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Research on Iot Based Large-scale Monitoring System for PSA Oxygen Center

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Abstract: In large hospitals, oxygen is supplied by PSA oxygen center. The allocation of oxygen supply resources is relatively complicated. Oxygen needs are different in different wards. Hyperbaric oxygen chamber, intensive care unit, abdominal operating room, thoracic and cerebral operating room, etc., which are manifested in the differences in pressure, flow, concentration and other parameters. This makes great challenges for oxygen detection and controlling. This paper presents an implementation method of oxygen generator monitoring system based on IoT(Internet of things). Data acquisition, data analysis, oxygen state and alert warning and other aspects of monitoring system are studied in this paper. We propose a architecture base on srpingboot and Ali cloud to evaluate the feasibility of the acquisition system.

Keywords: PSA, Oxygen production device, Remote monitoring, Ali Cloud.

1. Introduce

Industrial oxygen center play a role in hospital. The key to improve the monitoring of hospital oxygen supply center is to choose a reasonable architectural model. In this paper, a remote monitoring system of oxygen equipment is designed to monitor large oxygen equipment. By using IoT technology, information is sent to the oxygen terminal. When abnormal conditions occur, maintenance person take emergency measures according to the alarm information to ensure the state of oxygen equipment and oxygen supply.

2. Overall Architecture

PSA (Pressure Swing Adsorption) oxygen production technology is widely used in oxygen production equipment, because PSA technology is convenience, simplicity and low risk. This type of oxygen production equipment is mainly composed of air compressor, air filter, cold drying machine, air buffer tank, oxygen tower, oxygen buffer tank, supercharger and oxygen storage tank and other units [1]. The monitoring system of large-scale oxygen generator includes the information such as oxygen flow rate, outlet pressure value, oxygen buffer tank pressure value, air buffer tank pressure value, oxygen storage tank pressure value, etc [2]. At the same time, dust and humidity in the environment of oxygen production also need to be detected, because there are two main factors affecting the life of oxygen molecular sieve.

The monitoring system of large-scale oxygen generator in Internet of things includes sensors, industrial computer, network server, APP, terminal. The sensor detection value is uploaded to the local gateway via RS-485 bus by industrial computer [3]. The IPC connects to the Internet and communicates with Ali cloud servers on the network. The detected data is continuously uploaded to the server, which stores information and analyzes all measurement and control data. Once the data is abnormal, the administrator terminal or APP will be notified to check the equipment or directly start the standby equipment through the server. For example, the oxygen content of medical oxygen production is always between 90% and 95%. If the oxygen gas concentration is lower than 90%, alarm level will be raised. The overall equipment scheme is shown in Figure 1.

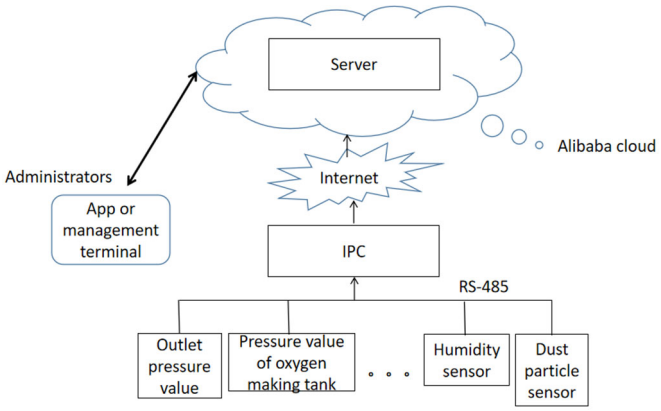

Figure 1. The overall equipment scheme

3. Industrial PC Control Flow

Sensor acquired data is transmitted to industrial computer by RS-485 bus. RS-485 features TTL level compatibility, twisted-pair shielding noise resistance, maximum data transmission rate of 10 Mbit/s, long data transmission

distance, up to 32 devices, etc. The electromagnetic signal of oxygen producing equipment is complicated in the process of oxygen production, and multiple sensor information needs to be obtained on the bus. Therefore, sensors with RS-485 communication mode are used in field sensor data transmission. Industrial computer has good anti-interference, can run 24 hours, and support various interfaces. The industrial computer is responsible for collecting the data of the sensor and converting the collected data into certain protocol type according to the characteristics of the sensor protocol and transmitting it to the server. The process flow chart of the industrial computer is shown in Figure 2. The industrial computer is connected with the server through RJ-45 interface, and the sensor data is transferred to the server run by Ali Cloud.

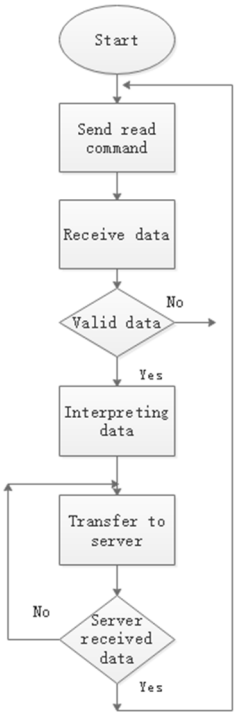

Figure 2. Industrial computer control flow chart

4. Server Architecture

In order to access the server in the wide area network, Ali Cloud is installed on the server. The functions of the server are divided into five situations: real-time data display, alarm data management, data diagnosis and analysis, historical information query [4-6]. Ali Cloud server needs to open the Socket server and upload the data received from the Socket client. As a Socket client, the industrial computer actively uploads detected sensor data internally. After the server receives the data, it will be stored in the database and used carry out the functions of each module. Finally, ECharts chart library is used to realize data visualization (Figure 3). The server is based on Spring Boot, Vue, My Batis framework. Java language is used to complete the code development of each module of the system.

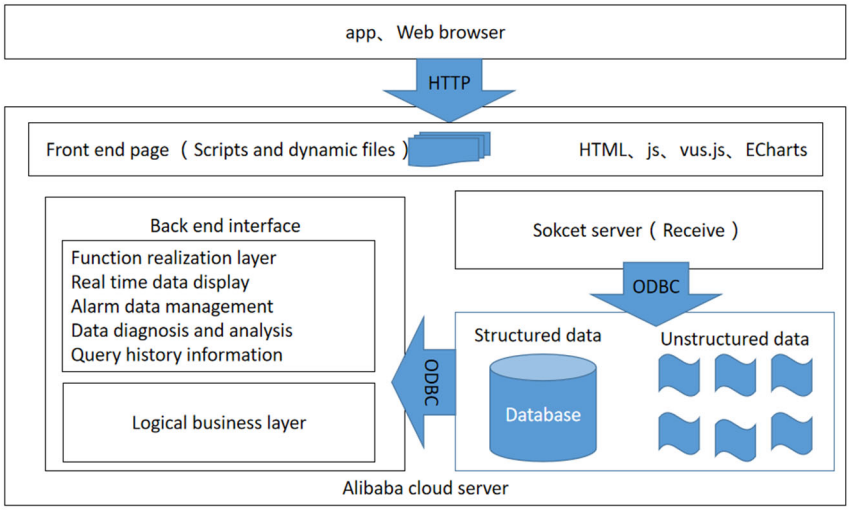

Figure 3. Industrial computer control flow chart

5. Summary

The monitoring of oxygen supply center is related to the safety of life and property. For large-scale monitoring system, detection data is complex and huge. This paper proposes an implementation method of oxygen generator monitoring system based on the Internet of things, which is used to monitor the normal operation of oxygen generator for real time, fault detection, alert warning etc. The architecture is one of the implementation scheme, which is helpful to improve the efficiency of oxygen monitoring system, reduce energy loss and increase economic value.

Acknowledgement

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