

REMOTE SENSORS IN WATER QUALITY MANAGEMENT

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A B S T R A C T	K E Y W O R D S
In according to ISO 9000 the basis of quality management in accordance is the total production control using the systems of automated measurement of process values. Coordinated functioning of the water production links: pumping stations, pipelines, filtration equipment, etc. increases the efficiency and reliability of the hydrosystem, reduces energy consumption and improves organoleptic water performance. Modern water supply systems have a branched network structure, which is located on a vast territory. To monitor the parameters of the operation of technological equipment, a variety of sensors are intended, which convert the test value into an electrical signal entering the actuator. Effective approaches to controlling the functioning of electric motors of centrifugal pumps ensuring the transfer of required volumes of water are analyzed. In work algorithms of regulation of volume of water and pressure supply by pumping stations of city water service with application of innovative sensors are analyzed.	water supply, quality management, water pumps, electric drives, level and pressure sensor, energy saving.

Remains relevant today the challenge of developing manageable, reliable hydraulic systems in the water supply of settlements and cities that allow more rational use water resources and electricity energy. Visual condition monitoring technological equipment and manual control of units in the water supply system cannot provide sufficient reliability functional operation of pumping stations (PS). Sustainable water supply for megacities with an extensive network, for example, in the MUP system "Ufavodokanal" more than 2700 km of water and sewer networks, needs to be expanded use of electrical sensors. The main mechanism of pumping stations is an asynchronous electric drive, which is one of the main consumers (up to 25%) of all consumed electricity [1]. Automatic management of water supply processes carried out using sensors for measurements of indicators and water consumption; blocks data input and output; executive mechanisms; controller, etc. [2]. Sensors in technological hydraulic scheme of water supply determine the characteristics, regulate and signal failures. Hydraulic water source wells are equipped with blocks input and output, sensors to control

voltage and pressure, smooth starting the drive. NS water intake, for example, "Ufavodokanal" with a total capacity of 611 thousand m³ / day equipped with current and pressure sensors, and the block motor protection is installed on each pump.

Automation of water pumps and HC on today is usually submersible electric pump control water level in storage tanks or pressure in the pressure pipe. On the NS enough hydraulic equipment effectively managed by electrical sensors: start and stop water pumps and auxiliary pumping units; control and maintaining the set parameters (for example, water level, flow, pressure, etc.); reception controlled parameters and signal transmission to control room. To monitor parameters operation of the NS are various sensors that convert controlled values into electrical impulses entering the executive mechanisms [3]. Currently in technology water supply is introduced microprocessor management of the NS. In work [4] algorithms and control methods electric motor to reduce inefficient costs when using it in as electric drives for water pumps. According to the principle of operation, one can distinguish the following types of water level sensors: float sensors; hydrostatic sensors; capacitive sensors; radar sensors; ultrasonic sensors, etc. [5]. Exist several ways to measure the water level, for example, with the contact method, the sensor installed on the wall in the tank a certain level. Based on this method functioning of hydrostatic and float models of electrical sensors, but to contactless control methods include ultrasonic and capacitive sensors.

MUP "Ufavodokanal" is constantly working on improving the quality of drinking water for population. This company has always been one of the leaders in the implementation of innovative devices and technologies. For example, Ufavodokanal, introduced Galaktika ERP system, which is used together with other specialized information systems for solving problems automation of supply management tasks and sales, personnel activities, etc. Should be note that the use of the Galaktika system ERP allowed to increase efficiency management, quality of work, which improved the overall economic position of the enterprise. In operation of the enterprise "Ufavodokanal" are:

- 7 water intakes with a total capacity of 611 thousand m³ /day;
- water treatment plant with a capacity of 200 thousand m³ /day;
- 15 pumping stations of the 2nd and 3rd lifts;
- 2 complete biological treatment stations wastewater with a total capacity of 542.5 thousand m³ /day;
- 34 sewage pumping stations;
- more than 2700 km of water supply and sewer networks.

At the enterprise MUP "Ufavodokanal" since 2003 year submersible pumps are used centrifugal with hydraulic drive (manufactured in Ozersk) for pumping liquids during emergency repair work on plumbing sewer networks. attachments, on which D-120 engines are installed, hydraulic pumps NSh-32 and hydraulic tanks, promptly used in the elimination water supply problems. Performance of such pumps is 50-60 m³ /hour at 15 m pressure and during operation, the pumps showed themselves as reliable means of pumping out in various weather conditions.

In automated hydraulic systems NS controls use the following types sensors:

◆ level - to supply pulses to turning on and off the water pumps when change in the water level in the tanks;

◆ electrocontact manometers – for control circuits of automation when changing pressure in the pipeline, etc.

The main elements of the electrode sensor float type water levels are signaling unit and electrodes that

installed at a certain height reservoir. For level control float level sensors (PDU) are produced with cylindrical float PDU-1, PDU-2; With spherical float PDU-3. Level sensor has a float that moves along vertical rod, and inside the float is a permanent magnet. In the stem of the remote control, which is a hollow tube electromechanical switching device reed contact: the reed contact is activated when approach of a magnet. Upon reaching the level the waters of one or another electrode are closed corresponding circuits in the electrical circuit signaling and control of the hydraulic system.

At present, automatic online water transmission network support impossible without feedback. Mission reading changing data and transmitting it to the relay is assigned to meters and analyzers different designs. Modern pumping water supply stations respond to changes in flow rate and pressure, and sensors signal to the control system that it is stabilization actions that are required. Used to control the water level mechanical, electronic or ultrasonic water sensors. In the first case floating mechanism on the surface moves with altitude water column and when reaching the end points one or the other control circuits are switched on. At the bottom of the accumulator can install electronic devices high sensitivity for fixation instant pressure. Moreover, in the scheme stabilization of the state of the water pressure system it is possible to install electrocontact pressure gauges. These gauges, along with diaphragm switches accept participation in the automation of switching off / on hydraulic blower drives. In these devices displacement of the diaphragm through the attached to it the lever closes (or opens) the contacts in relay mechanism.

Presence (absence) information water flow control systems water supply is obtained from jet relays. Inside the water supply line sensor-plate, which deviates when movement of the water mass or remains static, when there is no fluid flow. Principle actions of any manometric device consists in the deformation of the tubular chamber under some influence and return it to original position when the influence is weakening. Any water supply sensors have error or limit of measurement accuracy. In local water supply complexes considered the most relevant and practical determination of two indicators: pressure in the circuit and the occurrence of leaks. Measurement of the first (and main) characteristics carried out gauges from various manufacturers. When if pressure fluctuations are significant on during the day, you need to debug the local water supply stations.

Thus, in conclusion, one can do conclusion that the use of sensors frequency- controlled electric drive is economical and reliable control operating modes of pumping units of various destination. Quality control functioning of electrical sensors provides: saving 18-21% of electricity, reduction of wear of hydromechanical and electrical equipment thanks to reducing the number of starts and stops water pumps; decrease in probability accidents caused by hydraulic shocks, etc.

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