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# USE OF SCADA IN MANAGEMENT SYSTEMS FOR WATER DISTRIBUTION FACILITIES

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**Annotation:** The article analyzes the possibilities of using the SCADA concept in the control system of water distribution facilities. The object of the study is the Khachkab water distribution facility of the Amu -Bukhara Basin Administration of Irrigation Systems.

***Key words*** : water distribution facility, water supply system, modern process control system, SCADA system, control room, monitoring and control system.

**Аннотация**: В статье анализируются возможности использования концепции SCADA в системе управления водораспределительными сооружениями. Объект исследования – Хачкабское водораспределительное сооружение Аму-Бухарского бассейнового управления ирригационных систем.

**Ключевые слова**: водораспределительный объект, система водоснабжения, современная система управления технологическими процессами, система SCADA, диспетчерская, система мониторинга и управления.

***Introduction*** . Characteristic property of control systems that determines their How special Class dynamic systems is usage current information about managed and managing impacts during implementation reverse and compensating connections designed to ensure optimal quality _ control by selected criterion _

Promotion power , complexity and cost technological complexes and systems like objects control , tightening quality requirements _ products , protection surrounding environment and security staff , as well as security long-term performance equipment are economic and social prerequisites for continuous improvement of management systems .

Currently _ time achieved certain success in creating automated (with the participation person ) and completely automatic control systems. This contributed to the rapid development microprocessor means capable _ perform the full range of functions for transformation , transmission, processing , storage and use information to influence technological _ process and for communication with the

operator. First of all are being implemented measurement , control and regulation state technological objects .

Accelerating scientific and technological progress and intensifying production are impossible without the use of automation tools. A characteristic feature of the modern stage of automation is that it is based on the revolution in computer technology, on the widespread use of microprocessor controllers, as well as on the rapid development of robotics, flexible production systems, integrated design and control systems, and SCADA systems.

Numerous consumers require water: both of different quality and different quantities. The quantity and quality of water required by each enterprise is determined by the nature and scale of its main production. In turn, the efficiency of an enterprise often strongly depends on the organization of supplying it with water of the required parameters.

For many enterprises, stopping the water supply even for a few minutes means massive product defects, and often emergency failure of individual technological devices and installations.

The supply of low-quality water (dirty, hard, etc.) also leads to defects, a decrease in the productivity and efficiency of technological devices, and often to emergency failure of individual elements.

With the introduction of an automatic process control system into production, the reliability of the water supply system is significantly increased and high productivity of the enterprise is ensured.

***Materials and methods*** . A water supply system is a complex of structures to provide consumers with water in the required quantities and required quality.

The water supply system includes the following structures:

a) water intake facilities (water intake);

b) water-lifting structures (pumping stations);

c) facilities for purification, processing and cooling of water;

d) water pipelines and water supply networks;

e) towers and tanks. These are regulating and reserve tanks for storing and accumulating water.

A modern automated process control system (automated process control system) is a multi-level human-machine control system. The creation of automated control systems for complex technological processes is carried out using automatic information systems for data collection and computing systems, which are constantly being improved with the evolution of hardware and software.

The time-continuous picture of the development of automated process control systems consists of several stages due to the emergence of qualitatively new scientific ideas and technical means. Over the course of history, the nature of control objects and methods, automation tools and other components that make up the content of a modern control system changes.
The functions of the person (operator/dispatcher) called upon to ensure the routine functioning of the technological process also changed from stage to stage. The range of tasks solved at the management level is expanding; The set of tasks, limited by the direct need to manage the

technological process, is replenished with qualitatively new tasks that were previously of an auxiliary nature or related to a different level of management.

The dispatcher in a multi-level automated process control system receives information from a computer monitor or from an electronic information display system and acts on objects located at a considerable distance from him using telecommunication systems, controllers, and intelligent actuators.

The basis, a necessary condition for the effective implementation of dispatch control, which has a pronounced dynamic nature, is working with information, i.e., the processes of collecting, transmitting, processing, displaying, and presenting information.

