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# Electrical Automation and Power System in Electrical Engineering

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**Abstract**: The rapid development and the progress of technology in and all around the earth, Automation technology has got an important position in different fields and the application of power system has increased widely. Electrical automation technology is primarily used to monitor, during the operation of electrical equipment, the equipment running status monitoring, and to quickly identify problems resulting from the operation of the equipment through data analysis and feedback operation, as well as warning Therefore the importance of automation technology in power system and other fields is of great significance because automation technology comprises of all different types of processes and system to run automatically which includes the machinery of different types and other devices So, in this paper we are going to see the what does automation means and the application of electrical automation technology.

**Keywords:** Electrical Automation, PLC Technology, Fault Detection, Fieldbus

## I. INTRODUCTION

The rapid change in the development of technology in the new generation the living standards of audience is improving and the work load of different industries is also increasing rapidly and we can't be dependent on old style of doing work therefore important undertakings need to enhance the electrical system therefore Electrical Automation innovation can tackle various issues in power system. Electrical automation technology can solve different problems in power system with its advancement in technology and different types of methods we are using in modern days which is much safer, fast and reliable and which also improves the efficiency of work, reduces the manpower and the accuracy of work done is high. Automation Technology has also matured to a point where a number of technologies have developed and one of them is the robotics which is a specialized branch in automation technology.

## II. ELECTRICAL AUTOMATION

The combination of computer technology and artificial intelligence is known as electrical automation engineering. During the design process, the system can be automatically controlled to meet a variety of work requirements. Simultaneously, it realizes intellectualization through software programming, organically combines modern information technologies such as computer network technology and automatic control theory with electromechanical equipment, and fully employs intelligent thinking mode and management mode in the design to realize intelligent management of the entire power system and make it perform well. It mainly includes the following aspects:

1) Information acquisition and monitoring system.
2) Data transmission, processing and integrated control system.
3) Communication technology system, etc.

Analog switch and digital signal encoder are the two communication modes. In the design process of electrical automation engineering, it is essential to constantly optimize and upgrade it while understanding the current situation and requirements, in order to ensure that the overall quality level of electrical automation engineering can achieve the desired effect. It primarily consists of electronic technology, microcomputer theory and application, and other relevant theoretical knowledge and practical experience, as well as some fundamental skills such as data acquisition and processing ability and information processing ability. It also has specific performance or functional requirements (for example, control logic), which can simulate operation and complete tasks on the computer.

A. Application of Electrical Automation Technology in Electrical Engineering

the task of power grid delivering is more complex, traditional electric control will spend more time in power grid dispatching, and once a fault occurs, it will spend too much time to maintain the fault, which not only has a negative impact on residents' normal power consumption, but also consume a large amount of manpower. Controlling power grid dispatch with electrical automation technology can significantly improve its stability and reliability, as well as make the operation more stable. The failure can also be analyzed through the database, quickly locating fault points and causes, so

  

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that workers can be prepared to carry out fault maintenance, while the time to reach the exact position can also be greatly reduced, potentially reducing power company losses.

B. Application of Substation Electrical Automation Technology

Classic substations require a great deal of manual control, which not only causes data deviation but also reduces work efficiency. And, on occasion, in order to ensure the status of the project, people must rotate 24 hours a day, which significantly increases the input of human capital. Electrical automation technology can significantly solve this problem; not only is data accuracy effectively guaranteed, but fault detection is also more timely. Furthermore, electrical automation technology can reduce manpower input and use automation to carry out data transmission, which improves the stability of operation.

C. Application of Electrical Automation Technology in Power Plant

The control system of a power plant is extremely complex and decentralized, requiring the extensive use of various technologies. Engineers must supervise and maintain traditional operations for an extended period of time, and the corresponding parameter setting must be followed at all times to ensure stable operation. However, because of the uncertainty of manpower, the overall stability of the power plant operation is greatly impacted. Electrical automation technology can help to address this issue by automating control via computer, network, and control terminals, as well as collecting parameters and setting control actions to make power plant operations more stable and reliable.

Furthermore, there are certain safety risks associated with power plant operations. When there are more people on the job, it is easier to have a variety of accidents. The use of electrical automation technology can reduce human output and move terminal control away from the centre of power plants, making power plant working safer.

D. Simulation Application of Electrical Engineering

Since current electrical engineering tends to be intelligent and automatic control, simulation is the key application of electrical engineering. Before putting the system together, it is necessary to test its correctness using simulation. It must be applied to electrical automation technology in this process. Intelligent control is used to achieve the docking of reality and virtual, and system threats can be detected ahead of time, reducing losses and troubleshooting.

