

# DELIBERATION ON THE INTEGRATION OF ELECTRICAL ENGINEERING AND AUTOMATION TECHNOLOGY IN MODERN SMART BUILDINGS

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**Abstract:** Electrical engineering and automation technology play an important role in key components of smart buildings, improving electrical operating systems and increasing resource usage. Pass through the application of automation systems in intelligent buildings and fault monitoring and diagnosis systems, the concept and application of electrical automation in intelligent buildings are expounded, and theoretical reference is provided for relevant personnel to ensure the stable operation of intelligent building systems.

**Keywords:** Intelligent building; Electrical engineering; Automation technology

## 1 BACKGROUND OF THE EMERGENCE OF SMART BUILDINGS

In recent years, with the rapid development of our country's economy, people's living standards have improved. If the building's original electrical system continues to be used, it will eventually be closed as the market becomes more competitive. Under this situation, the functional technology of electrical equipment systems is continuously improved and improved, and electrical automation technology is widely used. In various economic development fields, electrical automation technology also provides strong support for smart buildings. Electrical automation technology has also become a new development in the construction industry, and current smart buildings dominate the construction market.

## 2 THE MEANING OF SMART BUILDING

Compared with ordinary buildings, smart buildings integrate a large number of high-tech products and advanced technologies. It can be said that the emergence and development of intelligent buildings are an important manifestation of the progress of modern society. It can not only meet the needs of residents at different levels for modern building infrastructure, but also ensure the safety of residents' lives and property. Therefore, the role of intelligent systems in development has also been greatly improved. The rapid development of smart buildings in China has also met the demand for smart building products in various fields of society. In this application, the control efficiency of intelligent building systems can be further improved, and the quality of buildings can be improved by increasing the automation level of various systems. Ensuring that the intelligent control level of the entire system during the operation phase can meet the needs of residents is the main reason why electrical engineering and its automation technology are regarded as the core technology of smart buildings.

## 3 CHARACTERISTICS AND APPLICATION ADVANTAGES OF AUTOMATION TECHNOLOGY

### 3.1 Features

The main features of electrical engineering and its automation are as follows. (1) Match the operation of electrical equipment through the design of control methods. The system improves the rationality of equipment management and operation, and enhances the reliability and stability of the power distribution network. (2) Through the support of automation technology, the effective utilization of power equipment is achieved. In the process of applying automation technology, the original power distribution network was reasonably rectified, and some new energy-saving and efficient equipment were selected to reduce power transmission.

### 3.2 Advantages

The wiring in the building is complex and the electrical system is highly interconnected, and the safety hazards caused by this cannot be ignored. Due to the limitations of human supervision and management, it is difficult to ensure the effectiveness of fault diagnosis. Electrical and automation technology can not only provide timely system information feedback, but also provide relevant information to maintenance personnel.

### 3.3 Device Control

Personnel can issue commands through the control system to connect to the equipment. The device can recognize instructions and perform operations, effectively improving work efficiency and avoiding human errors. At the same time, when designing smart buildings, we should supplement the automation infrastructure construction, strengthen the

effective connection between the system and the control room, ensure the effective use of data resources, and then make the use of equipment more efficient and more efficient through local control and remote control. Fast.

### **3.4 Optimized Design**

Mainly used in the design phase of buildings. Due to the complexity of gas pipelines, if the plan is not reasonable enough, it will directly affect the efficiency of use, there may be potential safety hazards, and even require secondary construction, which will increase the construction cost. Therefore, computer technology can be used to model and ensure optimized solutions.

## **4 APPLICATION METHODS OF AUTOMATION TECHNOLOGY**

### **4.1 Power Distribution System**

There are various electrical equipment and complex pipes in smart buildings, and management systems can be used to shut down or redirect power distribution. Corresponding automation equipment includes long-distance sensors, electronic detection devices, etc. The reversing valve can be used to change the switch for energy scheduling, effectively improving the efficiency of energy system management. At the same time, when choosing optical cables, the use of optical fiber communication lines is more common, because traditional power cables have weak stability and low efficiency. Therefore, the smart devices used in smart buildings monitor the effect of cable operations through remote terminals. If it is illegal theft can be detected and remedied promptly. Adopting regulatory measures can reduce the economic losses of the power sector and maintain the harmonious use of electricity in society. In the power supply system, the scientific use of automation technology can also determine the user's electricity consumption. Reasonable allocation of energy can maximize the utilization of resources and avoid consumption, which can improve the configuration level and meet the individual needs of customers.

