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IMPLEMENTATION OF AUTOMATED PROCESS CONTROL SYSTEMS AT SUBSTATIONS

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ABSTRACT

The automated control system for technological processes is designed to optimize the tasks of dispatching, production-technical and organizational control of technological processes. APCS allows you to carry out production processes without human participation, but under his control.

Keywords: Automated control system, technological process, substation, information processing.

INTRODUCTION

One of the criteria for assessing the effectiveness of an automated control system is determined by comparing the results from the functioning of an automated control system and the costs of all types of resources necessary for its creation and development.

The criterion for the effectiveness of the ACS is determined on a set (system) of indicators, each of which describes one of the sides of the system under consideration. Depending on the mathematical apparatus used, the criterion can be expressed in the form of an objective function or an ordinal measure that establishes an ordered sequence of combinations of indicators.

When determining the results from the functioning of the ACS, a universal system of generalized indicators is set, such as efficiency (timeliness), stability, quality of control, etc. The indicators used should be deployed in relation to the characteristics of a specific ACS (for example: efficiency - the probabilistic-temporal characteristics of the elements of the control process; stability - indicators of reliability, noise immunity, etc.).

The indicators of resource costs include material, human, financial, time and other costs.

Assessment of the effectiveness of ACS is carried out at:

- The formation of requirements for the ACS;

- Analysis of the created and functioning automated control systems for compliance with the specified requirements;
- Choosing the best option for the creation, operation and development of ACS;
- Synthesis (formation) of the most expedient option for building an automated control system according to the criterion "efficiency - costs".

At present, the APCS has great potential and favorable prospects for further development in Russia. Experts of the Russian industrial automation market note that today there is a change of generations of automation systems. We observe how more and more software and hardware solutions appear on the information technology market, the task of which is to increase the efficiency, productivity and competitiveness of industries.

The functions of the APCS are a set of system actions aimed at achieving a particular control goal. The set of actions of the system is a sequence of operations and procedures performed by parts of the system, defined and described in the operational documentation. It is necessary to distinguish the functions of the automated process control system as a whole from the functions performed by the entire complex of technical means of the system or its individual devices.

You can list its functions like this:

- Collection and processing of analog information about the operating modes of the equipment;
- Automated control;
- Warning and emergency signaling;
- Diagnostics of the current state of equipment;
- Registration of emergency events;
- Integration with related subsystems, information exchange;
- Subsystems of a higher level.

Features and capabilities of the APCS:

- Visual display of the progress of technological operations and the state of production equipment;
- Remote control of a technological process or production equipment in manual and automatic mode;
- Automatic identification of workpieces and finished products;
- Provision of emergency notification of the operator in the event of emergency situations;
- Maintaining accounting journals with the ability to provide information in text and graphic forms;
- Logging of the parameters of the technological process with reference to time and for each unit of the nomenclature of manufactured products;
- Storage of data for a long period of time and transfer to the level of MES and ERP.

When creating an automated process control system, specific goals for the functioning of the system and its purpose in the general structure of enterprise management must be determined. At the substation, an automated process control system is implemented with the aim of: increasing the efficiency of technological process control, increasing the efficiency of collecting, processing, storing and transmitting information, reducing the costs of organizational interaction of production structures, and reducing the cost of equipment maintenance, improving operational performance, increasing the level of safety by reducing the number of

emergencies and prompt elimination of their consequences, reducing the possibility of risk associated with the "human factor". Increase the resource of equipment, simplify its maintenance. Reduce production downtime and eliminate accidents.

The transition to qualitatively new automation and control systems is possible with the use of digital substation standards and technologies, which include:

1.ec 61850 standard:

- Device data model;
- Unified description of the substation;
- Vertical (MMS) and horizontal (GOOSE) exchange protocols;
- Protocols of transmission of instantaneous values of currents and voltages (SV);

2. Digital (optical and electronic) current and voltage transformers;

3. Analog multiplexers (Merging Units);

4. Remote modules USO (Micro RTU);

5. Intelligent electronic devices (IEDs).

The main feature and difference of the IEC 61850 standard from other standards is that it regulates not only the issues of information transfer between individual devices, but also the formalization of the description of circuits - substation, protection, automation and measurement, device configuration. The standard provides for the possibility of using new digital measuring devices instead of traditional analog meters (current and voltage transformers). Information technology allows the transition to the automated design of digital substations controlled by digital integrated systems. All information communications at such substations are digital, forming a single process bus. This opens up the possibility of a quick direct exchange of information between devices, which ultimately makes it possible
reducing the number of copper cable connections, and the number of devices, as well as a more compact arrangement.

