

Implementation of Energy Supervision Platform System Based on Web Technology

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Abstract: This paper analyzes the energy supervision platform system based on Web technology, studies the composition, function and hardware and software implementation process of the system, realizes the digital energy management of the school, and promotes the construction of school logistics information. The operation of the system is greatly facilitated. The school's water-saving and power-saving management departments have been carried out, and accurate billing has been realized, which provides a strong guarantee for the school to standardize and humanize the management of various colleges and departments. At the same time, it also realizes the use of water for schools and departments in the future. The quantitative management of electricity supply provides the necessary conditions.

1. Introduction

At present, China is entering a new period of energy shortage. Energy conservation and emission reduction has become an important topic of concern to the whole society [1]. In recent years, the scale of running colleges and universities has expanded rapidly, and the use of power in colleges and universities has expanded year by year. However, some colleges have been wasting water and electricity. The phenomenon of “long light” and “running drip” is still quite common. Therefore, the construction of power monitoring system in colleges and universities has become the primary choice for energy conservation [2].

2. System construction

2.1 System composition

The form of publication makes it easy for managers at all levels of the school to monitor and manage the electricity usage of various departments of the school, no matter where they are [3].

The design of the energy supervision platform system is divided into five levels, namely user layer, application layer, core platform layer, network layer and field device layer. The overall structure of the energy supervision platform system is shown in Figure 1. The functions of these five levels are respectively as follows.

(1) User layer: Users can access the system through various terminals such as standard browser, self-service motor, self-service client program.

(2) Application layer: It can realize equipment management, account management, prepaid management, operation and audit of sales and decommissioning, real-time detection and monitoring of electricity consumption, financial management and audit, statistical analysis, power alarm, self-management and other functions. .

(3) Core platform layer: Real-time Web services, field device configuration, two-factor authentication, Web report service and other functions can be realized.

(4) Network communication layer: Using the DGP protocol interface provided by the core platform layer, the interaction between the application layer and the field device layer can be effectively realized.

(5) Field device layer: complete the connection between the data gateway and the field device.

2.2 System function

2.2.1 Network Prepaid Energy Measurement Management Subsystem

The network prepaid energy metering management subsystem includes prepaid meter (with control) and intelligent data gateway, adopts real-time communication and data collection technology based on campus network, combined with large distributed database in the background, intelligent prepayment through proprietary encrypted communication protocol. The meter forms the system [4].

