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Irrigation Channel Automatic Control System

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Abstract: This paper discusses the creation of an automated process control system (APCS), which allows you to monitor the land reclamation condition and high-quality water supply for agricultural and domestic needs, with minimal operating costs. This system helps to improve the performance of irrigation and water supply canals, increase their productivity and reliability.

Keywords: APCS, irrigation and water supply canals, water supply facility, APCS architecture.

Introduction.

Control object. The object of automation is an irrigation canal. Such canals work to fill ponds and reservoirs and are able to meet the needs of agriculture and water supply for hundreds of settlements. The irrigation system includes: reservoirs, water intake facilities, sedimentation tanks, pumping stations, irrigation, drainage and drainage networks, upland channels, irrigation and sprinkling machines, power supply and communication facilities, anti-erosion structures.

Goals. The purpose of creating an automated process control system is to ensure reliable control over the land reclamation condition and high-quality water supply for agricultural and domestic needs, with minimal operating costs.

This system contributes to improving the performance of irrigation and watering canals, increasing productivity and reliability due to: strict compliance with the requirements of technological regulations and compliance with process control regimes; operational control over equipment operation; increasing the efficiency and reducing the labor intensity of the operation personnel; increasing the efficiency of interaction of personnel with technological objects; convenience of presenting technological information to personnel (temperatures of bearings and coolant, current and voltage of the rotor and stator, vibration, power consumption and power consumption, level in the channel and volume of pumped water, about the operating mode of each pumping unit, and much more); the accuracy of maintaining the specified parameter values; reducing the cost of maintenance and repair of equipment by preventing and avoiding emergencies; saving energy resources and water due to rational distribution; application of modern methods and microprocessor-based monitoring and control facilities.

System functions:

Collection, processing of information from temperature sensors, level sensors, ultrasonic flow meters, electricity meters, etc.; restoration of accounting parameters after system downtime, adding to their values at the time of shutdown the product of downtime by the contractual constant or the flow rate before shutdown; detection, signaling and registration of deviations of parameters from the set limits; displaying information to the operating personnel of the system on color monitors in the form of mnemonic diagrams with indication of parameters in digital, tabular form or in the form of graphs, formation of light and sound

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alarms of deviations of parameters from the specified warning and pre-emergency boundaries, as well as in other emergency situations; manual input of raw data in real time.

Architecture and equipment.

The APCS has a three-level hierarchical structure of components (Fig.).

The middle level of the system, located at the pumping stations, and the upper level - at the control room - are represented by automated workstations (AWP) of operators (operator / archiving station-server with a full graphic project, with the possibility of 100% "hot" backup)

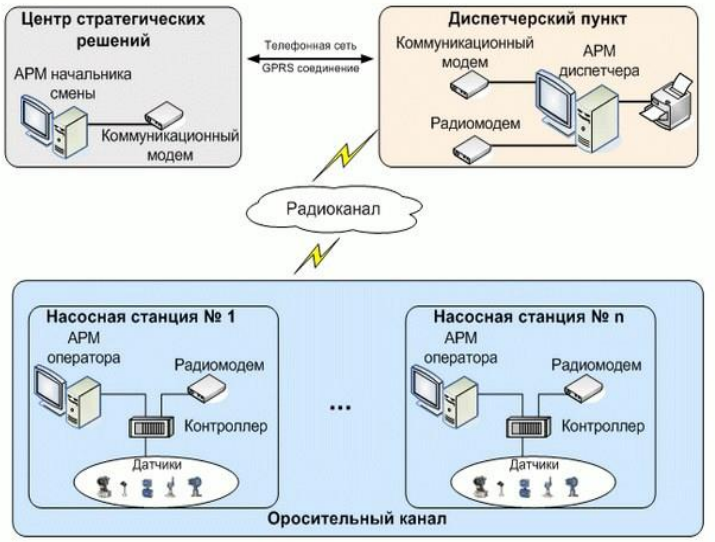

Fig.

The lower level is represented by modern, highly reliable microprocessor controllers. The controllers are located in the control and monitoring cabinets. Communication with lower-level controllers is carried out through a local area network.

From the automated workstation of pumping stations, all information is transmitted via a radio channel to the control center, which allows the dispatcher to monitor the operation of the entire cascade of pumping stations and regulate the water supply.

Conclusions.

The implementation of an automated process control system provides:

- increasing the reliability of the system through the use of technological protections to avoid emergency situations;
- providing the personnel with comprehensive operational and archived information about the operation of the system, such as water levels in the upstream and downstream of the canal between pumping stations, the operating mode of each pumping unit, power consumption, power consumption, etc .;
- broad capabilities of the operator to control the technological process, in particular, help the dispatcher to choose the required turn of the pumping unit blades and thereby ensure the optimal water supply regime;
- reducing the cost of operating the system;
- improvement of working conditions of operating personnel; long-term storage of measurement results with the possibility of their transmission to a remote personal computer via the telephone network;
- improving the accuracy and reliability of technological information; reducing the likelihood of erroneous actions of personnel due to the timely provision of information in a visual form.

The distributed modular architecture and industrial network make the system extremely immune to interference. Despite the considerable distances between subscribers (tens of kilometers), the system provides stable and reliable communication with the dispatch center. The use of removable terminal blocks in each I / O module eliminates all kinds of crosses, cables, etc., which increases the reliability of the

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connection between the module and the object and minimizes the size of the protective cabinets. Modular structure and completely open exchange protocol allows expanding the system without any restrictions.

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