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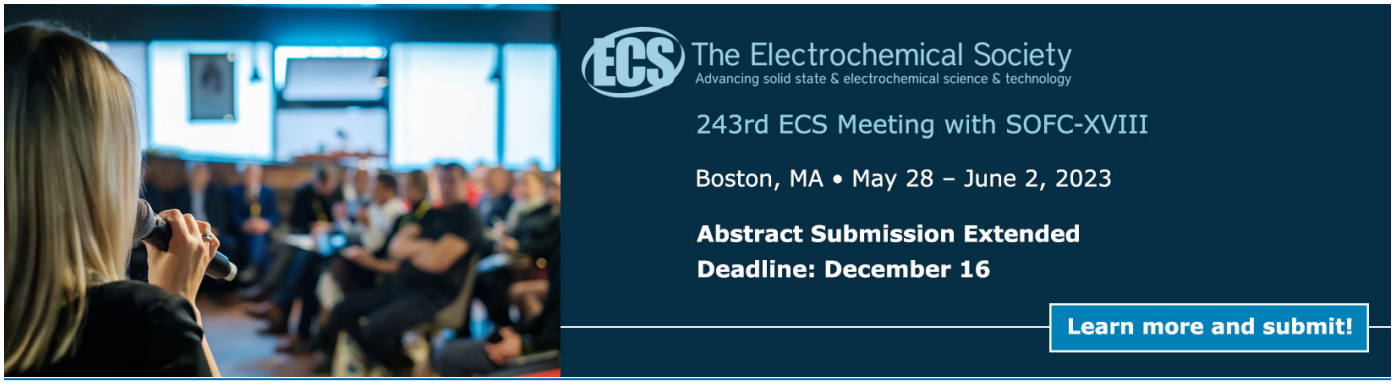

Analysis of fractional and chemical composition of chartak reservoir sludge sediments

S Xoshimov[1], T Qosimov, I Ortikov and A Hoshimov

"Tashkent Institute of Irrigation and Agricultural Mechanization Engineers" National Research University, Kary-Niyazy 39, 100000, Tashkent, Uzbekistan

[1]E-mail: xoshimov.50907@gmail.com

Abstract. In the present era, when climate change has become a global problem, efficient use of water resources is becoming an important task. Natural field research was conducted in Chartak reservoir. In order to determine the amount of turbidity entering with the flow, the characteristic tributaries were determined along the length of the reservoir, and in each tributary, samples were taken using a bathometer at different times of the season and filtered in laboratory conditions. According to the analysis of the results, the average amount of incoming turbidity was 0.3-0.5 g/l, and the amount of outgoing turbidity was 0.05-0.08 g/l. Samples of the sediments that sank into the reservoir bowl were taken and their fractional and chemical composition was analyzed in the laboratory of "Gidroproekt" JSC. According to the fractional composition of muddy sediments, particles with a diameter of 1.0-0.5 mm are 13.98%, particles with a diameter of 0.5-0.25 mm are 11, 49%, particles with a diameter of 0.25-0.10 mm - 7.56%, particles with a diameter of 0.10-0.05mm - 10.48%, particles with a diameter of 0.05-0.01 mm - 26.8% , it was found that particles with a diameter of 0.01-0.005 mm make up 13.34%, and particles with a diameter of 0.005-0.002 mm make up 16.42%. If we pay attention to the distribution and share of sediments on the walls, 35-40% of particles with a large fraction (d=1.0-0.1 mm) and 50-60% are particles with a small fraction (d=0.05-0.001mm). It is based on the presence of particles rich in microelements useful for agricultural fields in sediments. If we pay attention to the distribution and share of sediments on the walls, 35-40% of particles with a large fraction (d=1.0-0.1 mm) and 50-60% are particles with a small fraction (d=0.05-0.001mm). It is based on the presence of particles rich in microelements useful for agricultural fields in sediments. If we pay attention to the distribution and share of sediments on the walls, 35-40% of particles with a large fraction (d=1.0-0.1 mm) and 50-60% are particles with a small fraction (d=0.05-0.001mm). It is based on the presence of particles rich in microelements useful for agricultural fields in sediments.