The dispatcher is required not only to have professional knowledge of the technological process and the basics of its control, but also experience in working in information systems, the ability to make decisions (in dialogue with a computer) in abnormal and emergency situations, and much more. The dispatcher becomes the main actor in the management of the technological process.

***Results and discussions*** . Object research in this work is a complex of hydraulic engineering structures Khachkabsky waterworks on the river Zerafshan , who provides regulation water flowing along the river bed from two main sources – directly drain river and canal " Shakhrudskaya" branch ".

Hydraulic complex structures Khachkabsky waterworks adminis trative is part of the Basseynovovo management irrigation systems (BUIS) " Amu -Bukhara", functionally associated with the latter and, closely located , Kuyumazar pumping station station and Kuyumazar reservoir [1].

Khachkabskoe water distribution the device ( water divider ) is located in the middle flow the Shahrud -Kharkhur canal , which receives water from channel " Shakhrudskaya" branch " and partially from Duaba water hub rivers Zerafshan .

Waterworks performs function water divider between Northwestern branch and Shahrud canal .

Canal irrigation system Shahrud large irrigation system of Bukhara region , irrigating 6 districts Bukhara region and, partially , Kizil- Tepinsky district of Navoi areas . The irrigation system is designed to irrigate irrigation area 56.3 thousand hectares .

After commissioning _ _ I - queues Amu-Bukhara channel big Part irrigation systems Shakhrudskaya branch (56.3 thousand hectares ) was switched to irrigation with water from rivers Amudarya . After this Duabinsky water node rivers Zarafshan became be used only by 5÷10%, which led to intense siltation channel " Shahrud-Kharkhur " above Khachkabsky waterworks _

Included in Khachkab waterworks includes :

- supply channel with two water dividers ;

- left bank head regulator " Shahrud " channel ;

- head regulator of the right bank canal " North-Western" branch ";

- a siphon through the old bed of “ Shakhrud ” on the “ Severo-Zapadnaya” branch " in the bottom regulator bay .

Regulator gate control carried out manually . Automatic control system for gates on this The hydraulic unit is not installed . Due to this _ systems early warnings and alerts Also inactive .

**Purpose given work** is implementation partially automated systems regulation and operational control over water distribution to ensure consumers water as needed quantity as needed terms .

**The task** automation and monitoring is Creation systems automated management and control of work shutters Khachkabsky waterworks , which will allow :

- increase the reality of implementing the water use plan;
- create conditions for sustainable, equitable, fair water allocation, guaranteeing stability and uniformity of water supply , and eliminating unproductive water waste.

Achievement specified goals supposed implement application **SCADA** in the server room computer dispatcher point Khachkabsky waterworks _

**SCADA** ( Supervisory) concept Control And Data Acquisition - dispatch control and data collection) is predetermined by the entire course of development of control systems and the results of scientific and technological progress. The use of **SCADA** technologies makes it possible to achieve a high level of automation in solving problems of developing control systems, collecting, processing, transmitting, storing and displaying information.

Currently, **SCADA** is the main and most promising method for automated control of complex water management processes.

To solve the problem posed above, we propose the following diagram (Fig. 1) of an automated monitoring and control system (MCS) for the object in question.

