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Development of Real-time Monitoring System of the 100 MVA/100 MJ Flywheel Pulse Generator System

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A 100 MVA/100 MJ flywheel pulse generator system with the characteristics of high energy density and good control performance has been developed to energize the pulsed magnet at the Wuhan National High Magnetic Field Center (WHMFC). To realize the flexible, accurate, real-time and safe remote monitoring of the pulse generator system, a set of monitoring system using the total control plus sub-control mode was proposed so that the two sets of 12-pulse rectifier system can be used alone or together. Programmable Logic Controller (PLC) suitable for the industrial control was chosen as the central control system of the total control cabinet, which collected real-time operating parameters of rectifier transformer, direct current sensor, pure water cooler and other supporting facilities, and realized interlocking, protection and other function of electrical rules. High-speed and high-performance Digital Signal Processing (DSP) was chosen as the main controller of the sub-control cabinet to improve the accuracy of the firing angles. In addition, introducing the Complex Programmable Logic Device (CPLD) technology integrated the peripheral digital circuit of microprocessor into a piece of chip, which reduced the complexity of the system external wiring, improved the integration and reliability of the system. The host computer was realized by Monitor and Control Generated System (MCGS) based on OLE for Process Control (OPC) technology, which solved the problem that PLC protocol is not open. The proposed monitoring system has controlled the pulse generator system to energize the 50 Tesla magnet and the outer coil of the 100 Tesla magnet. The result shows that this monitoring system is stable, reliable, and easy to use, and can meet the security, flexibility and visualization requirements of the control system applied to pulsed magnetic high field facility.

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