### **4.2 Communication System**

Communication between building information requires the support of a communication system. The function of electrical automation is to ensure the efficiency and quality of communication, so that information can be interacted in the form of text, sound, images, etc. The traditional form of communication is mainly telephone communication, but the Internet provides opportunities for the development of information transmission. Smart buildings can establish networks between domains to exchange data with the help of computer systems. All office and electronic devices within the network can connect and communicate to improve data transmission efficiency and enable the communication system to better meet user needs. Electronic graphics systems can also retrieve valuable data, send and receive text messages, conduct video conferencing, use fax communications, etc., which can save a lot of interaction time and also improve the effectiveness of information exchange between users. For example, video conferencing uses communication technology to achieve inter-regional communication between departments, saving land resources and ensuring the effective transmission of video and audio signals, giving participants an immersive experience and breaking the limitations of face-to-face. Another example is desktop conferencing, which uses computers to interact. Participants in both locations can complete information on the same board. Information can also be printed on the meeting board for reference. All kinds of information can be transmitted to anywhere in the world in a short time, greatly meeting people's needs.

### **4.3 Lightning Protection System**

Lightning is an important factor affecting the safety of high-rise buildings. Traditional high-rise buildings use lightning rods to protect against lightning strikes. Smart buildings improve lightning and lightning protection with the help of electrical automation technology. If the grounding system is fully equipped, the computer selects a lightning protection area, and then cooperates with grounding technology, shunt technology, equipotential bonding technology and internal protection technology. Improve lightning protection and other technologies to ensure effective protection of building electricity and communication equipment.

### **4.4 Control System**

The automatic control system in an intelligent building is part of the user's daily life and work, so the effective application of automation technology can ensure the user's quality of life and make the services provided by the building more efficient. For example, smart lighting devices can detect by sound or light. The system can change the working or resting state, which can not only ensure the user's usage requirements, but also save energy. For intelligent building control systems, they mainly include drainage systems, lighting systems and ventilation systems, which are closely related to users' lives. If a danger occurs, the sensor can send out an alarm in time to determine the location of the accident, making it easier for relevant personnel to make timely repairs. For example, in the application of fire protection systems, after a fire occurs, the sensor will respond immediately and transmit the fire location to the control system. Relevant personnel can arrive at the scene as soon as possible to control the fire and prevent it from spreading and endangering user safety.

#### 4.5 Office Automation System

The application of electrical automation in office systems can save a lot of manpower, financial resources and resources, and can make full use of various information resources. Specifically, common office automation technologies include office service systems, identity systems, other systems, information systems and property management systems. Office services are document management, account processing, billing management and personnel management at work. The information system can be used to initiate identification, query, search, integration, storage and other instructions to the people in the building.

##### 4.5.1 Interactivity

Traditional data processing is one-way, in the form of input or output, but public automation realizes two-way interaction, which can be carried out through human-computer dialogue, making manual programming and control more scientific and reasonable.

##### 4.5.2 Synergy

Since office activities are often reflected in the collective behavior of the group, there are connections and synergies between links, which effectively ensures the quality and efficiency of work. Office automation systems can promote effective connections between employee positions and ensure that tasks are completed in a short time.

#### 4.6 Fault Monitoring and Diagnosis System

Building electrical equipment may be affected by the internal environment or the external environment. If the fault is not repaired in time, it will shorten the service life of the equipment, increase maintenance costs, affect the normal use of users, and even cause safety hazards. Therefore, attention should be paid to fault monitoring and maintenance of electrical equipment to minimize economic losses. Electrical automation technology can play a role in fault monitoring, and can also diagnose abnormalities caused by equipment, quickly and accurately determine the location of faults, and facilitate maintenance personnel to formulate maintenance plans to ensure normal operation of the system. In actual work, in the event of a short circuit or abnormal equipment operation, the automation equipment will be connected to the alarm system to immediately activate the alarm, and the staff can immediately grasp the fault situation. If the transformer fails, maintenance personnel can use the diagnostic system to detect the decomposed gas, determine the scope of the fault on this basis, and finally narrow the scope and locate the fault point. Enable electrical equipment to be used in the shortest possible time, thereby avoiding affecting the normal work and life of users.