E. Technical Integration of Electrical Engineering

The massive electrical engineering system is comprised of numerous subsystems, making the overall operation extremely complex. When problems arise in minor details, they have the potential to affect the entire field of electrical engineering. As a result, in order to achieve maximum automation and optimal management, it is necessary to integrate technology via electrical automation technology in order to make management more sophisticated and standardized. In the classic power system, security and maintenance are separated, and many links have docking issues, which not only reduces work efficiency but also raises operating costs. Following the introduction of electrical automation technology, the corresponding management has been significantly improved, the overall integrated system has been optimized, and the extensive application of modern technology can significantly enhance the efficiency of the power system, as well as the service capacity.

## III. ADVANTAGES OF ELECTRICAL AUTOMATION

Advantages commonly attributed to automation include higher production rates and increased productivity, more efficient material use, higher product quality, increased safety, shorter labour work weeks, and shorter factory lead times Higher output and increased efficiency have been two of the most important justifications for the use of automation. Despite claims of high quality from human craftsmanship, automated systems typically perform the manufacturing process with less variation than human workers, resulting in greater control and consistency of quality products. Furthermore, improved process control leads to more efficient use of materials, resulting in less scrap. Another advantage of automation is that factory workers work fewer hours per week on average. Around 1900, the average working time was around 70 hours. This has been reduced to a 40-hour workweek in the United States. Finally, the time required to process a typical production order through the factory is generally reduced with automation.

It is also due to the acceleration of the development of modern cities, The importance of automation technology for the development of many industries is increasing. As a result, electrical automation technology is gaining prominent place. When using electrical automation technology, a great deal of extraneous information can be obtained. These data must be processed in order to create an information control management system with strong controllability, which improves the controllability of electrical automation technology and increases system stability.

## IV. ELECTRICAL ENGINEERING AND AUTOMATION

A. PLC Technology

A programmable logic controller (PLC) is a type of control system. To complete the related logic operation, timing, calculation, counting and sequence control, and other related PLC operation instructions, PLC technology primarily uses a programmable memory. It is a very new and high PLC technology that combines modern computer application function technology with relay control technology. Because of its low resource consumption and adaptability, PLC technology is

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increasingly being used in electrical engineering. The relevant data in the application process is continuously analyzed and sorted by using PLC technology, on the basis of comprehensive processing, in order to improve PLC technology and make it better applied in electrical engineering, promoting the stability and continuous development of electrical engineering. Benefits of API technology Quick response is a prominent advantage of computers technology and that is an advantage of large-scale integration to effectively improve the storage of magnetic products electrical equipment. Large-scale integrated circuits and Computer technology is integrated and effectively applied in electrical equipment, it can improve automatic performance checks the responsiveness of the electrical equipment and makes sure storage capacity of electrical equipment. Automation is a together, and indicate transmission, power, and the outside world must be connected during the installation, which reduces the installation workload personnel and greatly reduce human error. Application PLC technology in the field of electrical engineering automation control

1) The application of on-off control:

For a long time, relay technology is being used in electrical control engineering. Although its prices are lower, its response is quite long, and it has no good use effect, so it cannot detect short circuits in time and implement appropriate solutions, affecting production efficiency. The goal of switch control is to have the PLC produce corresponding switch output depending on the input combination of switch history and current input sequence, allowing the system to operate in accordance with the given logic sequence. PLC technology can be used to carry out corresponding programming work in this process, and the entire process of virtual operation of electrical automation control can be established, to reduce all kinds of unnecessary attempts during the operation of automation control part of electrical system.

2) Application in closed loop control:

Closed-loop process control is the control of continuous change analogue quantities such as flow rate, temperature, and pressure in a closed loop. PLC technology performs closed-loop PID control of analogue quantities via analogue quantity I/O modules, as well as D/A and A/D conversion of analogue quantities to digital quantities. Closed-loop process control can be achieved using a specialized PID module or transformed using a PID subroutine (Packet Identifier).

3) Information processing:

PLC (Programmable Logic Controller) technology is capable of collecting, analyzing, and processing information, as well as table checking, sorting, data conversion, computing, bit manipulation, and data delivery. The collected and processed data can then be sent to various intelligent devices with communication systems to complete some control operations, relative to current reference values in the packet, and tabulated for printing. These data can also be used in the process control system to process data from large control systems like the unmanned flexible manufacturing system.