1. Introduction

The current state of the problem under consideration. In the current era, when climate change has become a global problem, efficient use of water resources is becoming an important task [1]. The issue of effective use of water resources is one of the urgent issues facing not only our republic, but the entire world community [2]. Today, one of the ten global problems of the 21st century is the increasing scarcity of water resources. In the last 60 years, the consumption of drinking water on earth has increased 8 times. Jakhan agriculture uses 2.8 thousand km3 of fresh water per year. This is 70% of the world's freshwater consumption, or 7 times more than the water used by global industry [3]. Necessary measures are being taken by our state and government to mitigate water shortage, efficient use of water resources and improvement of the sector [4].

According to hydrometeorological forecasts, as of March 31, 2021, water reserves in some reservoirs were 23-52 percent less than the annual norm [5, 6]. This has an impact on the origin of a number of problems in economic sectors. Therefore, it is important to organize the working mode of water reservoirs, which are the main sources of the water supply system, to accurately assess the hydraulic and hydrological processes observed in the water reservoir, to reduce the useful volume of the water reservoir, and to reduce the pressure of muddy sediments [7].

A large amount of muddy sediments flows into the bowl of Uzanli reservoirs during the period of operation together with the stream. Especially in mountain and flood reservoirs, the process of turbidity and their distribution along the basin of the reservoir is different [8]. In particular, many scientific studies have been carried out on the calculation of the change in the useful volume of water reservoirs, the prediction of the silting process, and the issues of ensuring their safe and reliable operation [9].

2. Research object and setting of the problem

Natural field research was conducted in Chartak reservoir. The Chartak Reservoir is located in the north-eastern part of Namangan region and is used to supply water to 5.1 hectares of cultivated areas of the region and to ensure the safety of the population during floods [10]. In the area where the Chartak reservoir is located, there are frequent precipitations, and as a result of atmospheric precipitation, floods occur. Floods combine with the continuous flow of the riverbed to form a large amount of muddy flow and enter the reservoir [11,12]. As a result, the filling of the reservoir with muddy deposits accelerates. Taking into account such factors, the formation of turbid sediments in water reservoirs, the structure of their fractional and chemical composition.

3. Research method (methods)

In order to determine the amount of turbidity entering the reservoir and the composition of turbid sediments, field studies were conducted at the research facility. During the field research, characteristic plots along the length of the reservoir were determined and samples were taken in each plot. To determine the amount of turbidity in the stream, samples were taken using a bathometer. All samples were analyzed in the laboratory of "Gidroproekt" JSC. Methods of processing and statistical analysis of the results obtained in field studies were used [14].

4. Results and discussion

The filling of the reservoir with turbid sediments is related to the location of the reservoir, its classification, the source of saturation, and the formation of its banks. The study of the characteristics of turbid sediments in the upper basin shows that when the flood flows enter the reservoir, the turbidity flows along the deep channel, and if the drainage facility is working at full capacity, a certain amount of turbid particles can be discharged into the lower basin [15, 16]. However, from the space image of the river bed at the upper entrance of Chartak Reservoir, it can be seen that most of the muddy sediments are sinking in the reservoir (figure 1).

Figure 1. Space image of Chartak reservoir.

During natural field studies, the level of turbidity of the Chartak reservoir was studied depending on the fractional (mechanical) composition of turbid sediments and water consumption. In this regard, a long-term analysis of water consumption data entering the reservoir was carried out [17,18]. The average annual and monthly water consumption variability of the Chartaksoy stream is shown in the figure below (figure 2).

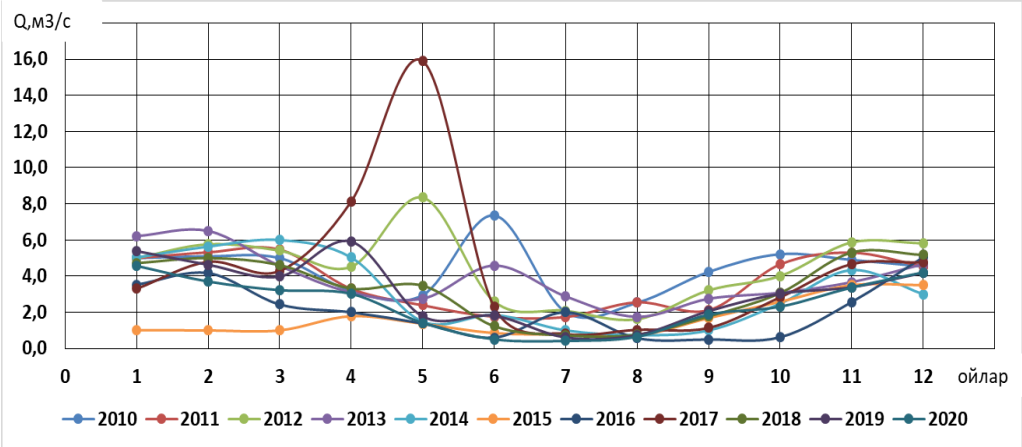

Figure 2. Changes in Chartaksoy water consumption over the years (at the entrance to the reservoir).

