

Design of Energy Supervision System based on Predictive Function

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Abstract: Through the measurement and energy-saving analysis of the enterprise energy system, the energy management application software system, the large-screen monitoring system and the computer network system are used to realize the centralized energy management and regional control of the enterprise, so that the energy management of the enterprise can be visualized from the traditional way, digital, network, intelligent transformation, in order to achieve energy saving purposes.

1. Introduction

The construction of energy management projects is the need to develop circular economy, energy conservation, environmental protection and reduce carbon emissions to alleviate climate anomalies. It is a major strategic task of the country and an important way to build a resource-saving and environment-friendly society and achieve sustainable development. Advanced energy management can achieve the greatest possible social and economic benefits with the lowest possible resource consumption and environmental costs. The energy management center construction project is a comprehensive system project that uses information, computer, video image and other control technologies as a means to target the production process of the enterprise, realize the digitization of energy information, visualize the process of energy consumption, and integrate decision-making. The substantial construction of the Energy Management Center mainly includes the transformation of related equipment of the enterprise, the updating of the instrument, the transmission and control of the transmission line and the energy management center, the development of various functional software, the modification of the DCS system control, and the joint debugging of the system.

2. System's overall frame design

The EMS system adopts a distributed computer control system structure. The whole system can be divided into three levels: data acquisition layer, data transmission layer and information data management layer structure.

The main function of the energy management center is to monitor the water, electricity, coal, oil meter data and equipment status of each monitoring point in real time, and analyze and process the indicators. The center consists of a database and a database storage program, and runs the TCP/IP protocol on the Internet, in line with the overall technical requirements of the Ministry of Industry and Information Technology. (1) Energy data collection. At present, in the production lines of Tongling Conch, energy data such as water, electricity, raw coal and oil metering have been connected to the DCS system. The energy management center needs to collect each analog and digital quantity and DCS data into the EMS. (2) Data storage. The project uses mature real-time database products to meet system data storage requirements, and the database collects energy data at full resolution and high-speed data rates. Information from the field can be collected and stored in a single database, providing real-time and historical plant information data at any time. These capabilities enable decision makers at any level in the organization to get the data they need and have the incentive to increase plant productivity. (3) Data balance. Data balance solves the problem of meter measurement errors and provides real-world information on the production process, including simulation of the production process, flow and component calibration. The project will use the data balance algorithm combined with the process modeling and energy pipe network model

to achieve balance using the root node and the amount of each node. (4) Energy control. Establish an energy control model and prepare an energy supply and demand plan. Energy data (including statistical and forecast data) are periodically concentrated and reported. Actual energy consumption is compared with expected energy consumption calculated based on production parameters, and energy consumption and outsourcing plans are made for production operations. (5) Energy coordination. Dynamically collect energy consumption and process energy consumption of various products, establish an energy consumption database, and produce an actual energy balance sheet. Strengthen management of key high-energy-consuming equipment, collect energy consumption data of main and by-product production, non-production, daily consumption, equipment maintenance and other aspects. (6) Energy indicators. According to the energy measurement data of the system statistics, combined with the production data of the products, the energy consumption of each product is calculated, and the energy control indicators are given on the basis of this, so as to evaluate and manage the energy performance. The energy consumption data is displayed on the screen in real time, which can understand the consumption of different areas, different equipments, different energy sources, and count the data of various energy consumption. (7) Energy forecasting. Receive energy flow and feature production data in real time, and process the data, compare the data from the previous moment, and query the existing historical data in the database. For each process energy user, use energy information for different production and operation states. Flow models or statistical methods to predict trends in energy consumption. (8) The results of the analysis are presented. The project will provide various data combination reports (consumption analysis, KPI analysis, energy comparison, etc.). The scope of the query defines the data analysis time period according to the needs. You can use Excel to configure the report style, and you can modify the format of the report as needed.

3. Energy Management Center Design

In order to ensure the security of the application center, a classic firewall solution is adopted, and the entire network is divided into four areas: the Internet, the local area network of the enterprise, and the internal network of the energy management center. By encrypting the external network services by buffering the central intranet, the data and application security of the internal core network are ensured. The 6×4 large screen is introduced into the center of the tube, and the operator monitors the entire process of the production process. The monitoring method is carried out according to the energy consumption status of the production process and the energy medium, and covers all production processes. According to the energy medium, it is divided into five areas of electricity, coal, oil, water and steam, and each energy medium is monitored separately. For the situation where the limit is exceeded in each link, the alarm can be alarmed in real time through flashing, sound and other dynamic modes. According to the project construction needs, the server includes database, application, backup, web, and so on. The server is configured according to the characteristics of the application system, combined with processing speed, storage capacity, reliability, and the like. As the core of the business system, the database server has a large amount of business and a large amount of storage. In order to ensure the continuous and stable operation of the system, the server data storage system must have high reliability, scalability and disaster recovery capabilities. The database is designed to meet the application function requirements and adopts enterprise-class minicomputer design.

