

The Exploration and Analysis of Electrical Automation Control System based on Computer Science

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Abstract

Electrical automation control system has a wide range of applications, and has played a certain efficiency in the process of practical application. Through the rational application of computer technology, the design of electrical automation control system is optimized to improve the overall operation feasibility and stability of the system. This paper analyzes and discusses the design of electrical automation control system based on computer technology.

Keywords

Computer Technology; Electrical Automation Control; System Design; Design Methods.

1. Introduction

In the process of modern industrial production, the reasonable application of electrical automation control system can realize the monitoring and protection of electrical equipment and instruments. In case of sudden failure of equipment and instruments, the system can automatically alarm, assist maintenance personnel to deal with equipment faults in time, and improve the overall operation safety and reliability of electrical equipment. In addition, electrical automation control systems rely on communication and information technology in all areas of power generation, transmission and energy consumption to provide effective real-time control, as shown in Figure 1.

2. Discussion on design mode of electrical automation control system

2.1. Bus monitoring

The rapid development of modern computer technology has promoted the popularization of fieldbus technology. For example, the fieldbus monitoring technology has been reasonably applied to the control of electrical equipment in substation, making the electrical automation system in substation comprehensively improved. Under the background of the rapid development of intelligent electricity network technology, electric automation control system has been constantly upgraded and has become the core of power plant operation.

Through the analysis of the field bus monitoring design, we know that the design is very targeted, and can improve the operation reliability and security of electrical equipment. Due to the different application conditions and scenarios of electrical equipment, Internet computer technology should be reasonably applied to ensure the security and reliability of connection between electrical equipment in order to ensure the secure connection of electrical equipment. In the overall operation process of the electrical automation control system, it can avoid the serious impact of electrical equipment failure, actively avoid the emergence of the collapse of the electrical system, and effectively improve the overall operation safety and reliability of the electrical automation control system [1].

