Probe into the Application Core of Power Electrical Automation Technology

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Abstract: This article discusses the related content of power electrical automation component technology, combined with the advantages of power electrical automation component technology, including improving system work efficiency, optimizing technology application mode, and improving the level of power distribution automation. This paper studies the specific application of power electrical automation component technology in converter circuits, full-control power switches, AC speed control technology, general inverters, and the development trend of power electrical automation component technology. The purpose of this article is to improve the application level of power electrical automation components technology and promote the stable development of the industry economy.

1. Introduction
In the context of the rapid development of science and technology, the importance of electricity is also gradually emerging. At the same time, the increase in power demand has also placed new requirements on the reliability of distribution network operations. The continuous improvement of the power automation component technology system has injected vitality into the development of the power industry, and in many application areas, the technology has also been well applied, such as transportation, agricultural production machinery. By studying the core content of the application of this technology, not only can it improve system operation reliability, but it also plays an important role in promoting the healthy development of the power industry.

2. Overview of Related Content of Power Electrical Automation Component Technology

2.1 Basic Meaning
The so-called power and electrical automation component technology refers to the basic realization of automatic management during the system operation, and in the management process, the use of various component structures to modularize the management of the system, so that it can achieve the automatic application mode of system operation management. In the specific application process, the system will use the signal system and data transmission system as the basis for operation, and perform remote application control on the current operating state of the power system. In addition, each component module has certain autonomy, and can automatically control the operation of the power system within its jurisdiction. This also speeds up the resolution of system operation problems, and can deal with sudden problems in a timely manner to improve the reliability of power system operations.
2.2 Development Path

2.2.1 Electronic Switch
Electronic switches are very important in the power system. The operation of any electrical equipment is inseparable from electronic switches. Electronic switches play an important control function. Electronic switches use AC frequency conversion technology as the working principle. Electronic switches have undergone a series of development processes. The first electronic switches to appear are called AC frequency electronic switches. The structure of such electronic switches is relatively simple. Subsequently, information technology continued to develop. At this time, a new type of electronic switch, called a fully-controlled electronic switch, has basically been automated. Nowadays, science and technology continue to develop. On the basis of full-control electronic switches, a more advanced electronic switch and a composite electronic switch have appeared. This type of electronic switch has a stronger performance. In most electrical equipment today, the selection is a composite electronic switch.

2.2.2 Circuit Configuration
In practical applications, automation technology is also gradually adopted in the circuits of power systems, and the frequency of the circuits is changed from low to high. The application of ordinary thyristors mainly uses rectification to effectively control the work of DC drive converters. The DC transmission changer can properly realize the cross-working working mode with the AC frequency conversion drive, and the AC-DC-AC frequency conversion drive method thus formed can be used to ensure the high-efficiency operation of the circuit. For decades, the components of electric power equipment have been continuously innovated and developed. Among them, the PWM converter has gradually attracted everyone's attention. This converter can greatly improve the utilization rate, not only improve the operating efficiency of the power system, but also reduce the impact of higher harmonics on the power grid and ensure the safe operation of the power grid. In addition, it also provides effective solutions for some problems that occur when the motor is running at low frequencies. Although the role of the PWM converter is huge, there are also some disadvantages in actual operation. In the process of effectively dealing with the disadvantages, a new type of resonant DC inverter circuit came into being [1].

3. Application Advantages of Power Electrical Automation Component Technology

3.1 Improved System Efficiency
In the process of traditional power electrical system work, many debugging operations need to be completed manually. Under the background of increasing power system functionality, this has also greatly increased the total number of staff tasks and increased the fault tolerance rate of operations. The application of power electrical automation component technology can divide the entire management process into different application modules, supervising the operation of different areas [2]. And the system will be associated with the early warning system. When receiving abnormal data information, it will also make early warnings, and use the sensor equipment set in the system to quickly locate the fault location, which also speeds up the troubleshooting. In this process, the amount of staff's tasks is also reduced, and the system can automatically manage, even if the staff is not in the operation room, they can use other clients to understand the current operating status of the system. As a result, the working efficiency of the system is greatly improved, and the negative impact of failure problems is reduced.

3.2 Optimized Technology Application Mode
In the process of normal application of technology, the application of its application mode is also very important to be considered. In the process of optimizing the application mode of the power and electrical system automation component technology, the original production management mode can be
adjusted [3]. For example, in the operation and management process of traditional electric power and electrical systems, the intensive management mode is basically adopted. In the application process of intensive management mode, although the uniformity of the management process can be improved, the applicability of the management mode is also decreasing against the background of increasing system complexity, and it will also affect the normal system maintenance speed. Bring large economic losses to enterprises. The application of the automation component technology of electric power and electrical systems can adjust the management mode to a sub-module management mode. Compared with the previous management method, the modular management method can refine the management content, and in the management process, it can also continuously infiltrate intelligent management technology, thereby injecting new impetus into the development of the system and accelerating the economic development of the industry [4].

3.3 Improve the Level of Distribution Automation
With the rapid development of science and technology, many industries have entered the stage of automated production, which has also greatly improved the production efficiency of enterprises [5]. In the electric power system, distribution management is a very important application link, which is also the main carrier for power transmission. In the specific application process, the corresponding distribution management work needs to be done. Once the corresponding problems occur in this link, then it will directly affect the normal life of residents. As mentioned above, in the distribution management of power electrical system components technology, the current operating status can be monitored at different management nodes, thereby improving the service performance of the system itself and bringing better services to residents experience.

