PORTABLE WATER QUALITY MONITORING

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Abstract. This article analyzes the parameters of water quality, as well as the portable devices, through which it becomes possible to monitor the quality of the aquatic environment.

Keywords: water quality, monitoring, water parameters, disease prevention.

Анотація. В даній статті проведено аналіз параметрів якості водних ресурсів, а також портативних пристроїв, завдяки яким, стає можливим моніторинг якості водного середовища.

Ключові слова: якість води, моніторинг, параметри води, попередження захворювань.

Introduction. There is a set of characteristics, for example, in a reservoir, which are important for the full functioning of the ecosystem, since wastewater as well as organic and inorganic residues of human life, can lead to critical pollution of the water and as a result - the death of the fauna of the reservoir as a result, pollution can occur underground water sources and infection of entire settlements, which in turn can lead to mass deaths.

For research, surface samples will be taken from a reservoir with the help of an operator who, moving on a swimming vehicle to specific points, takes samples using portable devices, which will be proposed in this article.

Analysis of the question. The problems of monitoring water quality in various water bodies, such as water bodies, watercourses, groundwater outlets, wells of natural or technogenic origin, need solutions thanks to which this process can be improved and developed.

Objective. Explore ways to improve the situation through monitoring. Consider devices that make monitoring of water resources possible.

Materials and results. Monitoring is a system of observations of hydrological, hydrochemical hydrobiological quality indicators, as well as the processing of these data in order to timely identify, predict and prevent possible negative processes leading to deterioration of water quality. Criteria according to GOST 31942-2012.

Monitoring is recognized to solve the following problems:

systematic receipt of both individual and time-averaged points of control of water quality data;

providing systematic and emergency information, as well as forecasts of changes in the hydrochemical regime and water quality.

Quality control of water from surface water bodies is carried out in accordance with GOST 17.1.3.07-82 "Nature Protection (MOP). Hydrosphere. The rules for controlling the quality of water in water bodies and streams. In addition, the normative document of sanitary and epidemiological surveillance, which lists the requirements for sources of centralized drinking water supply, is GOST 2761-84 “Sources of drinking water supply. Hygienic, technical requirements and selection

rules ", SanPiN 2.1.4.1074-01" Drinking water. Hygienic requirements for water quality of centralized drinking water supply systems. Quality control. Hygienic requirements for ensuring the safety of hot water supply systems "and SanPiN 2.1.4.1110-02 are also relevant[1]. “Sanitary protection zones of water supply sources and drinking water supply systems”.

There are factors such as: turbidity of water, pH level, amount of soluble oxygen, temperature, salt concentration, the monitoring of which is important for maintaining the ecosystem.

Turbidity of water - an indicator characterizing a decrease in the transparency of water due to the presence of inorganic and organic finely dispersed suspensions, as well as the development of planktonic organisms.

To measure the turbidity, a photometric method is used (ISO 7027 standard, Water quality - Determination of turbidity) with a turbidity unit of FNU (formazine Nephelometric Unit). The United States Environmental Protection Agency and the World Health Organization (WHO) use the Nephelometric Turbidity Unit (NTU) to measure turbidity. In addition, the Jackson Turbidity Unit (JTU) is used, which is defined as the reciprocal of the minimum water column through which the candle flame is not visible.

For our measurement purposes, you can use, for example, the PCE-TUM 20 turbidimeter [2], the device has a turbidity range of 0 ... 1000 NTU, the measurement step is <50 NTU: 0.1, <1000 NTU: 1, has accuracy ± 5% of the measured value or ± 0.5 NTU. For continuous monitoring, you can use the HI 98713-02 portable turbidimeter, which meets the requirements of the ISO 7027 methodology and has a range of 0.00 ... 1000 FNU. It can be used for a wide range of applications from drinking water measurements to wastewater measurements. Automatic calibration by 2/3/4 points according to the standards supplied (<0.1, 15, 100, 750 FNU), the accuracy is 0.1%.

PH level

A measure of the activity (in very dilute solutions it is equivalent to the concentration) of hydrogen ions in solution, quantitatively expressing its acidity. It is equal in magnitude and opposite in sign to the decimal logarithm of the activity of hydrogen ions, expressed in moles per liter:

$$pH=-\lg[H+].$$

According to GOST 31957-2012, the pH for water (not drinking) can range from 4.5 to 8.3.

For these measurements, for example, you can use testo 206-pH1 [3], since the portable device has a sufficient measurement range from 0.00 to 14.00 pH, an acceptable temperature ranges from 0 ° C to + 60 ° C, as well as relatively high accuracy ± 0.02 pH and ± 0.4 ° C. Also, we can consider a model of a combined pH meter 9853 (PR0826) [4], which can be used for continuous monitoring, the range is 0.00 - 14.00 pH (0.01pH), accuracy: ± 0.1pH, ± 2%.

The amount of soluble oxygen.

Oxygen enters the body of water by dissolving it in contact with air (absorption) and also as a result of photosynthesis by aquatic plants. The content of dissolved oxygen depends on the temperature of atmospheric pressure, the degree of turbulization of water, mineralization of water, etc. In surface waters, the content of dissolved oxygen can vary from 5 to 14 mg / l.

Depending on the water temperature, this indicator varies from 14.6 mg O2 / dm3 at 0 ° C to 0.0 O2 / dm3 at a temperature of 100 ° C.

There are portable hand held oximeters for example EZODO 7031 [5], which is used in fisheries to measure the level of dissolved oxygen. The device has a measuring range of 0 ~ 2000 mg / l, a temperature range of 0 to 90 ° C, and has sufficient accuracy: ± 0.2 + 1 digit. Also, you can consider the Delta OHM Oximeter [6] HD2109.1 device has a measurement range of 0.00 ... 90.00 mg / l Accuracy: (from 60 ... 110% 1013mbar, 20 ... 25 ° C) ± 0.03mg / l ± 1 digit, the device has a higher sensitivity, accuracy and range of applications. Also, there are multifunctional portable devices for monitoring media, for example ODEON, which is designed to measure pH, redox potential, water level, dissolved oxygen, electrical conductivity, liquid turbidity, etc.

Conclusion. In this work, the devices were analyzed, due to which, it becomes possible to monitor specific factors to ensure the functioning of water resources (water bodies), which makes it possible to monitor water quality, which leads to a decrease in the incidence of the population and an improvement in the quality of life as well as the survival of the fauna.

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