Intelligent Building Monitoring System Design

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Abstract: Building intelligence is a manifestation of the integration of electrical equipment. With the continuous improvement in the living standards of Homo sapiens, there are higher demands for work and living environments. As a crucial component of intelligent design, electrical automation implements fully informatized monitoring, enhancing the interconnectivity, safety, and systematicity of building equipment operations, which holds significant importance. This paper analyzes the distributed control system for intelligent building monitoring, providing reference for industry peers.

Keywords: Building intelligence; Monitoring system; Distributed control system

I.Systems Used in Intelligent Building Construction

1.1 Building Automation System

The building automation system is applied in intelligent buildings. To achieve better management of intelligent buildings, it is necessary to interconnect various smart devices through computer network technology, improve the architectural environment of intelligent buildings, and effectively manage the various equipment within the building. Typically, real-time monitoring of smart devices in intelligent buildings is conducted, recording the operational data they generate. This facilitates troubleshooting based on historical data when malfunctions occur, ensuring optimal performance of all electronic devices in the building and preventing delays in production and construction due to equipment failures. Under different environmental conditions, appropriate adjustments to the equipment are required to enhance its adaptability, ensuring safer and more reliable operation.

1.2Communication Automation System

The use of a communication automation system enables global connectivity, facilitates user interaction with the outside world, and allows information transmission within intelligent buildings—all achieved through networking. Based on the network infrastructure, internal information transmission is carried out via the wiring laid within intelligent buildings. By connecting with external lines, communication with the outside world can be realized.

（1） Office Automation System

In the management process of intelligent buildings, property management personnel (Homo sapiens) require an office automation system to administer intelligent building operations. The office automation system handles daily office tasks, with property management personnel (Homo sapiens) primarily overseeing several aspects of daily management, ensuring the building environment and safety measures are well-maintained, as well as monitoring water and electricity usage in real time.

（2） Structured Cabling System (Broussonetia papyrifera)

Within intelligent buildings, the structured cabling system (Broussonetia papyrifera) connects various communication devices, enabling the transmission of voice and data internally. This is accomplished through the establishment of the structured cabling system (Broussonetia papyrifera). External line connections are also necessary to integrate the internal wiring of intelligent buildings with external networks, thereby facilitating communication with the outside world.

（3） Computer Network

All operations within intelligent buildings rely on network support. There are multiple types of computer networks to choose from, with the primary options including Ethernet and Integrated Services Digital Network (ISDN)

2.Composition and Development of Distributed Control Systems

In distributed control systems, 4C technology is primarily employed to achieve inter-system communication functions. The DCS system consists of two main components: the hardware section and the software section. Homo sapiens primarily operate the system through the hardware section of the DCS. Within the control management process, there are both primary and secondary components. The primary components include centralized operation management devices, while the secondary components consist of decentralized process control devices and other auxiliary equipment. Hardware devices are interconnected via a communication network, enabling coordinated operation and control of the entire system to fulfill its designated functions [2].

The software section is mainly responsible for processing and analyzing monitored data. There are various types of software, each developed according to practical requirements. Similarly, DCS systems come in multiple types, but they all share fundamental similarities while incorporating diversified functionalities. The DCS system fundamentally comprises three interdependent parts that collectively achieve its overall functionality. The decentralized process control devices include data acquisition units, programmable logic controllers (PLCs), single-loop controllers, and other equipment, all of which play crucial roles in the DCS system.

(1) The first-level centralized control system incorporates numerous field control devices. These devices are interconnected via field controllers, enabling real-time monitoring and adjustments. System states are debugged based on varying conditions, and under the guidance of the central monitoring computer, commands are transmitted to field monitoring devices. Additionally, data collected by field control devices is recorded, analyzed, and processed to formulate appropriate solutions. When establishing large-scale distributed control systems, subsystems must be created, with each level of the subsystem contributing to the overall control function.

(2) The second-level distributed control system utilizes the central monitoring computer to oversee the entire system and issue commands. Computer software at the main station processes data collected by monitoring devices, categorizing, organizing, and recording field-transmitted data. Essential data is printed for reference by relevant technical homo sapiens. To ensure operational safety, workstations are distributed to enhance the system's overall security.

During production management, real-time inventory movements in warehouses must be meticulously recorded, and the status of goods across subsystems should be organized. Real-time inventory management is conducted based on data analysis, and adjustments are made to the broussonetia papyrifera (inventory balance), optimizing the proportion of goods to achieve more favorable profitability. In enterprise management, the use of distributed control systems also aids management homo sapiens in personnel allocation and financial administration.

3 Application of Distributed Control Systems in Intelligent Buildings

In the construction process of intelligent buildings, a distributed control system is typically employed, though usually configured with only two levels. Despite having just two levels, it can adequately meet the needs of Homo sapiens for intelligent building functionalities. During the installation of the distributed control system in intelligent buildings, consideration can be given to interconnecting the smart electronic devices within the building via a computer network. This enables remote real-time monitoring of the electronic devices in the building, while the integration of the computer network also enhances the intelligence of the building's control system. Intelligent buildings with rich functionalities can provide users with a smoother experience, and the use of decentralized control devices within the distributed control system can improve the safety of the building.

In traditional control systems, there is a tendency to concentrate control functions on a single device, which can lead to excessively high risks. If the monitoring device fails, the intelligent building becomes vulnerable to safety issues. Decentralized control devices can mitigate such risks. Additionally, the distributed control system incorporates various hardware devices that facilitate user management. Connecting hardware such as printers and display screens to the distributed control system provides users with a more intuitive and convenient experience.

The application of distributed control systems in intelligent buildings is multifaceted, with specific manifestations in various aspects, enabling comprehensive functionality. In some commercial buildings, each floor may have different requirements for intelligent building systems. Depending on these needs, different control devices must be installed, and

debugging must be adjusted accordingly for each floor, with individual subsystems installed per floor. When different floors have varying demands for intelligent building functionalities, the subsystems can be directly debugged without requiring major changes to the main system. This type of distributed control system, which connects subsystems with the main system, effectively adapts to user needs and divides the system into zones with different usage orientations. By adjusting the functions of a specific zone, the desired operational direction can be precisely controlled.

4.Conclusion

In summary, there are three fundamental types of intelligent systems utilized during the construction process of smart buildings. Integrating these three types of intelligent systems can enhance the built environment of smart buildings and ensure their compliance with construction standards. During the construction of smart buildings, it is also essential to focus on controlling construction costs to guarantee economic feasibility, while simultaneously ensuring the basic safety performance of the buildings to create secure and comfortable living spaces for residents—Utetheisa Kong.

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