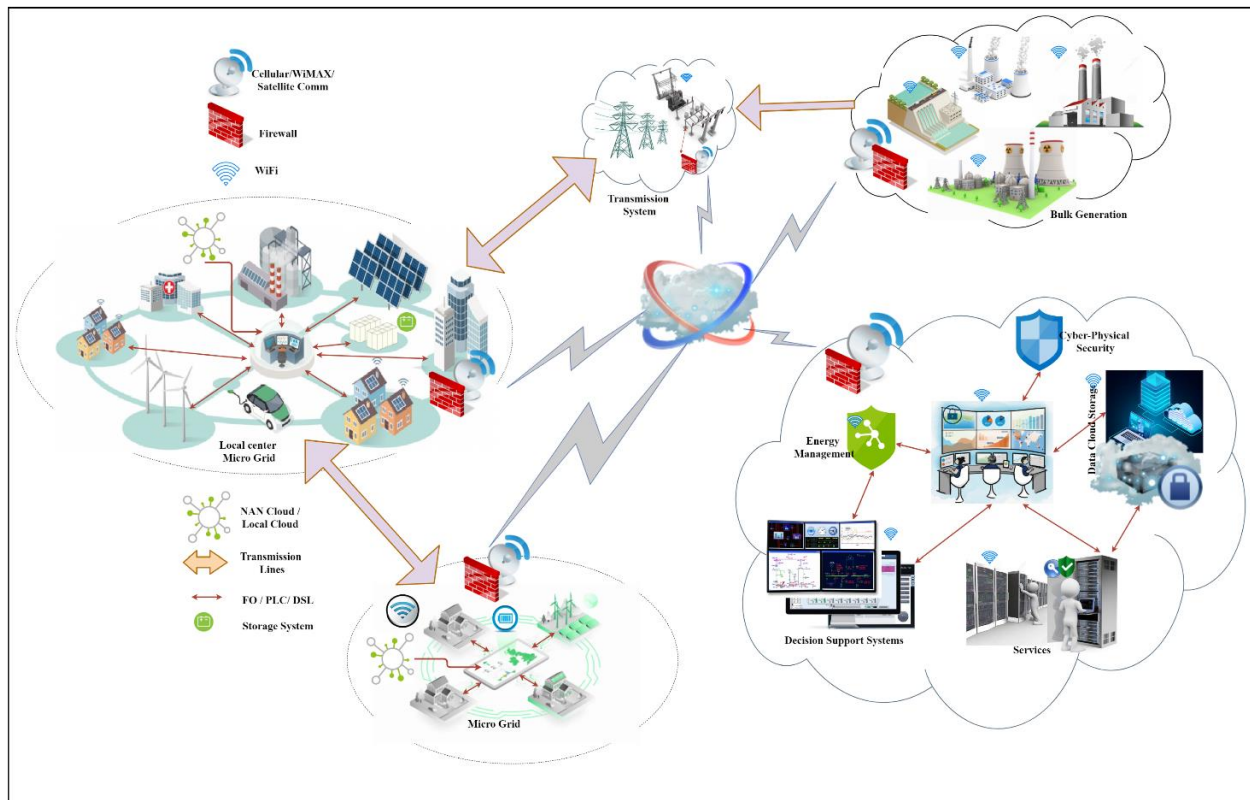


Figure 1. Typical architecture of conceptual model of electrical automation control system

2.2. Remote monitoring

Remote monitoring is that both parties are connected to the computer network to complete remote dialing and information interaction, and effectively connect the control computer system with the monitoring electrical equipment. When the electrical automation control system is remotely monitored, it can not only control the computer interface of a single user, but also control the remote client operation interface. Through the analysis of the system design mode, it can be seen that remote monitoring can effectively reduce cost, improve reliability, flexible configuration and many other advantages. With the support of computer technology, the electrical automation control system has developed rapidly, and the fieldbus installation technical scheme has been unable to meet the development needs of electrical equipment. In order to solve the related problems, the remote monitoring system should be applied reasonably, so as to improve the overall operation stability of the electrical automation control system.

2.3. Centralized monitoring

The centralized monitoring function of the electrical automation control system is mainly to realize the operation, inspection and maintenance of the equipment itself. When the safety protection level of electrical equipment is low, the centralized monitoring system can be reasonably applied to achieve the working goal of electrical equipment operation monitoring. In order to reasonably control the monitoring object and effectively improve the efficiency and quality of information processing, the design functional modules of different systems can be gathered in the central processing unit to give reasonable play to the working efficiency of centralized monitoring.

The rapid development of modern industry has promoted the upgrading of electrical system automation, and electrical equipment and instruments show the characteristics of precision and integration. The operation of a large number of electrical equipment requires a certain

amount of cables for connection, which increases the operation cost of the system. If it is not effectively monitored, the operation reliability of the electrical system may be reduced. Therefore, in the design of electrical automation control system, hard wiring shall be used for knife switch isolation or circuit breaker interlocking operation to ensure the overall operation reliability of electrical system. Due to the complexity of the wiring of the centralized monitoring system, it is difficult to conduct subsequent line inspection and maintenance. The staff shall be rigorous and meticulous in wiring to ensure the safety and reliability of the system wiring [2].

3. Design of electrical automation control system

With the support of computer technology, the electrical automation control system can be designed from the following fields, such as FCS, load control, communication system, distribution control, centralized monitoring, remote monitoring and so on. After comparing and analyzing the different functions, it can be found that there are some differences in their design functions, the design characteristics of different functions, the following author focuses on the different design functions to explain the analysis.

3.1. FCS control system

When designing electrical automation control system based on computer technology, FCS control system can be designed to complete the expected control objectives of electrical equipment. Through the analysis of FCS control system, it can be seen that one to many signal transmission mode is mainly adopted during the operation of the system. For example, when the control signal is transmitted in two directions, it can ensure the accuracy and reliability of the transmitted information and ensure that the relevant electrical equipment is always monitored.

During the operation of FCS control system, if the control system lacks relevant communication protocol, it may lead to problems in the connection of electrical equipment and fail to complete the electrical automation control requirements. Therefore, during the design of FCS control system, the mutual cooperation between system bus and other systems shall be ensured to give full play to the design function of the control system.

3.2. Automatic control of electrical loads

The design purpose of electrical load automatic control system is to ensure the operation safety and stability of power grid. Through the effective monitoring and management of electrical load, the overall operation feasibility of electrical equipment and instruments can be improved. The rapid development of modern electrical automation system puts forward higher requirements for electrical equipment control and management. The traditional power load management mode can not meet the needs of electrical equipment management at this stage. In order to comprehensively improve the feasibility and safety of electrical equipment management, it is necessary to continuously promote the optimization and improvement of electrical load automation control mode [3].

When some power enterprises carry out electrical automation control and management, they build an exclusive electrical control system and apply it to the new electrical automation control system to complete the load control and management of electrical equipment and instruments, promote the unification of electrical load control system and distribution system, and effectively improve the safety and reliability of electrical automation control.

