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ANALYSIS OF HYDRAULIC PROCESSES AFFECTING WATER RESERVOIR DEFORMATION

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Abstract: Article describes the process of muddy flooding of reservoirs, which is one of the most pressing problems of resent. In particular, given analysis of research on the factors that cause problems, such as improving the mode of operation of reservoirs, increasing service life, ensuring hydraulic reliability. In the study of this process, water samples were taken with using a batometer and laboratory analyzes were performed to determine the level of sedimentation of the flow mounted on a rod from the marked storks of the research object. According to the experimental results obtained, that the sedimentation level of the flow is 0.5 g/l in the first stage, 1.5 g/l in the third set and 2.1 g/l in the fifth row. Based on the measured values, were assessed the deformation processes occurring in the upper reaches of the reservoir and their impact on the exploitation of the structure.

Keywords: Reservoir, waterbed, deformation, sediment flow, flood, water flow, b'ef, dam.

Introduction

Today, great importance is attached to solving the problems of agriculture and water management, which are an important part of the national economy. Given the importance of these sectors in improving the economic situation of country, reforms in agriculture and water management, the use of modern information technology in water management, the use of the latest achievements of science are considered as important issues [1]. The rapid development of the agricultural sector, leads to an increase in the consumption of water resources. In order to fully meet these needs, the construction of reservoirs, prolonging their service life, saving water resources, rational and efficient use of available water resources is becoming a vital necessity [2]. Due to the periodic water shortages that have occurred periodically as a result of global climate change in recent years, there have been some challenges in the agricultural sector during the growing season. Therefore, the development and improvement of science-based recommendations for improving the operation of reservoirs, which are the main link of water supply, increasing the operational reliability of hydraulics, preventing the reduction of useful capacity of the reservoir due to turbidity and the introduction of water-saving technologies in agriculture are urgent issues [3,4].

Despite the large-scale research in this area, issues such as the assessment of changes in the useful volume of reservoirs, the calculation of turbidity in reservoirs and the development of science-based measures based on them remain relevant [5]. When developing a reliable and efficient mode of operation of reservoirs, it is necessary to have accurate information about the volume of water stored in the reservoir for the safe operation of facilities [6,7]. The useful volume is steadily declining due to the sedimentation of sludge as a result of the annual operation of the facilities [8]. Millions of cubic meters of sludge can accumulate in reservoirs within a year, resulting in errors in calculating the useful volume of reservoirs [9]. This article examines the effect of the water level in the reservoir on the turbidity process [10].

Object of research and problem statement. It is known that the reservoir meets the needs of several sectors of the economy (irrigation, water supply, electricity, shipping, fisheries, flood control, etc.). The reservoir regulates flow by seasons and years, allowing for redistribution across areas along with canals and other drainage structures. The Chartak Reservoir, selected as the object of study, is used to irrigate 5.1 hectares of land in the region and to protect the population and agricultural facilities during floods [11]. The schematic cross section of the reservoir dam is as follows (Figure 1).

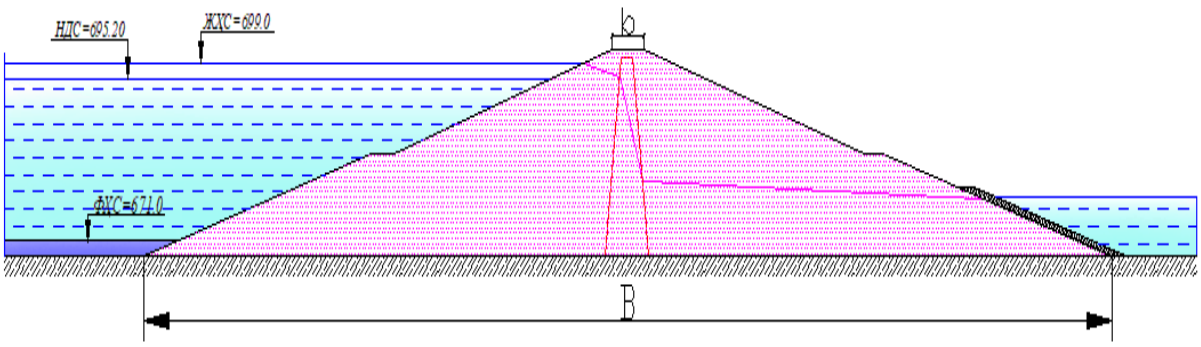

Figure 1. Cross section of the dam

One of the factors influencing the useful volume of the reservoir is the turbid pressure. When the reservoir volume is filled with sediment, the technical characteristics of the reservoir deteriorate, large sedimentary sludges fall on irrigation canals and water supply facilities, and the reservoir management capacity decreases [12]. According to the results of the natural field studies, the amount of turbidity of the reservoir indicated in the project differed sharply from the amount of turbidity measured [13]. Due to environmental changes over the years and floods caused by atmospheric precipitation, deformation processes were observed in the upper reaches of the reservoir, and the amount of turbid sediments increased sharply [14]. As a result of such negative changes, the efficiency of the reservoir is declining and its impact on the safety of the population and agricultural facilities is increasing.