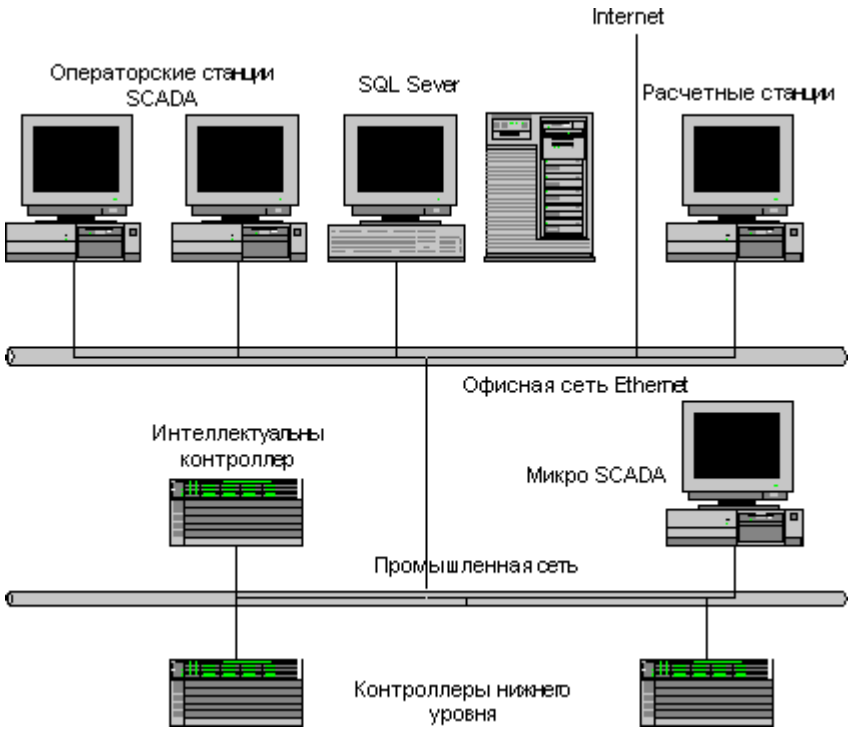


Fig.1. Generalized diagram of the monitoring and control system.

This is a two-level system, since it is at these levels that direct control of the technological process

is implemented. The specifics of each specific control system are determined by the software and hardware platform used at each level.

**The lower level** - the object level (controller) - includes various sensors for collecting information about the progress of the technological process, electric drives and actuators for implementing regulatory and control actions. Sensors supply information to local programmable logic controllers (PLC - Programming Logical Controller ), which can perform the following functions:

- collection and processing of information about technological process parameters;
- control of electric drives and other actuators;
- solving problems of automatic logical control, etc.

Since the information in the controllers is pre-processed and partially used on site, the requirements for communication channel capacity are significantly reduced.

Information from local controllers can be sent to the control center network directly, as well as through upper-level controllers. Depending on the task at hand, upper-level controllers (hubs, intelligent or communication controllers) implement various functions. Some of them are listed below:

- collecting data from local controllers;
- data processing, including scaling;
- maintaining a uniform time in the system;
- synchronization of subsystems operation;
- organizing archives according to selected parameters;
- exchange of information between local controllers and the upper level;
- work in offline mode in case of communication failures with the upper level;
- reservation of data transmission channels, etc.

**The upper level** - control center (DP) - includes, first of all, one or more control stations, which are an automated workstation (AWS) of the dispatcher/operator. A database server, workstations (computers) for specialists, etc. can also be located here. IBM PC-type personal computers of various configurations are often used as workstations.
Control stations are designed to display the progress of the technological process and operational control. **SCADA systems** are designed to solve these problems . **SCADA** is specialized software aimed at providing an interface between the dispatcher and the control system, as well as communication with the outside world. The range of functionality is determined by the very role of **SCADA** in control systems and is implemented in almost all packages:

- automated development, which makes it possible to create software for an automation system without real programming;
- application program execution tools;
- collection of primary information from lower-level devices;
- processing of primary information;
- recording alarms and historical data;
- storage of information with the possibility of its post-processing (usually implemented through interfaces to the most popular databases);

- visualization of information in the form of mnemonic diagrams, graphs, etc.;
- the ability of an application system to work with sets of parameters considered as a "single whole" (" recipe " or "settings").

All components of the control system are interconnected by communication channels. Ensuring the interaction of **SCADA** systems with local controllers, upper-level controllers, office and industrial networks is entrusted to the so-called communication software. This is a fairly broad class of software, the choice of which for a specific control system is determined by many factors, including the type of controllers used and the **SCADA** system used.

***Conclusions.*** A thorough study of the complex was carried out hydraulic engineering structures Khachkabsky hydroelectric complex from the point of view of automation of individual objects of the latter. The need has been identified for the development and implementation of an automated control system for objects, in this case the Khachkab gates waterworks _ A generalized diagram of a system for monitoring and managing a research object using **SCADA** technologies is proposed , which will allow achieving a high level of automation in solving problems of developing control systems, collecting, processing, transmitting, storing and displaying information.

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