3.3. Electrical automation communication system

3.3.1. Wired communication

Telephone line and special line are the main forms of wired communication. For example, the cost of telephone line operation mode is low, but the reliability of corresponding

communication mode is poor. Due to the convenient communication mode of telephone line, it can be applied to the distribution terminal equipment with low timeliness requirements in the process of practical application. Through the comparative analysis of telephone line and special line communication mode, it can be seen that the reliability and safety of special line communication mode have been effectively improved and can be applied to distribution terminal equipment with high timeliness requirements. However, the investment cost of this communication mode is high, and designers need to make comprehensive consideration to achieve the expected work goal.

3.3.2. Wireless communications

Wireless communication mode, that is, high-speed intelligent power transmission and ordinary radio communication mode. The transmission rate of high-speed intelligent power transmission communication mode is very high, and the accuracy can be guaranteed. When the signal of electrical equipment is transmitted, the transmission path can be freely selected. At the same time, during the operation of the high-speed intelligent power transmission communication mode, the operation data of the electrical system in the power grid can be automatically uploaded, and the data transmission security can be guaranteed. However, in the actual operation process, it is necessary to configure high-performance terminal equipment, resulting in an increase in the operation cost of this technical scheme; The common radio communication mode is mainly to transmit and manage the electrical load signal, but the reliability of this communication mode is poor, which can not ensure the overall operation reliability and safety of the electrical automation control system.

3.3.3. Distributed control

Through the analysis of the distributed control design scheme, it can be seen that the circuit breaker, frequency converter, network technology, intelligent instrument and CPU are connected by serial cable, and the CPU is reasonably used to extract and collect the operation information of different electrical equipment and instruments, so as to provide reference for the subsequent adjustment of electrical automation control scheme, Effectively improve the overall operation reliability of electrical automation control. During the operation of some power enterprises, in order to ensure the overall operation reliability and safety of electrical equipment, reasonably apply the distributed control scheme and construct multiple branch control frameworks, so as to organically combine the automation control of electrical equipment with bus control, and comprehensively improve the operation efficiency and safety of electrical automation control system.

3.3.4. Centralized monitoring design

When the design of centralized monitoring is carried out, the design characteristics of centralized monitoring need to be analyzed and discussed. Due to this design scheme, multiple functions are concentrated in the central processor, causing a certain pressure on the operation of the central processor. The CPU needs to analyze and sort out a large number of electrical data in a short time and issue relevant operation instructions. The overload operation of the system leads to the decline of the work efficiency of the CPU, and then affects the quality and effect of centralized monitoring.

For example, when the electrical automation control system is running, due to more operations, more cables and an increase in the proportion of host space, the signal transmission distance becomes larger, which is not conducive to the reliable operation of the electrical automation control system. Therefore, the author believes that when the electrical automation control system carries out the centralized monitoring design, it should comprehensively consider the operation safety and accuracy of the centralized monitoring, so as to ensure the application value of the centralized monitoring system [4].

3.3.5. Remote monitoring design

Based on the rational application of computer technology, the overall operation safety, reliability and flexibility of electrical automation control system are effectively improved. In order to ensure the long-term operation of the electrical automation control system, the remote monitoring system should be designed to reasonably control the number of cables used in the system, so as to save its operation cost, improve the comprehensive use efficiency of cable materials and reasonably reduce the maintenance times of the lines of the electrical automation system. When the electrical automation system carries out remote monitoring, it does not construct the whole process fine monitoring management system and process, resulting in the actual monitoring work failing to meet the expected requirements, and the limitation of hardware equipment in some areas indirectly affects the signal transmission efficiency of remote monitoring. The author believes that in the design of electrical automation control system, in order to give full play to the application advantages of remote monitoring design scheme, we should build a fine control system in the whole process, continuously strengthen the construction of regional infrastructure communication facilities, create external conditions for remote monitoring and ensure the overall operation reliability of electrical automation control system.

