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Analysis Of the State of Automated Control Systems of Technological Processes at Substations

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Abstract: The management system is carried out without the participation of personnel, reducing labor costs, which contributes to saving on personnel.

Keywords: Automated control system, technological process, substation, information processing, monitoring, control, quality, automated workplace.

Introduction.

Modern process control systems are designed using a distributed architecture. The impetus for the development of this approach was the reduction in the cost of wireless communication modules and the general development of technology, which, in turn, made it possible to create cheap, compact and multifunctional devices. Another typical architecture of a system for collecting information about the functioning of a physical object is a set of simple sensors that collect one or two parameters, connected by a wired network. This approach only works effectively with a limited number of sensors. The use of a distributed architecture makes it possible to achieve high reliability and the ability to effectively scale the ACS. This is achieved due to the fact that each element of the distributed system independently analyzes the state of a separate part of the controlled object and carries out a control action.

1. APCS PS is built in the form of a hierarchical multi-level structure on the basis of modern software and hardware tools that implement the main information and control functions.

2. The following levels are distinguished in the typical structure of the APCS:

3. - the level of sensors, actuators and devices, meters, microprocessor terminals and other measuring instruments;

4. - the level of industrial controllers;

5. - the level of central computing resources and automated workstations.

6. It is necessary to provide for two modes of operation of the automated process control system of the substation:

1. with a local control point and dispatching for served substations;
2. with a remote telecontrol point for unattended substations.

For the maintenance-free operation of the substation, the main control and dispatching functions should be transferred to a higher level of the cluster dispatching and control center. At the same time, at each unattended substation, it is necessary to provide for the placement of a reduced number of operator consoles in order to perform preventive and commissioning work.

For a substation with a serviced mode of operation, a network of AWPs (automated workstation) in the required composition is organized as part of the APCS. Communication with the appropriate cluster control and dispatching center should be provided in order to ensure the possibility of distribution of

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functions and tasks of reduction between the local and cluster control centers and the transition in the future to an unattended operation mode.

The goals of creating the software and technological complex of the automated process control system of the substation should be achieved by solving the following tasks:

1. Automatic and operational remote control of the main technological equipment.

2. Monitoring and control of technological processes, the condition of the main equipment and the quality of electricity, including:

3. Presentation to the operator of electrical circuits of substations in the dynamics of their changes;

4. Presentation of digital values of technological parameters that are essential for maintaining modes;

5. Registration of alarms when the parameters of technological processes go beyond the permissible limits;

6. Display and signaling of changes in electrical circuits occurring in the process of maintaining the technological regime.

3. Registration of parameters necessary for the analysis and evaluation of the operation of technological equipment, automation equipment and personnel actions, including:

1. Registration of technological events in normal mode;

2. Registration of emergency situations of normal mode;

3. System integration with systems and means of automatic monitoring and control (relay protection and automation equipment, PA, ASKUE). ACS TP PS should integrate automation tools and systems, ensuring, at a minimum, obtaining information from external control systems and assigning settings for them, and, as a maximum, the implementation of common functionality using a single software and hardware complex of automation tools;

4. Monitoring and control of specialized subsystems of automatic technological control:

- Relay protection and automation;
- Local emergency control automatics;
- Management of auxiliary technological processes;
- Registration of parameters of transient processes in abnormal modes;
- Accounting for the parameters of the main technological equipment;
- Commercial and technical metering of electricity and power;
- Generation of reports of operational and accounting information on the main and auxiliary technological activities (forms of operational switching, operational event log, reporting documentation of ASKUE and other types of documents on management tasks);
- Monitoring of operational parameters and diagnostics of the state of the main technological equipment;
- Monitoring and diagnostics of the complex of software and hardware tools of the automated process control system of the substation;
- Formation and submission of operational reporting information to the upper level of the ACS PDT FGC;
- ensuring information security and public safety of the automated process control system of the substation.

ACS TP PS is built in the form of interconnected complex of hardware and software and network channel-forming resources, compatible in terms of interfaces, protocols and information technologies.

The PCS complex must have an integrated monitoring and self-diagnostics system that provides diagnostics, localization and identification of faults for the main components of the system.

The technical means of the ACS TP of the substation include:

1. Sensors of input information, actuators, relay terminals;

2. Industrial controllers - universal and specialized;

3. Computing facilities, including servers, work and operator stations;

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4. Technical means of computer and industrial networks, including switches, routers, channel-forming equipment, channel and cable networks.

Conclusion.

All technical means intended for use in the automated process control system of the substation must have architectural and interface compatibility, which ensures interfacing and full functional performance without additional refinement and work on adapting the system as a whole.

In terms of computing facilities, there should be one Intel preference - the architecture, which is overwhelming in world practice and allows, within the framework of the APCS, to be based on a single architectural platform for computing devices of all levels, including industrial controllers, servers and workstations of dispatchers and operators.

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