Research method (s). Widely used to determine the amount of suspended runoff in natural field conditions in determining the consumption of suspended runoff in the reservoir , a batometer-bottle measuring instrument mounted on a rod was used (Fig. 2).

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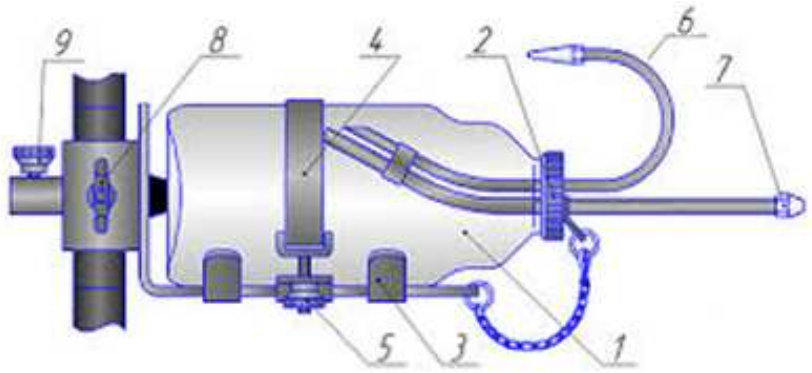

Figure 2. A barometer mounted on a barbell
1-bottle; 2 metal cover; 3 bottle holder; 4 bottle holding belt; 5 belt tightening screw; 6 air vent pipe; 7 water collection pipe; 8 rod coupling; 9 clamping screw;

A batometer is a device that takes samples from natural water bodies at a certain depth in order to check the chemical and physical properties of water, to determine the organic and organic compounds in it. The turbidity water sample is taken using a batometer in two different integrated and point methods. We used the point method in sampling because it was recommended to use the point method when the flow depth was up to two meters. Field research was carried out during the period when the water level decreased sharply after the vegetation period, ie characteristic (stvor 1, stvor2, stvor 3, stvor 4, and stvor 5) stvars were determined and water samples were taken at flow depth using a rod batometer. the samples were emptied into pre-prepared special containers. Preliminary analysis of the samples was carried out in the laboratory, ie the process was carried out through a filter. After the samples were filtered, the turbid filters were dried in a drying cabinet, the weights were measured using analytical scales after the filters were sufficiently dried, and the amount of turbid sediment retained in the filter was determined by comparing the net weight of the filter.

Analysis and discussion of the results obtained. At the object of study, statistical analysis of batometric studies, laboratory analyzes and long-term data of the reservoir carried out in natural field conditions were performed. Deformation processes can be seen in the upper reaches of the Chartak Reservoir due to environmental changes (Figure 3).

Figure 3. Condition of turbid-sedimentary deposits in the upper reaches of the Chartak reservoir.

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During the period of discharge (vegetation) of the muddy sediments formed in the upper reaches, the water level decreased, the natural flow washed away the bottom and banks of the river and was pushed towards the dam. According to laboratory analysis, the presence of turbid sediments in the amount of 0.5-2.1 g / l (gram / liter) in the natural flow. The average water consumption in the inlet channel is 1.0-2.5 m3 / s. It was concluded that a few cubic meters of turbid sediments per day, together with the natural flow into the reservoir. During the floods, this figure increased several times, which accelerated the process of turbidity of the reservoir, and the impact on the environment was assessed. That is, the reservoir is filled with turbid sediments, which disrupts the natural geostatic and hydrostatic balance and dramatically changes the seismic hazard. This process poses a serious threat to the safety of the population and agricultural facilities around the reservoir. Taking into account the above factors, it was argued that the development of measures to reduce the useful volume of the reservoir by filling it with turbid sediments is an important task. Inlet and outlet water consumption have an impact on turbidity processes during the operation of the Chartak reservoir. The following is a hydrograph of the study object related to the change in input water consumption to the turbid pressing process (Figure 4).