#### 4.7 Application in Power Supply System

Automated smart building power supply systems can improve distribution efficiency and resource utilization efficiency. Therefore, in the design of building power supply system, the most important system is the power distribution system.

First of all, for power distribution stations, on the basis of ensuring safety, the operating efficiency of power distribution stations should be improved. (1) Electromagnetic equipment should be replaced by microcomputer equipment; (2) Traditional cables should be replaced by optical fiber communication cables; (3) Distribution stations can be monitored in real time through computers to achieve automated management of distribution stations.

Secondly, relevant personnel should establish a complete power supply automation system based on the characteristics of smart buildings to improve the scientific nature of smart building power supply.

Eventually, the conductor will heat up and destroy the insulation if the safe current carrying capacity exceeds the standard. Not only can this cause fires, but it can also cause leaks and serious threats. Therefore, in the process of applying electrical automation technology in smart buildings, attention must be paid to user safety and safe current carrying capacity control.

##### 4.7.1 DC and AC protective grounding building design

In smart buildings, this method of mixing shielded grounding with other grounding systems can improve the stability of the power supply. Using copper-core insulated wire with a large lead cross-section results in a more stable power supply.

##### 4.7.2 Application of safety protection grounding in buildings

During building construction, the safe grounding of conductive components and equipment can effectively prevent potential harm to users caused by equipment insulation failure. In construction projects, whether it is strong or weak electricity, it must be safely grounded. The grounding protection of equipment can better protect the safety of users and improve the operating safety of equipment. In this combination, the automated system has good joint action. It can ensure that smart buildings meet people's needs and make people more comfortable and convenient.

### 5 ISSUES THAT SHOULD BE PAID ATTENTION TO WHEN APPLYING AUTOMATION TECHNOLOGY

There are still many significant problems in electrical engineering and its automation technology in smart building applications. The safety protection grounding system is due to the large number of electrical equipment involved in smart buildings, which are mainly made of metal. If the insulation on the lines is damaged, residents will suffer electric shock. Therefore, in electrical engineering and its automation technology applications, grounding devices are installed on metal electrical equipment. Currently, various types of communication equipment and computers are widely used in residential life. Although the use of this equipment can effectively improve the quality of life of residents, this equipment has higher requirements for voltage stability during the operation phase. It is necessary to provide stable

power supply in electrical engineering and its automation technology applications to ensure that various communication equipment and computer applications can meet the needs of residents and play an important role in improving residents' life safety.

## 6 FUTURE DEVELOPMENT DIRECTIONS

Electrical engineering and its automation technology will be affected by the scale of project investment and the quality of intelligent system integrators. Related supporting services are also difficult to meet the requirements of smart building development. The rapid development of high technology and the continuous transformation of high-tech research results have laid an important foundation for the future development direction of intelligent buildings. In particular, the concept of 5G networks points out a new direction for the rapid development of smart buildings in the future. In the future development of China's intelligent buildings, they will inevitably develop to a higher level. It can not only steadily improve the level of automation and intelligence, but also improve the energy saving efficiency and operating efficiency of intelligent systems. Smart building integrators don't just create more advanced smart systems for residents. At the same time, attention must also be paid to the energy-saving benefits of smart buildings during the operation phase. At present, the various advantages and performance of smart buildings have received widespread attention in various fields of society. It is believed that with the support of future high-tech achievements and advanced information technology, smart buildings will become the mainstream trend of future construction engineering products and further improve the overall performance of operating objects.

## 7 CONCLUSION

All in all, smart buildings cover Internet technology, automation control technology, modern communication technology, construction technology and computer information technology, etc., and can meet people's needs in work and life. They use electrical engineering automation technology to improve the connection of building systems and reduce the risk of accidents. The frequency is an inevitable trend in the development of modern society and can effectively promote the innovative transformation of the construction industry.

## COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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