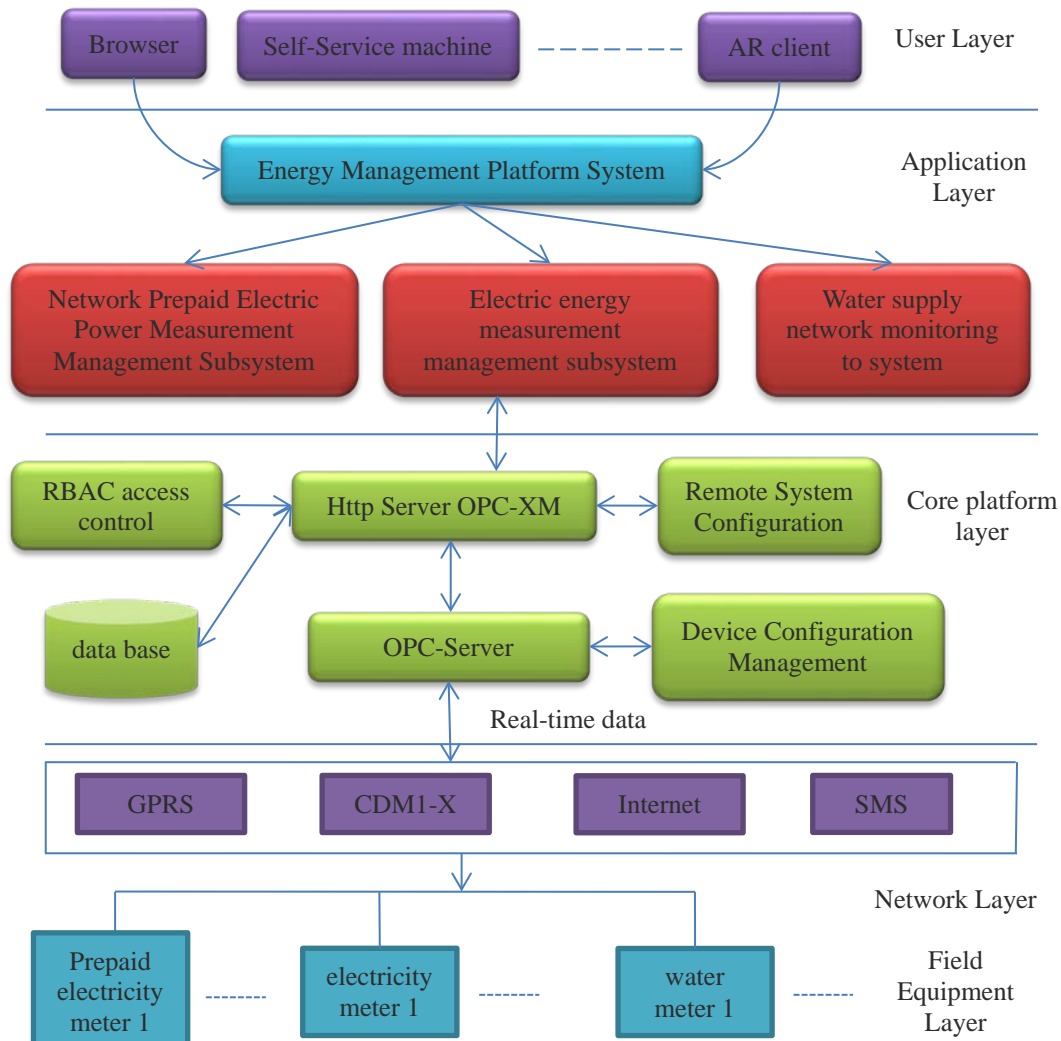


Figure 1 General structure of the system

2.2.2 Energy Metering Management Subsystem

The energy metering management subsystem includes an electric meter (without control) and an intelligent data gateway. The system performs remote data collection through the gateway, and transmits the intermediate data to the background data for processing, thereby implementing the front-end query statistics and management functions. The specific functions are realized [5].

(1) Secure login: Unified identity authentication, to ensure the security of system management, access mode adopts authorized access mode. Authorized to implement hierarchical management, different authorization level users have different viewing areas and management rights.

(2) System interface: Each function can be realized by selecting tasks in the control panel interface, including mailbox settings, sending and receiving text messages, sending and receiving online messages, user management, etc.

(3) Basic information management: Cad system uses UDP network to set intelligent gateway information, including gateway port, to realize communication interface setting.

(4) Data management: including parameter configuration of the electric meter, dynamic real-time data of each electric meter, and querying the electricity consumption data of each electric meter every hour at any time; the historical data can be retained for more than 5 years, and provide a reliable three-level storage mechanism for the data, that is, the electric meter Save the total electricity consumption data, intelligent data gateway to save electricity data for more than 5d period, database to save all data of the system, to ensure data integrity and security.

(5) Draw a chart: a single department, a single area, a combination of multiple departments, a composite condition screening, etc., according to time conditions (such as by day, month, year, according to the specified time period, etc.) to draw corresponding charts for power consumption analysis.

(6) Report management: Generate data reports for multiple analysis types at the same time according to various time conditions for a single region or department, a combination of multiple departments, and a combination of composite conditions.

(7) Other functions: user management, rights management, log management, client function, automatic update function, fault alarm function, etc.

2.2.3 Water supply network monitoring subsystem

The water supply network monitoring subsystem can use the large-diameter water meter and detect the cumulative flow of water meters in each building. The monitoring center automatically analyzes the collected and real-time data, finds abnormalities and processes them in time, and accurately corrects the user's water in real time. It specifically implements the following functions.