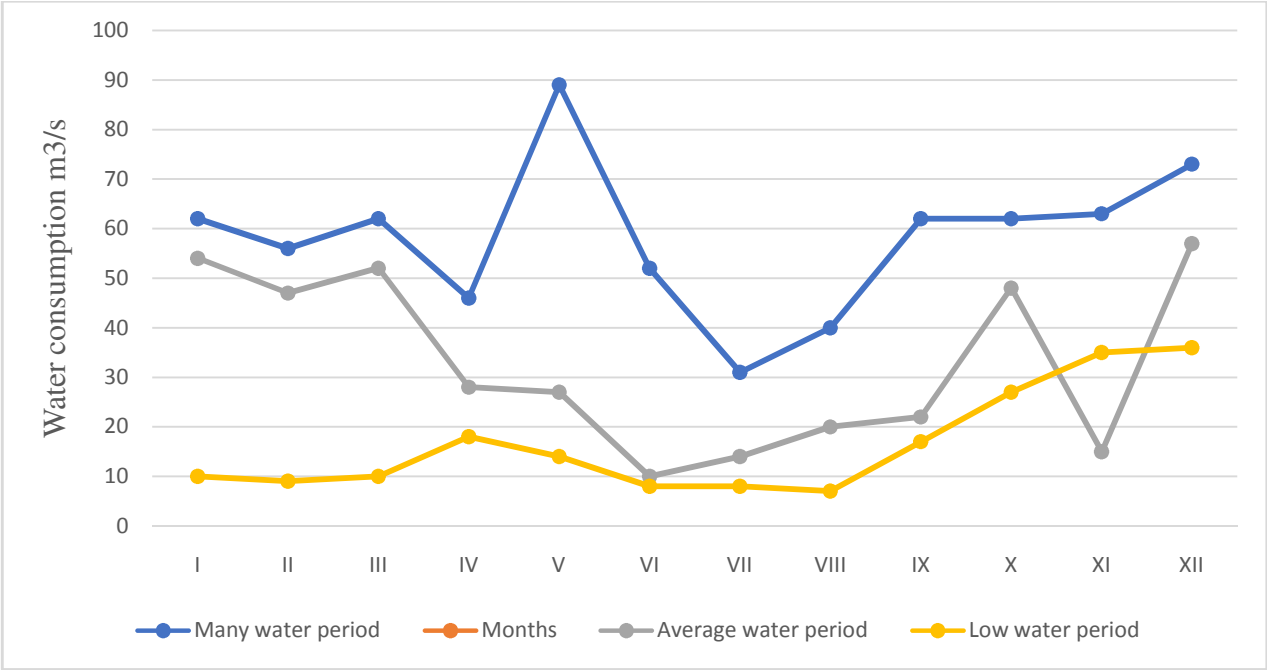

Figure 4. Hydrography of Chartaksay in high-water, low-water and medium-water years

Based on the above statistics and results, taking into account the periodic variability of the flow rate at the object of study, a graph of the change in the amount of turbidity on the storks (Figure 5) was presented.

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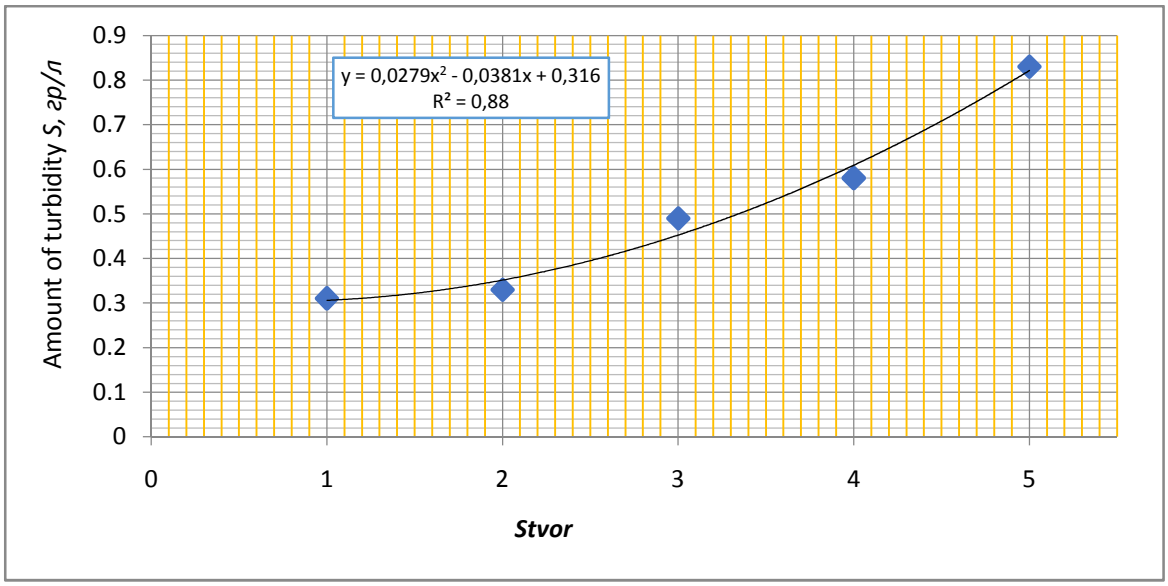

Figure 5. Graph of change of turbidity in the water content of the Chartak reservoir between pickets

It is clear from the graph that the turbid sediments accumulated in the upper part of the reservoir cause deformation processes as the reservoir water level decreases, causing the shoreline to be washed away and the amount of turbidity in the stream to increase. This has a negative impact on the increase in the amount of turbid sediments in reservoirs, the reduction of useful capacity of the reservoir, the violation of the operating mode of the structure, the deterioration of the environment and ecological situation, rising groundwater levels and land reclamation. To overcome these problems, it is necessary to accurately assess the amount of turbid sediments, determine the balance of turbid sediments in reservoirs and develop measures to reduce them.

Conclusion. The amount of sludge in reservoirs is formed under the influence of various factors depending on their geographical location, and the accumulation of sludge also depends on the configuration of the basin. Based on the results of the field study, the amount of turbid sediments entering the reservoir together with the natural flow was determined and an average of 1.5-3 times more than in the project. This factor depends on the duration of operation of the reservoir, the mode of operation efficiency, reduction in useful volume, changes in water level and increasing negative impact on the environment.

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