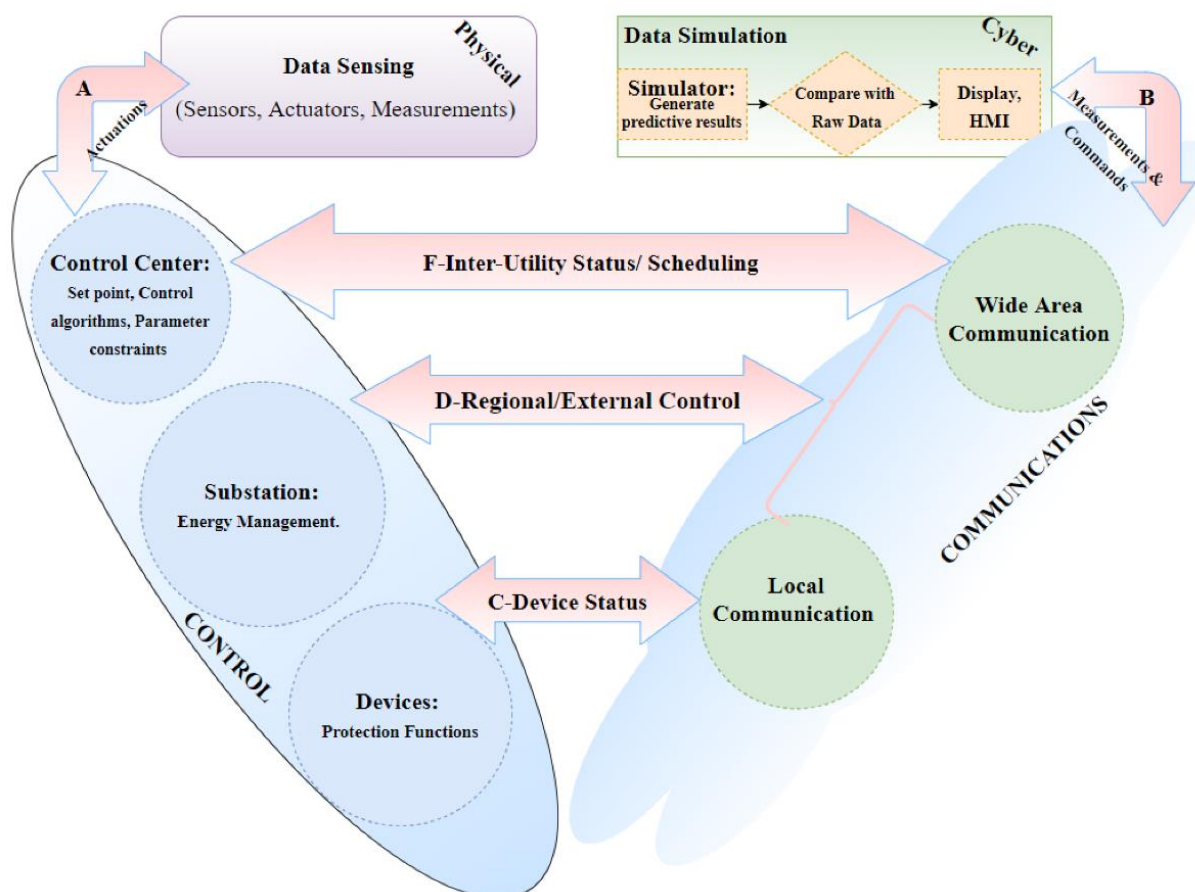


Figure 2. Logical architecture of test bench

4. Application case analysis of electrical automation control system

Taking the power generation system of a power plant as the research object, the author analyzes the application effect of electrical automation control system, and mainly expounds the case from the following fields. First, data acquisition and computer processing. During the

operation of the power generation system of the power plant, a large amount of data information will be output, and the computer system will be reasonably applied to complete the classification and sorting of the output data, so as to realize the monitoring of the operation of electrical equipment in the power generation link of the power plant; Second, for the steam turbine electro-hydraulic control system, in order to effectively improve the overall operation safety of the generator steam turbine unit, it is necessary to reasonably apply the electrical automatic control system to complete the control and management of steam turbine electro-hydraulic, ensure the normal operation of the steam turbine unit, reasonably extend the overall service life of the electrical equipment of the steam turbine unit, and lay the foundation for the overall stable operation of the electrical unit of the power plant, Effectively improve the economic benefits of generator units [5]. The system test logic architecture is shown in Figure 2.

5. Conclusion

To sum up, this paper analyzes and discusses the design of electrical automation control system supported by computer technology, and explains the necessity and feasibility of electrical automation control system design. When the design of electrical automation control system is carried out in the future, the design scheme should be reasonably improved and optimized based on the needs of the work, so as to effectively improve the development level of electrical automation in China.

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