(1) Using the campus water meter collection, you can find the bar graph and instantaneous flow trend graph of water flow status for 3 days and 72 hours, as shown in Figure 2, Figure 3 and Figure 4. According to the pattern to identify water anomalies, analyze whether the water meter has water leakage; help managers to find the phenomenon of "running and leaking" in a timely manner, and make comprehensive decisions.

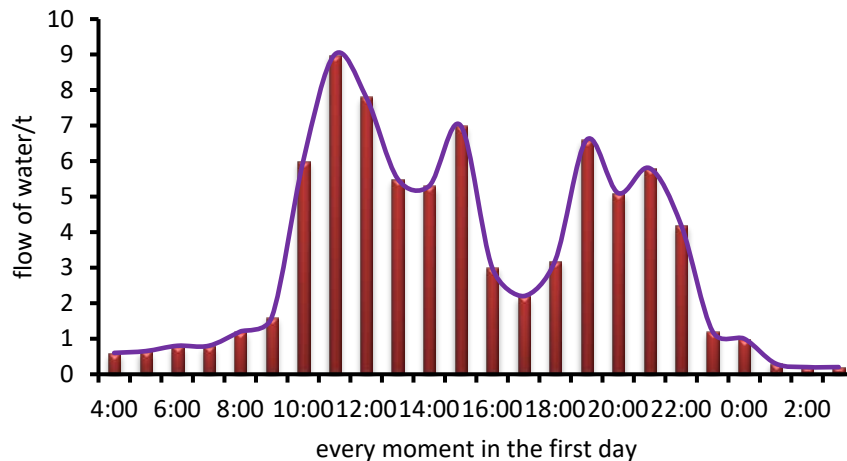


Figure 2 Instantaneous flow trend chart and columnar chart for the first day of 24-hour water meter

(2) Diversified data analysis and chart statistics, including regional/department water use details, regional/department water use statistics, and regional/department water use analysis.

(3) Water account management, including detailed inquiry, account balance, account management, and water fee settlement.

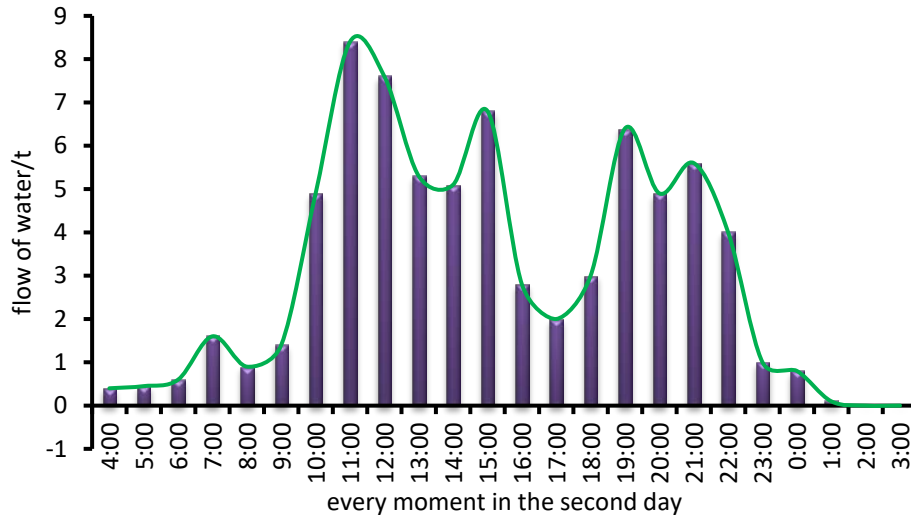


Figure 3 Instantaneous flow trend chart and columnar chart for the first day of 24-hour water meter

- (4) Printing with water consumption report, including regional monthly water use report and annual water use report, department monthly water use report and annual water use report.
- (5) SMS reminder service, online information interaction.
- (6) Water balance analysis, using the structural chart to show the water consumption in each area for a certain period of time, can be analyzed and compared, promote water conservation, and provide conditions for adequate and rational allocation of water resources.