4. Core Analysis of the Application of Power Electrical Automation Component Technology

4.1 Converter Circuit
The converter circuit is one of the very basic contents in the technical application, and it is also an important guarantee for the smooth operation of the system. For the converter, in the development process, continuous innovation is needed to improve the applicability of the structure itself [6]. At present, the rectifier circuit converter structure has strong application stability, and has been applied in many fields. The schematic diagram of the structure is shown in FIG1.

![Figure 1 Schematic diagram of rectifier circuit converter](image)

As shown in the figure above, the left side is the converter structure, and the right side is the conventional circuit. During the specific operation process, the converter structure on the left side will induce the current passed in the conventional circuit, thereby achieving the smooth conversion of the current. The main role of component technology in this structure is to assist the system to successfully complete the control of the phase difference between current and voltage. Especially after the
occurrence of high harmonics, the system can smoothly offset the effects of high harmonics and improve the stability of system operation. In addition, if the load power passed by the system is large, then the automatic component technology can adjust the working condition in combination with the load situation, and at the same time adjust the load situation to reduce the negative impact of excessive load [7].

4.2 Fully Controlled Power Switch
During the operation of the electric power system, thyristor converters belong to the first generation of electronic components. In the current stage of development, the system has been unable to meet application requirements and needs to be appropriately adjusted in accordance with the current situation. In previous applications, the thyristor controllers used were basically semi-controllers, but other systems were full-controllers. And GTO frequency conversion controller also belongs to a relatively widely used technology type. This component has relatively poor stability in practical applications. For this, we need to use electric power automation component technology to optimize the power switch and achieve the entire application process full control. In the actual running process, the system will scientifically adjust the entire process according to the current running situation. When the current running situation is unstable, it can automatically perform the opening or closing operation, thereby reducing the probability of switch damage.

4.3 AC Speed Control Technology
In the process of technology application, AC speed control technology also belongs to common technology types. This technology is a multi-variable control system that can scientifically control the content of correlations based on vector changes. The current motor structure is mainly DC motor structure, and the application model of the system is shown in Figure 2.

4.4 Universal Inverter
In addition to the above-mentioned application content, on the general-purpose inverter, the power electrical automation component technology has also been very well applied in this process. Among the inverters in these applications, IGBT also belongs to the commonly used inverter type. This structure has also achieved very good application results in system applications and has strong durability. Similar to the previous application system, in the process of applying this system, it is
possible to objectively adjust the current operating state of the system in combination with the actual application situation. And in the process of system operation, the content of the transmitted information can also be kept secret, thereby improving the security of the entire system operation and the reliability of the system operation.

5. Development Trend of Power Electrical Automation Component Technology

5.1 Theoretical System Continues to Mature
China's research on electric power automation technology started relatively late, but has achieved very good achievements so far. In the future development process, the theoretical system of technology will also continue to mature, and its applicability to the corresponding environment will continue to improve. In the process of system operation, the degree of refinement of the theoretical system is also continuously improved. For potential hidden dangers existing in the system operation process, it can also be prevented in advance, which also reduces the probability of some problems and increases the reliability of the system operation process.

5.2 Functional Attributes Keep Increasing
In the initial application phase of power electrical automation component technology, its main work content is used to assist system operation, debugging, etc., and its overall functionality is relatively low. However, with the continuous development of technology, the functional attributes of power electrical automation components technology are also continuously improved, such as modular control, system early warning, intelligent management and control, etc., the content of functional attributes is constantly enriched. In practical applications, service functions can be refined. When faced with user requirements, retrieval can be completed quickly and problems can be solved, thereby improving the reliability of the entire system operation.

5.3 Wider Range of Services
In addition to the above-mentioned application content, in the future development process, the service scope of power and electrical system automation component technology will also be continuously expanded. For example, with the help of this technology and computer technology, with the help of a display interface, you can display the distribution information you want to know. At the same time, in the application process, we can also use the database technology to build an information database to organize the system operating data. During the information arrangement process, managers can quickly retrieve information, thereby improving user service satisfaction.

6. Conclusion
In summary, the power system provides a lot of convenience for people's daily life. Under the background of the increasing number of electrical applications, the operating load of the power system is also increasing. On one hand, the application of automation component technology can effectively solve this problem. With the help of modular management, on the one hand, the probability of operating failures can be reduced and the reliability of power system operation can be improved. On the other hand, it can speed up the resolution of fault problems and reduce the negative impact of operational problems.

References
[1] Huang Shuxia. Analysis of application characteristics of power electrical automation component technology [J]. Science & Technology Innovation and Application, 2019 (29): 186-187.
[2] Zhou Binji. Talking about the Application of Power Electrical Automation Component Technology [J]. Electronic Components and Information Technology, 2019,3 (08): 79-80 + 83.
[3] Zhou Tianwen. Analysis on the Application of Power Electrical Automation Component Technology [J]. Communications World, 2018 (09): 137-138.
[4] Zhang Jianyang. Analysis of components of electric power automation technology [J]. Electronic Test, 2018 (16): 125 + 122.

[5] Lu Yifan. Research on Electric Power Automation System and Component Technology [J]. Communication Power Technology, 2018, 35 (04): 48-49.

[6] Sun Xin. Application of Electric Power Automation System and Component Technology [J]. China High-tech Zone, 2018 (23): 110.

[7] Lai Jun. Analysis on the application of power electrical automation component technology [J]. Low Carbon World, 2018 (25): 58-59.