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DESIGN OF CONTROL INTEGRATION PLATFORM FOR THERMAL HEAT SUPPLY NETWORK BASED ON KINGVIEW

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ABSTRACT

This design mainly uses Kingview software to design the intelligent thermal heat supply network that will provide operations of the large-scale central heating business with one-stop systematic solutions. From the point of view of heating operation, the intelligent heat network control system can provide comprehensive solutions such as heating metering, pipe network optimization, automatic scheduling, terminal energy saving and so on, and realize the integrated heating platform. At the same time, a number of management platforms have been designed to facilitate the management and control of heating suppliers. By controlling the data report and data curve of the integrated platform to check the data of each part of the system, it can directly judge the running state of the system and prevent the operation failure in time, so as to achieve the purpose of automation processing of the heating network.

KEYWORDS

Kingview, Control integration, Thermal heat supply network.

1. INTRODUCTION

The thermal heat supply network monitoring system is the general trend in the development of heating industry. The low-carbon, green and efficient heating is provided based on the intelligent thermal heat supply network which symbolizes the integration between heating technique and various modern technologies, demonstrated by automation technology, especially the combination between automation technology and computer network system. Man-machine interaction is demanded in order to make the system have the optimum operation mode. In this case, the control integration system will finally have the optimum operation mode through man-machine integration control. The control will be promoted by management to optimize the production process. The corporate informatization realized by control integration will greatly promote the development of enterprises and be very significant for the development of national economy.

2. SUMMARY OF CONTROL INTEGRATION PLATFORM FOR THERMAL HEAT SUPPLY NETWORK

Intelligent thermal heat supply network means the intelligentized heating system. In a heating system with sound body, the running target of the thermal heat supply network that is safe, reliable, economical, efficient and can rapidly respond to the demands of the users is achieved through the combination between modern computer technology, sensing and measuring technology, big data technology, etc. and advanced heating technology and advanced ideas of management decision [1]. intelligent thermal heat supply network provides operations of the large-scale central heating business with one-stop systematic solutions. From the perspective of heating operation, the intelligent thermal heat supply network will also provide integrated solutions to heat metering, pipeline network optimization, automatic scheduling, terminal energy conservation, etc. To run the control integration platform, the heating supplier will control the heating temperature and water flow of the heating system.

Entire-network intelligent monitoring is achieved since the following data can be acquired directly from the platform: Real-time heat meter data, heat curves, prediction of the load of the heating system, outlet flow change, backwater temperature contrast, one net loss heat consumption contrast, analysis of heating running tendency, etc.

The development of the informatization of heating enterprises creates conditions the establishment of intelligent thermal heat supply network. The core of big data is data prediction which is a part of artificial intelligence. To conduct data prediction, mathematical algorithms are applied to mass data to predict the possibility of things, which is necessary for the safe operation and adjustment of thermal heat supply network. Thereinto, the external technologies include modern communications technology, computer technology, information technology, software technology, sensing and measuring technology, etc. Mainly depending on advanced heating technique, intelligent thermal heat supply network is established by means of information technology [2]. Therefore, advanced heating technique and advanced design of thermal heat supply network are necessary for intelligent thermal heat supply network. The thermal heat supply network can properly adjust temperature change and the change in the heating load used by the users after the heating is charged for. Interaction between demand and supply, rapid adaption are demanded. The heat demand system and the heat supply system are integrated.

The overall control strategies of central heating system mainly include: Upper computer control system, heat source control system, heat exchange station control system, thermal heat supply network monitoring system, user monitoring system, etc. The system control layer is shown in the following Figure 1.

Figure 4: Energy Consumption Analysis Curves

Therein, energy consumption management platform covers management of energy consumption of heat source and heat exchange station, meteorological data management and thermal load prediction.

3.3.1 Management of energy consumption of heat source and heat exchange station

To conduct the management of the energy consumption, people will gather the energy consumption data of heat source and heat exchange station, carry out uniform data statistics and analysis on the users in different regions, carry out energy consumption statistics of different regions, analyze the load and flow of the heating, water yield demanded in the heating season, analyze the transmission error and analyze the rules of the usage of the heating by the clients in accordance with the characteristics of the client base. Consequently, the reasonable control of the whole heating system will be realized.