B. Remote monitoring technology

Remote monitoring technology is a type of technology that allows you to operate target equipment from afar, even if you can't get to the location for some reason. It has the ability to monitor and control the state of electrical engineering and its equipment. Traditional field control mode has a high cost, and it requires a lot of manpower to monitor the field 24 hours a day. Remote monitoring technology can effectively solve this problem, and electrical engineering supervision and control will be free of time and space constraints, improving the effectiveness and timeliness of monitoring work. It's important to remember that remote monitoring technology has high hardware requirements, and low-configuration equipment can't play a major role in remote monitoring. At the same time, because this technology isn't perfect yet, there are some flaws and limitations. It is not suitable for large-scale electrical engineering, so it is commonly found in small and medium-sized electric power enterprises. In some cases, it may even result in a decrease in monitoring work efficiency.

C. Intelligent Control and Fault Detection Technology

The use of electrical automation technology in electrical engineering appears to make electrical engineering's related control more intelligent, and the use of intelligent control technology in electrical processes has a bright future. Some complex electrical engineering difficulties are simplified by the use of intelligent control technologies, resulting in the resolution of some challenging electrical engineering challenges. At the same time, electrical automation technology can be used in electrical engineering fault diagnosis and even quickly find fault points, so that the relevant fault warning signal can be given the first time the fault problem is passed to the monitoring personnel, greatly reducing the possibility of further increase in electrical engineering faults. Many problem-solving techniques have been developed. last few years. Commonly used systems are:

1)Impedance Locator Impedance-based locators are used to determine the distance. Fault from primary power supply to fault location Measure current and voltage with one or both ends Locator. This value is then mathematically Equation for estimating the location of damage.

2)Traveling wave detector the traveling wave tomographic localization technique is as follows. It is divided into two terminals and one terminal. travel wave analysis, but the single-terminal method is time between voltage or current reflections Impedance Break - Error in this case - Find Distance between sensor and fault, 2-pin scheme works based on the time delay between sensor and fault. Arrival of information at the end of a power line

3)Knowledge base locator Save time using knowledge-based methods. Precomputed set taken by locator based on impedance Compare the data to the current resistance. Square. The knowledge-based approach stands for soft computing.

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Many artificial intelligence techniques are used in calculations. Determination of the site of damage, including but not limited to artificial Neural Networks (ANN), Fuzzy Logic (FL), Expert Systems (ES) and genetic algorithms (GA) in soft computing, etc. Opportunity to find something more restrictive and more complex Correlation is higher, but accuracy and reliability are the cost of making a trade-off between precision and precision Uncertainty

D. Electrical Control

Electrical control is the center connection of the entire Electrical Automation process. It not just decides the activity speed and creation effectiveness of the electrical automation process, yet additionally can handle the entire electrical mechanization process thoroughly. After the presentation of man-made brainpower innovation into the electrical control process, the electrical control process has become more logical. Moreover, the activity effectiveness of the gear has been enormously improved. Additionally, AI innovation likewise successfully cycles and controls data handling and creation costs during the time spent electrical control, making electrical control more productive and logical.

E. Fieldbus technology

The advantage of fieldbus network Fieldbus technology appeared in the 1980s. definition of FF (Foundation Fieldbus) and IEC (International Electrotechnical Commission), the school bus is a transmission type, bilateral structure, multi-branch and a real-time communication network connected smart field devices to automation systems. FCS (Fieldbus control system) is simply considered as two layers consisting of workstations and field equipment. On the other hand, FCS is a distributed system consisting of a digital communication device, monitoring and control system. According to computer, the fieldbus is a method of communication between total digital, universal series, bilateral and multi-device link.

Fieldbus technology is a crucial component of automation control technology, as it allows managers to create management plans based on current conditions, ensuring the efficient operation of automation electrical engineering. At this time, contemporary bus monitoring technology is in its infancy. It not only ensures the efficiency of system operation under the relatively independent control module, but also eliminates system interaction, and may demonstrate the application value of electronic automation technology in the steady operation of high efficiency. As a result of this, we can conclude that by constructing fieldbus technology, we can achieve efficient and automatic electrical engineering operation through more flexible and stable electrical engineering control, which is an inherent demand of electrical engineering development in the new period.

Advantage of Fieldbus Network

Configurable control system Decentralized control The factory H1 segment is linked to an existing high-speed Ethernet network Health and quality related status information of data in addition to measurement Status information including quality, substrate and limit information Real-time measurement confirmation Field diagnostics delivering the right information to the right people at the right time Fault tolerance without redundancy Active and static parameters can be viewed Advanced control with single loop integrity 100 Field terminist Support safety device functions

## V. CONCLUSION

The importance of electrical automation in electrical engineering and how largely it has spread all over the world is clear. With the advancement in science and technology and people's demand for electricity, electrical automation technology has become increasingly useful. We have developed different types of technology which can reduce the human effort and the work can be done efficiently with the least error

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