The software and hardware complex of the network analyzer is used as a system for managing the life cycle of a digital substation.

The software and hardware complex performs the following functions:

- Storage of SCD-files and organization of access to them;
- SCD-files version control, change tracking and return to any previous version;
- Validation of SCL-files, checking the integrity of the configuration, analysis for errors;
- Checking the clarity of the configuration and the availability of opportunities for optimization;
- Checking the consistency between the data on the network and the approved configuration throughout the entire life cycle;
- Control of the absence of losses of GOOSE and SV-messages in the network;
- Monitoring of unauthorized access and threats, such as the appearance of unconfigured GOOSE and SV-messages on the network;
- Monitoring the state of synchronization;
- Registration of events caused by any changes in data and flags with a record of the previous mode.

CONCLUSION

At present, the mass implementation of digital substation solutions based on the IEC 61850 series standards has begun in the world, Smart Grid control technologies are being implemented, and applications of automated process control systems are being put into operation. The use of the Digital Substation technology should allow in the future to significantly reduce the costs of design, commissioning, operation and maintenance of power facilities.

LITERATURE

1. Научно-технический журнал Промышленные АСУ и контроллеры.
2. Справочник по теории автоматического управления / Под ред. А.А. Красовского. – М.: Наука, 1987.
3. Бородин И.Ф., Судник Ю.А. Автоматизация технологических процессов. – М.: Колос, 2002.
4. Наладка средств автоматизации и автоматических систем регулирования. Справочное пособие / Под ред. А.С. Клюева. – М.: Госэнергоиздат, 1989.
5. Журнал «Современные технологии автоматизации».
6. Втюрин В.А. Автоматизированные системы управления технологическими процессами: учебное пособие.
7. Пьявченко Т.А. Проектирование АСУТП в SCADA системе: учебное пособие.
8. Отабек Абдукаримович Мирзаев, Шавкат Серабович Турсунов // Теоретическая обоснования деформированного состояния оболочки питающего цилиндра прядильных машин // Oriental renaissance: Innovative, educational, natural and social sciences // 2021. 1092-1103 https://cyberleninka.ru/article/n/teoreticheskaya-obosnovaniya-deformirovannogo-sostoyaniya-obolochki-pitayuschego-tsilindra-pryadilnyh-mashin
9. T Khankelov, S Tursunov, Z Maksudov // Domestic Solid Waste Crusher // International Journal of Psychological Rehabilitation 24 (issue 07), 8090-8096 psychosocial.com/article-category/issue https://www.psychosocial.com/article/PR270784/18957/
10. Tavbay Khankelov[1], Zokir Maksudov[1]*, Nafisa Mukhamedova[1] and Shavkat Tursunov[2] // Crushing and screening complex for the production of compost from organic components of municipal solid waste // Interaction of Materials Resistance Science With Other General-Military Disciplines In Engineering Specialties // 2021. https://www.e3s-conferences.org/articles/e3sconf/abs/2021/40/e3sconf_conmechydro2021_01026/e3sconf_conmechydro2021_01026.html
11. Oliya Nurova Salomovna[1], Asror Nazarov Allanazarovich[2], Tursunov Shavkat Serabovich // Interaction of Materials Resistance Science With Other General-Military Disciplines In Engineering Specialties // https://www.annalsofrscb.ro/index.php/journal/article/view/5911

12. Tursunov Shavkat Serabovich // Analysis of existing desings of crushers for crushing municipal solid waste// International Journal for Innovative Engineering and Management Research(IJIEMR) // https://scopedatabase.com/documents/00000181/00000-84600.pdf // 2021
13. Nazarov Asror Allanazarovich, Raximov Jura Suyunovich, Radjabov Mansur Rustamovich, Tursunov Shavkat Serabovich, Sharipov Shuhrat Pulatovich // Completion of the course project on the subject" machine details" // Turkish Online Journal of Qualitative Inquiry (TOJQI)Volume 12, Issue 10, October2021: 793-800 // https://www.tojqi.net/index.php/journal/article/view/7407.