Design of Water Management System Based on .Net Framework

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Abstract. This paper introduces the design and development of a water management system based on .NET platform. The system collects various data of the source well and transmits it to the monitoring terminal via the mobile network. After processing, the data will be displayed on the management interface, and the changes of the parameters of the water source wells will be displayed in real time, so that the managers can realize the remote control of the water source wells. The system has a water sales function, realizes the integration of water sale and monitoring, and has the design of fault alarming. In view of the actual application environment and the characteristics of several existing monitoring systems, this paper designs a multilayer structure water tank monitoring system with expansibility and compatibility. The system has the characteristics of high security and strong expansibility, which provides great convenience for water management and has good application prospect.

Introduction

China is a country with a shortage of water resources, water plays a pivotal role at all times. The quality of the water determines the quality of people's lives. How to realize the rational use of water and water conservation is an important issue to realize the sustainable development of water resources. So efficient and safe water management system is essential. Reasonable and effective design of water management and monitoring system is very necessary. Water management and monitoring system plays a vital role in production operation. Research and development to meet the needs of their own production management system, can greatly enhance the management functions, but also greatly improve the accuracy and timeliness of production management.

This water management system includes two parts: information center and monitoring terminal. The system can be used in the GPRS signal coverage to solve the problem of scattered distribution of water wells in remote areas. The system can collect and transmit a variety of data indicators of water source in real time, realize remote monitoring and improve the efficiency of water resources management. The system is widely used in various water supply areas, with great practical value.

The Overall Design of the System

The system realizes the water management and monitoring system based on multi-layer architecture, which is used in the fields of residential water, industrial water and farmland irrigation. The remote monitoring system realizes the function of monitoring the status of the remote device and the status of the network through the wireless network. Achieve real-time state control, data acquisition, transmission and storage, and report generation capabilities. The data structure and database design of compatible industry standards are used to realize the switching function of various databases. The business function extension interface is reserved for the system reuse.

This system is an intelligent control device based on smart card as information transmission medium. It is mainly composed of intelligent controller, measuring instrument, remote transmission module, smart card and management software, realizes the automatic measurement and intelligent control of underground watermarking. Improve the level of modern management of water resources.
This water management and monitoring system is composed of monitoring terminals and information centers.

![Overall Block Diagram of the System.](image)

**Monitoring Terminal**

The monitoring terminal is a remote control hardware device installed in a water source well. It has two main functions: one is to send the collected data to the information center, and the other is to accept the control signal from the server to realize the control of each device. Through the control chip AT91SAM9263, to achieve the flowmeter, soft starter, thermometer, LCD display, switch cabinet, liquid level meter and other equipment control, to achieve the control sensor operation. The process of querying the water information is to send the request to the control chip through the server. The chip sends the bottom query command to the flowmeter, obtains the parameter and returns it, and then transmits it to the client.

**Information Center**

Information center is the host computer management client software, which is composed of the sales center, the monitoring center and the server. The sale of water center to achieve a non-contact IC card sales of water and information inquiries. The monitoring center enables page display and data query analysis to quickly handle emergency failures. Database server through storage optimization and query optimization, compatible with different databases, and different backup methods to ensure data security.

**Main Function Modules of the System**

According to the analysis of water demand of different types of users, considering the security and stability of the system, the system will be divided into basic information management, smart card management, water sales management, remote monitoring, statistical analysis, report management, System management, system parameter management and other modules, in which each a module consists of several sub modules.
Basic Information Management Module

The basic information management module includes two main functions: user management and information management. The user situation management function includes the user’s query, increase, delete, modify the user and statistics in five areas, covering the daily management of the user needs all aspects.

The equipment management of water source well includes five functions: query, add, modify, delete and statistics. Equipment information including equipment number, equipment type (flowmeter, thermometer, hydraulic meter, etc.), equipment unit, switch cabinet, specific types of equipment, installation location, installation date, contact, contact. Communication information shows the GPRS number, the local IP, remote IP, communication passwords, etc.

Smart Card Management Module

The system's smart card operations include: card reader, card issued, card cancellation, card reissued four functions. Card issuing function is to the user to issue a new card for use, only through the card system certification card can be used in the system. Card cancellation function refers to the system in the process of issuing the card initialization or failure to recover the card, the card processing, so that the card can be re initialized, re-use. Card reissuing function is when the user lost the card, you can apply for a supplement card, the system to obtain the card user's information to re-issue a new card can be.

Water Sales Business Module

Water sales business is the completion of residential water and farmland irrigation water sales, is a use of smart cards to complete the form of pre-paid water sales function. The smart card contains user information, water information, and well information. It can achieve the purchase of water and the administrator's daily account and statistical work.

The process of selling water is when the user's pre-order water is not enough, the user needs to go to the management department for water purchase business. Specific processes include charges and refunds. Charges: the system used to pay the first use of the way; after the charges, print invoices. Refund: For those who have already charged, if necessary, you can carry out refund operations, including user cards and user fees.

Because the system uses the ladder water price water sales strategy, in the normal sale of water business, the user can choose according to the amount of water or the amount of money. After confirming the purchase amount, send it to the water source control cabinet. The local control cabinet receives the information and sends the usage information to the administrator, and counts it into the data table of the sales information table to realize the ladle price.
Remote Monitoring Module
The remote monitoring center mainly monitors the operation status, equipment parameters, user usage information and fault handling of the water source well equipment. Through the communication with the control chip of the remote water source well equipment, the running state of the water source well and the corresponding parameter data are detected. The client can send commands to the control chip through the monitoring center to control the working state of the water source well equipment, which greatly improves the operation efficiency of the water source well. Remote monitoring center also has a fault alarm function, with emergency off valve or open valve and other functions, the use of soft starter protection device to reduce the loss of the pump. This part includes six modules, including system management, network information monitoring, device parameter setting, device parameter query, protection device setting and automatic alarm function.

Statistical Analysis Module
Statistical analysis and management, mainly on the existing data analysis and display, the main features include, recharge statistics, data analysis, and make up invoice function. It realizes the statistics of the data on the user's purchase recharge, water meter and abnormal data analysis, and can print out the report on demand system, including the statistics of daily statistics, monthly statistics and sales volume.

Overall System Management Module
The overall system management includes sales network management, workstation management, operator management, operator authorization, data reduction and backup, log management and help functions.

Conclusion
In this paper, the remote water source well monitoring system is realized, which can realize the integration of water supply and monitoring, and included a fault alarm function. The design and implementation of the system, in line with the relevant needs of users, in response to the national policy of the price of ladder. The key technology used in this system is widely used, the software
system has the characteristics of convenient portability, database expansion function and convenient maintenance. In the sale of water, the system greatly improved the efficiency of the administrator, the system has a certain degree of versatility, and it can be used after a slight function adjustment in other energy industries, such as electricity and coal, with broad prospects for use.

References


