exponential distribution. The difference between test method and laboratory test method lies in testing and examining the early failure of electrical automation control equipment. With the failure rate of control equipment reaching the reliability index of the factory, it is suitable for all products produced in small quantities and can only be used as samples of products produced in large quantities.

For upstream and downstream modules, the data recording tool is transparent and will not affect the communication between upstream and downstream. Figure 1 shows the workflow of the data recording tool.

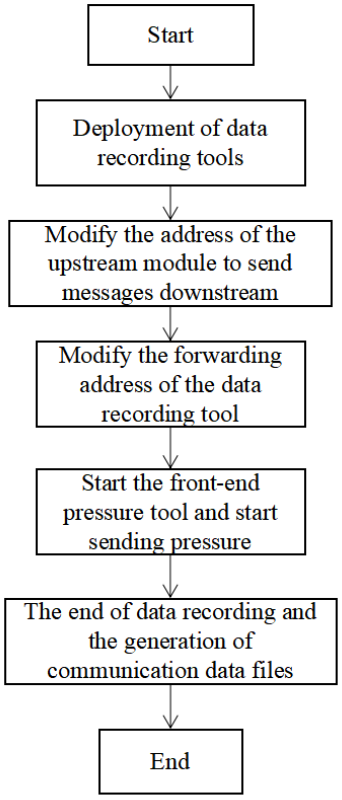

Fig.1. Data Recording Flow Chart

At present, in order to meet the various needs of consumers, enterprises often need to apply electrical automation control equipment technology in the production process, and then improve the technical content of products. While improving its reliability, it can ensure the safe and efficient development of various tasks of production enterprises. Guarantee test of products before leaving the factory is essentially necessary to detect premature damage of products, and then repair the faulty products, so as to reduce the failure rate of products as much as possible. When the failure rate of the product is reduced to the specified target, the product can be processed by the factory. The test method is to test the product without trouble before the product leaves the factory. It is suitable for small-scale production, high reliability requirements and complex equipment construction. The advantages of this method can test that the machine is random and various faults, the shortcomings test spans for a long time, and the circuit is complicated. The on-site test method tests the electrical automation control equipment on site, and can collect and systematically analyze the first-hand data to obtain more objective and accurate fault working time. It is a practical and highly accurate test method for assessing reliability and developing assessment indicators.

3. Result Analysis and Discussion

Before the enterprise product has not been shipped from the factory, the failure test of the product is called the guarantee test method. At this stage, more than 90% of electrical automation control equipment is composed of multiple components. The form of failure of these components is random, and the specific form of the fault appears as a function. For different reliability indicators, different test sites should be selected, such as reliability indicators under normal working conditions. A typical test site should be chosen. If the level of reliability required to be tested is set at a specific range, the most severe areas of the test site should be selected. If you need to know the true reliability of the equipment, you should choose a test site with similar test conditions or the same test conditions. Specifically, it mainly includes: recording various performance indicators, exclusion guarantee, data acquisition, recording guarantee situation, determination of time interval, start and end time of test, etc. Firstly, the purpose of field test is to collect and analyze field data and make reliability evaluation, which is helpful to formulate reasonable and accurate assessment indicators. Reliability data indicators can be obtained, reliability indicators of components of electrical automation control equipment can be formulated, the characteristics of service life of equipment can be inspected to determine reasonable baking time, and maintenance data of equipment can be collected to make maintainability evaluation.

According to the requirement of sampling theory of electrical reliability and considering the investment of actual equipment, the test device can test at most 8 4-pole samples at the same time, i.e. 32 contacts. The circuit schematic diagram of this unit is shown in Fig. 2.

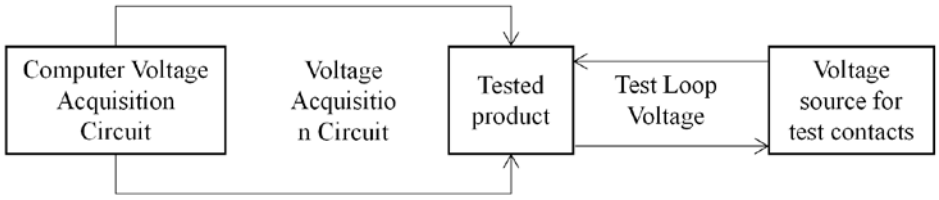

Fig.2. Circuit schematic diagram of contact voltage acquisition unit

Table 1 shows the recommended operating conditions of TLP521-4 optocoupler. However, this table does not provide the minimum value of I F. According to experience and actual measurement, I F at 10mA can ensure reliable conduction.

Table 1 Recommended working conditions for TLP521-4

Characteristic quantity	Minimum value	Maximum value
Supply voltage	0.26	53
Forward rectifier current	0.15	42
Collector current	0.64	58
Ambient temperature	0.67	26

Laboratory testing method carries out relevant testing through reliability simulation, and uses relevant regulations to simulate the working environment of existing equipment efficiently. It is convenient to realize the environmental stress detection which is closest to the equipment operation site, and at the same time, it can count the total number of product failures and the failure time. There are various kinds of test products, and their characteristics are typical. These equipment include textile machine electrical control equipment, paper machine electrical control equipment and coal mine electrical control equipment. These electrical automation control devices are large-scale equipment, which has both intermittent operation equipment and continuous operation equipment. Therefore, it is necessary to select the test product according to the actual situation. According to the requirements of the reliability index system of the electronic control equipment, the reliability data is statistically analyzed. Finally, not only the reliability characteristics, but also some rules can be found. By statistically calculating the collected data, the structure shows the average trouble-free working time of typical or representative domestic electronic control and automation equipment.

4. Conclusion

The reliability test of electrical automation control equipment has become a research difficulty and hotspot of production enterprises. In order to improve the efficiency of production enterprises, relevant staff are required to select appropriate test methods according to specific situations. The reliability of electrical automation control equipment has been highly valued by various industries, and corresponding measures have been taken to enhance the reliability of control equipment. It can be seen that the importance of reliability in electrical automation control equipment. It is of great significance to judge the reliability of equipment by comparing the data obtained from laboratory test with those obtained from field test. Field reliability test is suitable for China's national conditions, but the future direction of development will be laboratory test. The reliability testing method of electrical automation control equipment needs to be selected according to the actual situation. Compared with the field testing method, it is more suitable for China's national conditions, and the laboratory testing method is the direction of future development. In the process of design, production and use of electrical automation control equipment, controlling the factors affecting the reliability of the equipment can effectively ensure the reliability and life of the equipment.

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