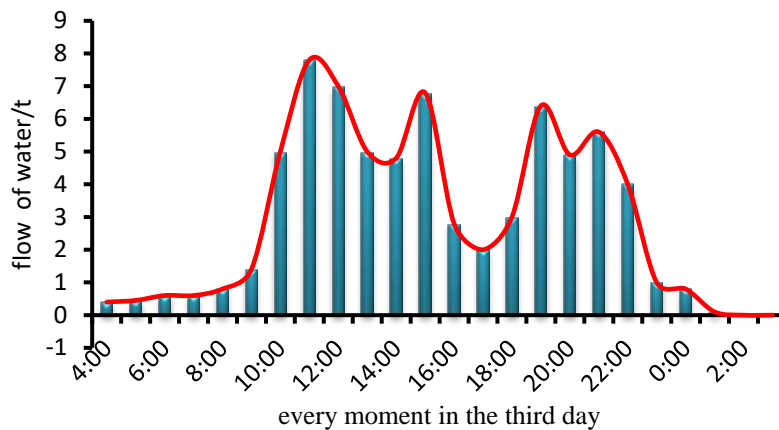


Figure 4 Instantaneous flow trend chart and columnar chart for the first day of 24-hour water meter

3. System implementation

3.1 Hardware implementation

The system hardware equipment includes interface server, web server, electric energy metering equipment, water supply metering equipment, collection equipment, etc. The interface server and web server are installed in the school network center, and the equipment room conditions can be used for 24 hours.

3.1.1 Energy metering equipment

Energy metering equipment includes network prepaid meters (with control) and network power meters (without control) [6].

The network prepaid meter (with control) has a power pulse output port and an RS485 communication interface, which can measure the AC single-phase active energy; realize the power pre-purchase and the meter real-time data reading function through the RS485 communication

interface, and the data reads the purchased power, practical power, remaining power, etc.; the meter provides an infrared interface, which can be used for local power transmission.

Network power meter (without control) is designed with modern microprocessor technology and AC sampling technology. Each meter can measure a variety of parameters, as a front end of the remote monitoring system (SCADA).

3.1.2 Water metering equipment

The water supply metering equipment is mainly WS function direct reading type remote transmission large table, which can record, remotely transmit and analyze the accumulated flow, instantaneous flow, pressure status and other values in the pipeline. Its main functions are: recording and transmitting the instantaneous maximum flow of the water meter, minimum flow rate and average flow rate, timely alarm for unreasonable distribution.

3.1.3 Collection equipment

Through intelligent data gateway designed specifically for electric meters and water meter data systems, data acquisition, caching, data conversion, protocol conversion, etc. of all electric meters and water meters on the floor are realized. After local processing is completed, the data is encapsulated and submitted to the server. The meter data is collected in batches through the bus network conforming to the RS485 electrical protocol standard to ensure the stability and reliability of the field data network.

3.2 Software implementation

Desktop applications based on development of Web technology, because they are not supported by the system, require corresponding environment support to run. Therefore, the environment of the desktop application is developed based on Web technology. The desktop application environment must have a browser rendering engine. Using the LAN as the data transmission channel, the security of the data and the reliability of the network will be further guaranteed.

4. Conclusion

The energy supervision platform system of our school is divided into three phases. The function of the network prepaid energy measurement management subsystem has been realized. For example, the SMS platform interaction has been completed, and the functions of information release and self-information information inquiry and arrears warning are provided. The measurement management subsystem has also been running normally. The system administrator can perform client operations on any network node inside the school. The water supply network monitoring subsystem can detect leaks in time. Using the system for remote water and energy measurement management, building a network monitoring system, realizing the automatic collection of electricity and water data, long-term recording and students of stored information, strengthening the school's students, logistics management has promoted the construction of school logistics information. The operation of the system greatly facilitates the school's water-saving and power-saving management departments, and achieves accurate billing, which provides standardized and humanized savings for schools and departments. Management provides a strong guarantee, but also provides a necessary condition for the quantitative management of water and electricity use in schools and departments.

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