Technical Research on Substation Overhaul Status Based on the Combination of Computer Technology in Power System

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Abstract. With the development of computer technology, its application in power failure detection has become more and more extensive, and the functions of the power system have been continuously updated. This article mainly focuses on the technical analysis of the substation overhaul status and the application of substation overhaul technology in the power system.

Keywords: Computer, Power System, Technology of Substation Overhaul Status

1. Introduction
With the development of social economy, people’s demand for electricity is increasing. As the functions of the power system become more complex and abundant, computer technology is needed to perform state maintenance and diagnosis of power equipment. This kind of maintenance technology can effectively avoid equipment failures, thereby playing an important role in maintaining the operation of the entire power system [1].

2. Overhaul of substation status

2.1. The significance of substation state maintenance
With the development of computer technology and the power industry, the functions of the power system have become more abundant and perfect, this has gradually improved the level of power equipment systems. In this case, the traditional methods for managing power equipment and power systems are no longer available. Therefore, we need to make further adjustments, and condition maintenance is the key. Condition monitoring is mainly to collect real-time equipment status data through related functional technologies. Based on these data, we can overhaul the equipment through equipment maintenance decision-making, risk assessment and condition evaluation. This method of real-time detection intersects with regular maintenance. First of all, in this way, the faults in the system can be found in the first time, and it will be reported and resolved in the first time, so as to avoid the phenomenon that a certain fault takes a long time to be resolved [2]. Secondly, this effectively improves the safety, availability and service life of the equipment, this reduces maintenance costs and time. Therefore, we must give full play to the advantages of substation state maintenance, and then combine the actual conditions of substation operation work to appropriately
adjust the substation operation management situation, so as to ensure the safe and stable operation of power equipment [3].

2.2. Overview of state maintenance of substation equipment
The state maintenance of substation equipment refers to the collection of real-time state data of the equipment through related functional technologies. Based on these data, we can conduct maintenance on the equipment through equipment maintenance decision-making, risk assessment and state evaluation. The main purpose of condition maintenance is to be able to understand the operating status of the power system at any time. The judgment result of the condition maintenance is based on the actual measurement data. Based on these data, the relevant personnel can make correct diagnosis and analysis. Once the equipment fails, it can effectively ensure that the system failure is found and resolved in the first time. In addition, this effectively improves the work efficiency of related personnel and the life of the equipment. The determination of maintenance decision needs to be based on data and information. Therefore, in the state maintenance work, collecting and processing inspection data is one of the key links [4]. The meaning of condition maintenance mainly includes three aspects: first, monitoring the operating status of substation equipment; second, diagnosing whether the substation equipment has hidden troubles; third, determining the maintenance strategy, these three meanings are indispensable.

2.3. Fault diagnosis algorithm
The fault diagnosis process is:
1) Obtain the average vector of failure modes. Each failure mode sample is shown in formula (1). For each failure mode sample, the average vector of failure modes is obtained by the following method as shown in formula (2):

$$X_d = (x_{d1}, x_{d2}, \ldots, x_{dn})$$

$$X_i = (\frac{\sum_{j=1}^{q} x_{ij1}}{q}, \ldots, \frac{\sum_{j=1}^{q} x_{ijn}}{q})$$

2) Folded into a failure mode matrix.
3) Matrix singular value decomposition (sample learning and training), the specific decomposition formula is shown in (3).

$$(u_{11}, v_{11}), (u_{21}, v_{21}), \ldots, (u_{61}, v_{61})$$

4) Fault diagnosis, the final diagnosis formula is shown in (4).

$$w_i = -u_i^T M^* v_{11}$$

3. Technical analysis of substation overhaul status
3.1. Online monitoring technology
The main purpose of the status of the substation maintenance is to ensure that the power system can operate more safely and reliably. The main content of the work is to collect status information data. Online detection technology can collect status information data in real time. Through these data, the status of the power system can be effectively understood, so that once the power system fails, the relevant personnel can find and solve it in the first time. This effectively avoids the phenomenon of delays in troubleshooting [5].
3.2. Modern monitoring technology
Modern monitoring technology mainly refers to the collection of data and information through high-tech equipment based on computer technology. Today's equipment for testing technology can better detect things that cannot be detected by humans. For example, infrared imaging equipment can show many things that cannot be seen with the naked eye through thermal images, so as to conduct technical research on equipment failures based on thermal images.

4. Main process of substation overhaul status
For the state of the substation overhaul of the power system, a specific process must be installed, as shown in Figure 1 is the process of the substation overhaul status [6].

![Figure 1](image)

**Figure 1.** The flow of substation overhaul status

5. Application of substation maintenance technology in power system
The application of substation overhaul technology in the power system mainly includes six aspects, as shown in Figure 2 [7].
5.1. **Maintenance of the main transformer voltage in the system**

The overhaul of the main transformer voltage is mainly for the overhaul of the main body part and the overhaul of the accessory part. The overhaul of the main body part is more important and more complicated. The overhaul is mainly for the main insulation, coil and iron core in the main body. The main thing is to check whether the main body has oil leakage, whether the coil is deformed, and whether the iron core is grounded. These problems mean that there is a fault in the main body. The relevant personnel should carry out corresponding maintenance methods according to the severity of the fault. For more serious faults, it is necessary to return to the factory for inspection and repair [8].

5.2. **Maintenance of the high voltage switch in the system**

The overhaul of high voltage switch is mainly aimed at overhaul of SF6 switch, overhaul of vacuum switch and overhaul of oil switch. In the specific testing process, the service life of the switch should be tested first, the contact of the switch should be tested, and finally, the test should be carried out. In addition, the maintenance of the switch should be carried out regularly, so as to ensure that the power system can reach a stable state.

5.3. **Maintenance during live work**

In the maintenance process of live operation, it is mainly to carry out real-time monitoring, detection and assistance to the operation process, this ensures that the entire operation process is in strict compliance with industry regulations and standards. Before entering live work, relevant personnel must do relevant training, so as to ensure the safety of the work to the greatest extent [9].

5.4. **Joint handling in the system**

The overhaul of the joints in the system is an important step in the whole overhaul process. It is mainly to detect the temperature of the joints. If the temperature of the joints exceeds the safe temperature, it means that the joints are malfunctioning. If the connector fails, the result may be very serious. Therefore, when dealing with the connector, we should record the data in detail through the state detection mode, and use the data to formulate the best method for repairing the connector, this allows power equipment to effectively guarantee the operation of the power system.
5.5. Inspection and repair of thermal faults of substation equipment
There are still more cases of thermal faults in the substation system, which may mainly be caused by the long running time of the system or the excessive use of electric power. Therefore, after the relevant personnel detect a thermal failure in the system, they should replace the original material with a material with better thermal performance to improve the oxidation resistance of the substation equipment. Therefore, the overhaul of substation equipment under the condition of using the status monitoring mode can effectively avoid thermal faults in the operation of the substation system, thereby making the operation of the substation system safer and smoother.

5.6. Monitoring function of condition maintenance
Condition maintenance is mainly for real-time monitoring of the status of the power system. In this way, relevant personnel can know the operating status of the power system at any time, and if there is a problem, it can be found and resolved as soon as possible [10]. Relevant maintenance personnel must pay full attention to the wiring work in the normal power operation process, so as to make the operation of the substation system safer and more stable.

6. Conclusion
In short, the technology of substation overhaul status is widely used in the power system, and the entire power system can operate more safely and stably through substation overhaul technology. Therefore, we must pay attention to the improvement of this technology and add more innovative ideas in the improvement process, this can improve the efficiency and quality of maintenance.

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