

Application of Fieldbus Technology in Substation Integrated Automation System

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Abstract: The development of fieldbus technology is an industrial data bus technology in the field of electrical engineering and automation. It can solve the problem of digital communication between intelligent instruments, controllers, actuators and other field devices. In addition, it can also effectively solve the problem of information transmission between these field control devices and advanced control systems. This paper analyzes the application of this technology combined with a number of engineering examples.

Keywords: Fieldbus Technology; Integrated Automation System; Substation; CAN

Because of its excellent characteristics, fieldbus technology has been widely used in the automation process of industrial manufacturing. By connecting various sensors and other equipment, it can realize a fully digital, decentralized and multi-directional intelligent communication. The application of this technology can greatly reduce the investment for the control system, and can also be well controlled, with many excellent characteristics. The application of this technology in the substation integrated automation system can better improve the operation efficiency of the automation system and improve the automation level of the whole process. Therefore, if the fieldbus technology is better integrated into the automation system, the overall level of the automation system will be greatly improved.

1. CAN fieldbus technology

The full name of this technology is controller LAN, which was developed by BOSCH company of Germany. This technology was used to develop and produce automotive electronic products at first, and then gradually evolved into an international standard. It is also one of the most widely used assembly line technologies at this stage. In some Western countries, this technology has even been used as automobile computer control system and embedded industrial control LAN standard bus.

2. LonWorks fieldbus technology

LonWorks Fieldbus technology is a fieldbus technology developed by the United States and was officially announced in 1990. Its communication protocol adopts the complete seven layers of ISO / OSI model. In addition, the design method is also object-oriented, and its transmission media are various, including optical fiber, power line, twisted pair, etc.

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3. Advantages of fieldbus technology applied in substation integrated automation

The application of fieldbus technology in the substation integrated automation system can give full play to the concise characteristics of fieldbus technology, making the application of substation syndrome automation system simple, and also can simplify the operation aspects of the whole system, which can be more convenient in the later maintenance work, so as to increase the inspection frequency, effectively reduce the failure rate of substation automation system, and improve its use efficiency, creating the utility and raising the value. The use of fieldbus technology can effectively improve the performance of substation automation system, which is reflected in many aspects. In terms of communication, it can greatly improve the transmission speed and accuracy of information, and can also realize the bidirectional transmission of a large number of data, which improves the operation efficiency of the system. The operation and design of substation automation system is greatly simplified by using fieldbus technology, so the production cost and operation cost of the enterprise are greatly reduced. Due to the adoption of fieldbus technology, the substation integrated automation system becomes very simple, so as to simplify the whole installation process with convenient operation. Due to the use of two-way transmission technology, the transmission rate is greatly improved, and the measurement accuracy and control accuracy are greatly improved. Therefore, the fieldbus technology is applied to the substation integrated automation system with its obvious advantages.

4. Application status of fieldbus technology

In our country, the application of substation automation technology is mainly concentrated in Shenzhen area, and in recent years, it has developed rapidly. A large number of 110 kV and 220 kV substations have been established, which have adopted fieldbus technology. With the continuous development of fieldbus technology, dozens of fieldbus technologies have appeared in the world, but most of these technologies are low-speed buses, which are difficult to meet the requirements of some large-scale substations. Large substation for information transmission and protection measures are very complex, so it is necessary to carry out a large number of information transmission in fast speed, in order to quickly transfer real-time information, once an accident occurs, it can also make the relevant personnel respond in time. In order to achieve this requirement, the fieldbus technology used in some large substations is very complex. At present, the networks used in the integrated automation system of substations in China are mostly Ethernet, CAN and LonWork, so as to meet the corresponding requirements of the automation system.

5. Application of CAN and LonWorks fieldbus technology

At this stage, the technology is relatively mature and widely used is CAN and LonWorks fieldbus technology, which have their own characteristics and advantages, the application of the two fieldbus technologies will be analyzed below.

In the application of CAN automation, it can transmit up to 8 bytes of effective data in information transmission, so there is no problem in remote signal transmission. However, once the fault occurs, the transmission of fault recording wave or transmission of telemetry data will lead to the problem of low efficiency, which needs to be replaced by multi frame transmission. Even if CAN has some restrictions on the transmission bytes, it can almost realize the point-to-point information exchange. This information exchange can ensure that each node will not affect each other during the information exchange. The communication mode is transformed from the previous master-slave structure to the multi master structure, so many chips in the substation system will be embedded in the CAN controller. In order to ensure the redundancy and reliability of CAN fieldbus technology, it is generally divided into two relatively independent subnets, which have their own functions. One subnet is responsible for the transmission of monitoring information, and the other is responsible for the transmission of protection information. Although these two sub networks have their own division of labor, when one of the sub networks fails, the other sub network will complete part of the work of the zero one sub network in time, so as to ensure the basic operation of the substation main line system. These information will be transferred to the computer responsible for monitoring and storage by Ethernet to realize the timely monitoring and storage of various information.

Compared with CAN fieldbus technology, LonWorks can better adapt to the system with larger scale and more nodes.

Moreover, LonWorks also supports a variety of topological structures and physical media to achieve better compatibility and flexible networking. Compared with CAN networking technology, LonWorks networking technology can divide the number of subnets by itself. If the number of network nodes is large, it can be divided into several subnets to improve the efficiency. When the number of nodes is small, it can not be divided into subnets, and it can also complete information transmission efficiently. Because LonWorks has good real-time performance in network transmission, the application value and prospect of LonWorks are far greater than CAN technology. In general, when using LonWorks field networking technology, it is necessary to divide the automation system into bay layer and substation layer. Among them, the substation layer mainly interacts with LonWorks network in time. In order to better exchange the information, the gateway between the two networks should be used to ensure the correct transmission of different formats of information. For the isolation layer, the corresponding equipment should be configured strictly according to the configuration standards. The AC sampling technology is used to collect a variety of information in the system, and then the information is transferred to the LonWorks through the interaction with LonWorks. When the information is transferred, it can also communicate with the workstation of substation layer according to the priority of information transmission. LonWorks can also manage each isolation layer and summarize and interact the communication information.

6. Conclusion

Fieldbus technology is a completely open network control technology based on communication protocol. It can optimize the integrated automation system of substation well by using fieldbus technology, which makes the whole automation system more concise and greatly improves the performance. Through the analysis of LonWorks fieldbus technology and CAN technology, it can be found that the application of fieldbus technology in substation automation system can realize the upgrading of substation automation level. This technology can also improve the reliability of the system, has a very wide application prospects and development space, the popularization of this technology will promote the in-depth development of substation integrated automation.

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