It should be noted that if a flood flows into the reservoir several times in one season, the amount of muddy sediments will increase and the effect on the operational conditions of the reservoir will increase. In order to determine the current turbidity, water samples and sediment samples were taken using a rod bathometer from several walls of the entrance part of the Chartak reservoir basin [19,20]. The sampled streams are shown in the following spatial image of the reservoir (figure 3).

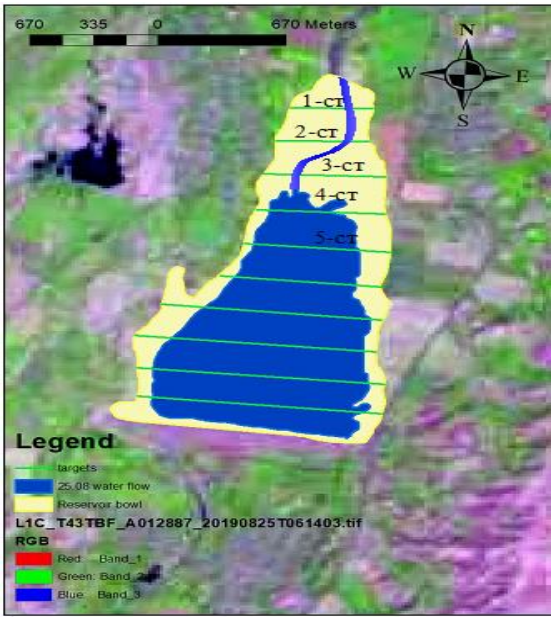

Figure 3. Designation of walls in Chartak reservoir.

Stream sampling was done at different times. The turbidity of the obtained samples was analyzed in the laboratory of "TIIAME" NRU and the fractional and chemical composition of sediments in the laboratory of JSC "Gidroproekt".

According to the results of the research, it was found that there is an average of 0.3 g/l turbidity in the samples taken from the natural stream in the part of the river water entering the reservoir. The average turbidity of 0.055 g/l was found in the samples taken from the outlet channel water. In the later stages of research, laboratory analyzes showed that the average turbidity of the inlet channel flow was 0.31 g/l, and the average turbidity of the water samples taken from the outlet channel was 0.08 g/l. Based on the analysis of measurement results, the amount of turbidity entering the reservoir with the current and the turbidity leaving with the current was compared, and conclusions were made about the amount of turbidity sinking in the useful volume of the reservoir.

During the research carried out in Chartak reservoir, samples were taken from the bottom sediments that sank to the useful volume of the reservoir. The samples were analyzed in the special laboratory of "Gidroproekt" JSC and their fractional and chemical composition was determined (figures 4, 5).

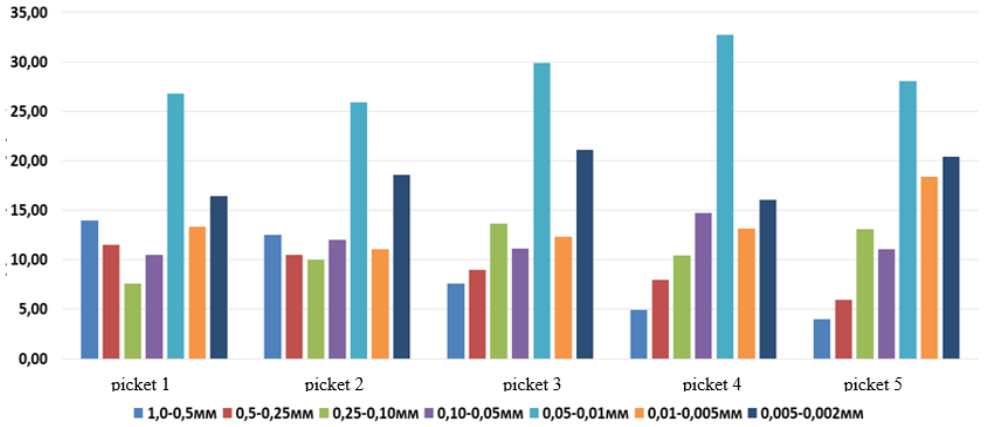

Figure 4. Distribution of turbid particles by fractional composition in Chartak reservoir.