The main components of the project platform application software are: image processing, operating system (Windows 2003 Enterprise Edition/Linux), database system (Oracle 10g Cluster), energy management center platform (system management, production process detection, data retrieval, report presentation, human-machine operation). , production process control, data sharing), data collection system (receiving and warehousing of secondary unit upload data), data processing system (data statistics, report generation), optimization control system (command generation, instruction decomposition and verification, instruction) Hair), energy management systems, etc. The source of energy monitoring data is mainly imported into the energy management center according to a certain data format through energy collection instruments and sensors installed in the total

descending station and related processes. The energy data of the DCS system entering the energy management center is transmitted to the main server of the energy management center through the modification of the DCS system software and the addition of several hardwares according to the data collection communication protocol of the energy management center. For energy data that is far away, it needs to be transmitted to the energy management center through fiber optic cable. The core of the real-time monitoring and management system of the energy management center is energy information. Energy measurement is the embodiment of quantitative data of energy conservation and emission reduction. It is the basic work of energy management and energy conservation and emission reduction. It is reasonable and correct to equip and use measuring instruments to ensure accurate measurement data. It is of great significance to the energy accounting of enterprises.

4. Energy saving analysis and measures

Clinker production process and energy consumption analysis. Clinker production the limestone and sandstone collected by the mine are crushed and transported by the belt conveyor to the homogenization yard for homogenization. The homogenized limestone is transported by the belt conveyor to the raw material batching station; the purchased iron raw materials are transported by the automobile. The factory is discharged into the shed and stored in the hopper, and then sent to the raw material batching station via the loader and the belt conveyor. Raw material batching station Three kinds of raw materials are proportioned and sent to the raw material mill for grinding by the belt conveyor. The raw raw powder after grinding is sent to the raw material homogenization storage for storage and homogenization. The purchased raw coal is transported into the factory by train and ship, and transported to the yard for storage and homogenization by the belt conveyor. The homogenized raw coal is ground into coal powder by coal grinding powder, and the coal powder is sent to the kiln burner through the pipeline. The kiln tail is decomposed in the furnace for combustion. The homogenized raw material is sent to the kiln tail preheater through the bucket, and the material after the preheater and the decomposition furnace enters the rotary kiln. After the high temperature calcination, the mature material is formed, and the kiln head is discharged into the kiln cooler to be cooled. The apron machine is fed into the clinker. According to the characteristics of the production process, the raw materials of clinker, limestone and sandstone are all transported by mining and short-distance mine vehicles. The energy consumption is fuel consumption, accounting for 0.43% of the company's total energy consumption. Limestone is broken and long. The belt is transported into the yard, mainly for power consumption, which accounts for 2. 18%; from limestone, auxiliary materials to raw materials grinding to the raw material warehouse is also mainly electricity consumption, accounting for about 45. 08%; from raw material warehouse to preheater and rotary kiln calcined to clinker storage, energy consumption mainly includes coal and electricity consumption, almost all coal consumption of the company comes from clinker burning system; coal consumption accounts for 76% of total energy consumption . 85%, electricity consumption accounts for 36. 63%. The energy used for clinker production accounts for more than 95% of the company's total energy consumption, and is the key monitoring object of the energy management center. Although the company's equipment and processes are more advanced, due to the lack of online monitoring of energy, it cannot be analyzed and adjusted in time. There is a certain energy loss. By timely monitoring, energy consumption can be reduced. (2) Cement grinding production process and energy consumption analysis. In the cement grinding production, gypsum and coal gangue are purchased from the automobile, transported into the factory by the automobile, and sent to the grinding head warehouse after being crushed; the purchased fly ash is directly pumped into the fly ash warehouse after being transported into the factory; Self-harvesting, it is sent to the yard for storage by the mine car. The four kinds of materials and clinker are proportioned and transferred to the cement mill by the belt conveyor. After the cement is formed by grinding, it is sent to the cement storage. In the process of cement grinding, it mainly consumes electricity, which accounts for about the total electricity consumption of the company. 04%. Through electrical transformation and process optimization, system power consumption can be

reduced. (3) Clinker and cement transportation. From clinker storage, cement storage to terminal and bagged cement shipping sales, energy consumption is belt transportation, shipping power consumption, accounting for about the company's total electricity consumption. 9% .

Collect and obtain real-time data of various energy media (electricity, oil, water, steam, coal, etc.), through energy data processing and analysis, combined with real-time monitoring and control of production processes, to achieve stable supply and real-time balance of energy consumption process, Optimize the energy efficiency of dispatching, in order to save energy and reduce consumption. (1) Analyze and adjust the operating parameters of the rotary kiln system calcination system, reasonably adjust the coal energy purchase and inventory management, reduce the possession of energy purchase funds, and reduce costs. At the same time, refine the analysis of energy purchase and consumption indicators, find unreasonable energy supply and balance links, improve the real-time balanced energy management level, and reduce energy consumption. (2) Through the real-time balance analysis of energy consumption, find the problems in the process of energy transmission and distribution, reduce unreasonable consumption and waste, improve the optimal allocation of energy, and make efficient use of energy recovery, cascade utilization and optimization. Especially for the coordinated management of 5 dry clinker production lines and other equipment, through the analysis and adjustment of the energy process parameters of the kiln system, the optimal balance of heat recovery from kiln heat and waste heat power generation can be achieved to achieve energy-saving efficiency. To achieve the unity of recycling and utilization, and improve energy efficiency.

5. Conclusion

At present, the energy management system has completed all the work and successfully applied to cement enterprises such as Chengde Jidong, which solves the problems of traditional meter reading, improves the energy management level and energy utilization efficiency of the enterprise, and achieves the optimization of energy balance and energy conservation and emission reduction. After one year of normal operation, it received good results and changed the bad operation of operators in the management center. The energy consumption was significantly lower than before. Managers can analyze and predict energy consumption scientifically and reliably, bring huge economic benefits to enterprises, protect the environment, fulfill their responsibilities to society, and are currently planning to promote this energy system nationwide.

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