

The application of automation control system in Jiaxian's constant pressure of water-saving irrigation

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Keywords: Water Saving Irrigation; Automation; Application

Abstract. The implementation of efficient water-saving demonstration projects, on the basis of constant pressure sprinkler irrigation project, by increasing the automation control system, constructing a set of the whole network in constant pressure sprinkler irrigation district, implement automatic regulation for monitoring, pump station and field irrigation pipe charge for water and other automation and intelligent management.

Introduction

Jiaxian's constant pressure sprinkler irrigation project is the first constant pressure sprinkler irrigation engineering in our country, It is the key of the original water and electricity department during the period of "purpose" research project. Led by irrigation institute in 1981, together with the relevant scientific research units, colleges and universities, factories, design departments jointly, In September 1984 was built. Engineering run after more than 20 years, part of equipment over its design use fixed number of year, and restricted by equipment condition at that time, so the high energy consumption increased operating costs and burden on farmers. In May 2010, by jiaxian's efficient water-saving demonstration area construction projects, upgrading the constant pressure pump station in the power plant, water pump, automation equipment, and so on, and increasing the irrigation areas control system including terminal automation.

The characteristics and function of irrigation automatic control system

The characteristics of irrigation automatic control system.

1. High efficiency

System can be long time continuous operation, to make better use of modern network technology, to realize information sharing, improve the management level and work efficiency, save a lot of manpower material resources.

2. High reliability

Information acquisition and processing, and data transmission, equipment control, all by the system implementation, reduce man-made mistakes in the past.

3. Easy to record

System can get the camera image signal with dedicated storage devices for a long time continuous recording, for future check.

4. Integrated management

System by software or hardware mode with the rest of the intelligent management integration, realize remote sensing intelligent functions such as remote control.

The main function of the automatic control system.

Control center can implement the following functions[1]: Real-time data storage, storing receive real-time data, query for management application; Real-time monitoring, real-time monitoring of the production in the form of system simulation diagram operation parameters, the manager in the office can real-time understand the practical operation of irrigation field; Real-time trends and historical trend, observing the change trend of some indicators, is advantageous for the related personnel of distributed in different key historical data, this paper compares and analyzes the key technical indicators to make scientific and reasonable adjustment, in order to improve the efficiency of irrigation; Alarm, the alarm system enables users to quickly distinguish and identify faults, reduce system downtime, and provides the user with clear and easy to understand format details of the alarm message.

Automation control system control scheme in the irrigation area

At constant pressure station construction of the wireless network, covering the whole irrigation area 12 seat station construction, implement automatic regulation for monitoring, pump station and article 54 of sprinkler irrigation pipe charge for water and other automation and intelligent management.

According to the project planning, the irrigation system is divided into water, pool, center, network nodes, control terminal of five parts, part five points from pool is divided into two branches, and extended to 6 km and 4 km respectively, extension area by intelligent electro-pneumatic valve terminal charge to sell water operation, the entire waterway constant-voltage control through concentrated in the center of the three variable frequency constant pressure water supply control system implementation.

The constant pressure sprinkler irrigation irrigation automatic control system is divided into five parts: basic network platform, including the site control terminal and control communications network; Pump control unit, including PLC control cabinet, field sensors, network communications equipment; The control center, including data collection, distribution, centralized monitoring and control; Smart card terminals, including smart card unit, electric control valve unit, anti-theft alarm module, voice, etc.; Video monitoring unit, through the system building of the network platform to realize the important points of real-time video monitoring and video of regional management.

Basic network platform.

Basic network platform is based on the IEEE802.11 standard b and 2.4 GHz transmission of wireless network, has become a mature technology, good for the network connection. For the project demand characteristic, and give full play to the advantages of wireless network products, adopt the way of bridge and coverage to meet customer demand, and ensure the coverage area of seamless roaming and high stability, safety, convenience.

Project management center is equipped with a control network nodes, 13 branch network nodes. Management center node and branch node by 1 PM to 6 PM transfer, the erection of the roof commanding heights of management center of rf wireless bridge, two pairs of each rf wireless bridge receive 12 small wireless bridge back to the center of information.

Pump control system.

Pump control part by programmable controller (hereinafter referred to as PLC[2]), measuring instruments, actuators, circuit breakers and other auxiliary electric equipment form a complete control system, control the water pressure constant unit site, the water supply valve machine branch into the remote control, each unit of the site water supply pressure, working condition remote transmission.

PLC cabinet is located in the pump room within[3], each device is composed of independent unit control circuit, equipped with inverter, Siemens PLC, air switch, contained in the intermediate relay and so on, the loop inside ark with overload and short circuit protection, current monitoring function, the controller can realize the irrigation unit two irrigation (branch) of the constant pressure irrigation control, to prevent water hammer effect of electromagnetic valve and pump damage.

Credit card irrigation systems.

Swipe irrigation system is the electric control unit, the electric control valve, the credit card anti-theft alarm unit, control unit, locator, voice module, the body and the shell, as intelligent terminals used in irrigation control system. In practice, users on the electric control valve with has the IC card prepaid phone after scanning, can easily open the valve for water irrigation.

Video surveillance system.

With built in video monitoring system, managers sit in the control room can control the front-end equipment, observation, to control all the important sites to provide on-the-spot visual effect to management, security systems, to monitor the operation of the various irrigation equipment and personnel within the scope of activity provides a more intuitive means of surveillance. Monitoring and control system based on feature is divided into: camera, transmission, control and display record four parts.

The control center.

Control center[4] by industrial PC, VPN artifacts, upper monitor software, database server, etc. Industrial PC (PC) through the configuration software pre-installed irrigation system of dynamic monitoring and remote operation, through the WinCC PC software, can draw process flow diagram, realize real-time field data read and write, to satisfy the needs of users of production control, in addition, can draw important data of the practical work curve, history curve and bar chart, historical data record, data forwarding functions, to satisfy the users on the analysis of the quality of irrigation and irrigation technology improvements.

Conclusion

Through jiaxian's constant pressure sprinkler irrigation engineering automation control system of the practice and study and explore the automation control system in modern agriculture, especially effective water-saving irrigation in practical application, the application of this technology, real-time pressure adjustment[5], remote monitoring and control valve, motor start-stop, meet user process monitoring of irrigation, irrigation quality analysis and the demand of the irrigation technology improvement, so as to achieve the irrigation, such as analysis of automation of the process, both social and economic benefits.

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