3.3.2 Meteorological data management

Comfort heating means that the heating load is controlled in a timely manner in accordance with the change in outdoor temperatures to guarantee that the indoor temperatures can satisfy the standard requirements. The outdoor temperatures can be learned by the standard outdoor weather collection site established by the heating enterprises themselves or through the contact with the local meteorological department [6]. And the learned outdoor temperatures can only be used in the meteorological data management after they have gone through further smoothing process.

3.3.3 Thermal load prediction

Due to the complexity of heating supply system and the thermal inertia of the building and system, it is very difficult to establish the mathematic model to predict the thermal load through physical model [7]. Based on the load change rules, we take historical data as reference, contrast the operating parameters of similar weather and time stages according to the weather forecast to work out the best control plan.

3.4 Production Data Management System

The data sources of the production data management system consist of data of heat exchange station, data of heat source, data of key network nodes, etc. The data are gathered and controlled [8]. In view that there are a large number of equipment on the site and that the data of heating metering are relatively large, multi-device and multiple-concurrent gathering method is adopted hereby. At the same time, block data gathering and breakpoint resuming function are allowed to guarantee the uniformity and integrity of the data. The operating parameters of the main equipment and technologies of the heating supply system can be set to combine with programmable controller [9]. Therefore, the equipment will be automatically operated in accordance with the set parameters. For example, the starting and the stopping of the equipment will be controlled. What's more, the equipment parameters may be adjusted in accordance with the operating parameters of the technologies to automatically control the operating situation of the technologies, such as the opening degree of the valve. As shown in the following Figure 5 is the operation panel of the system.

Figure 5: Operation Panel

3.5 User Rights Management

Different user rights, such as manager, engineer, worker on duty, etc., can be set in accordance with the characteristics of the organization structure. Each user can be corresponding to one or more roles. The change in the roles of the users will directly influence their operating rights in the system. The system will stipulate the content range available for visiting and operating conducted by each role to guarantee the safety of system information, especially the safety of core data of production operation management.

4. CONCLUSION

Centering on the control integration platform, many management platforms are designed, such as energy consumption management platform, data management platform, working conditions management platform, etc., to make it convenient for the heating supplier to carry out management and control. At the same time, the data of each part of the system can be examined through data reports and data curves on the control integration platform to directly judge the operation state of the system and guard against the operation breakdown in a timely manner. What's more, the operators can also control the starting and stopping of each pump and the opening degree of the valves directly through the upper computer. All in all, control integration platform for thermal heat supply network is a low-consumption, low-cost and high-efficiency platform.

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REFERENCES

- [1] Cao, P.Q. 2015. Application of the intelligent control system of heat network in central heating. Huateng technology, 37 (4), 48-51.
- [2] Liu, Y.J. 2014. Strategy for Control Integration of Autonomous System of Regional Boiler Room. Huoli Periodical Office, 11 (7), 68-68.
- [3] Jia, A.P. 2013. Optimization configuration and operation analysis of central heating and heat exchange stations. Technological innovation and application, 20, 123-124.
- [4] Chen, H., Li, X.H., Qin, B. 2007. Operation Adjustment Ways of Heating Supply System of Distributed Variable Frequency Pump. Gas and Heat, 2 (30), 73-75.

[5] Zhang, H.Q., Lei, C.M., Zhao, H.Y. 2013. Application of thermal user energy service management platform in heating management. *Regional heating*, 3, 84-92.

[6] Liu, X.L. 2010. Design and implementation of multi-element automatic weather station based on GPRS. Doctoral dissertation, Harbin Engineering University, Harbin, China.

[7] Chen, Y.R. 2008. Research on the relationship between thermal characteristics and urban heat island in the city. Doctoral dissertation, Beijing Institute of Architectural Engineering, Beijing, China.

[8] Tang, L.J. 2007. Data collection and algorithm research of urban heating system. Doctoral dissertation, Shandong Institute of Light Industry, Jinan, China.

[9] Li, Z.G., Liu, J.X., Sun, L.P. 2013. Design and Implementation of Monitoring and Control System for Heating Network. *Forest Engineering*, 04 (9), 90-95