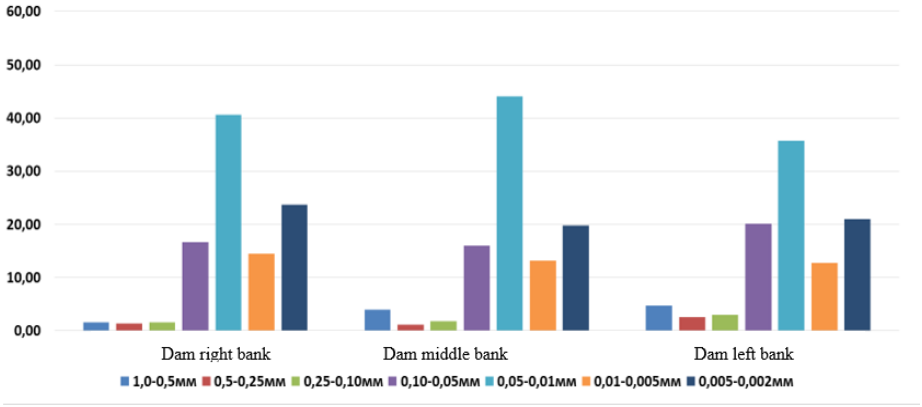

Figure 5. Fractional composition of samples taken from Chartak reservoir dam.

As a result of the analysis of the fractional composition of sediments in the reservoir, particles with a diameter of 1.0-0.5 mm make up 13.98%, particles with a diameter of 0.5-0.25 mm make up 11.49%, 0.25-0.10 7.56% of particles with a diameter of mm, 0.10-0.05mm diameter particles 10.48%, 0.05-0.01mm diameter particles 26.8%, 0.01-0.005mm diameter particles 13.34%, 0.005-0.002mm diameter particles It was found that particles make up 16.42%. According to the analysis of the fractional composition of sediments taken from the surface of the reservoir dam, particles with a diameter of 1.0-0.5 mm make up 2.26%, particles with a diameter of 0.5-0.25 mm make up 1.97%, 0.25-0.10 mm particles with a diameter of 1.60%, particles with a diameter of 0.10-0.05 mm - 16.65%, particles with a diameter of 0.05-0.01 mm - 39.31%, particles with a diameter of 0.01-0.005 mm - 14, 47%, particles with a diameter of 0.005-0.002 mm made up 23.74%. If we pay attention to the distribution and share of sediments on the walls, it was found that 35-40% of particles with a large fraction (d=1.0-0.1 mm) and 50-60% are particles with a small fraction (d=0.05-0.001mm).

Together with the analysis of the fractional composition of the sediments taken as a sample, analyzes were also carried out on the chemical composition, that is, the chemical composition of the sediments and their share in the samples were analyzed (figures 6, 7).

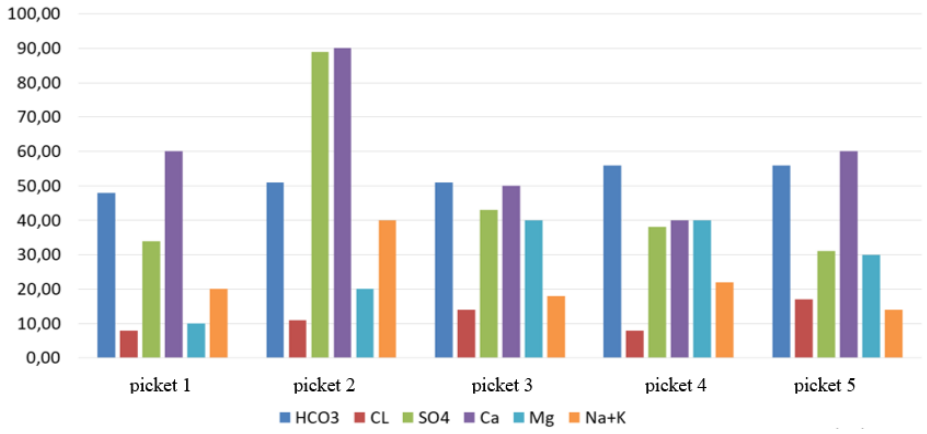

Figure 6. Distribution of chemical composition of particles by walls.

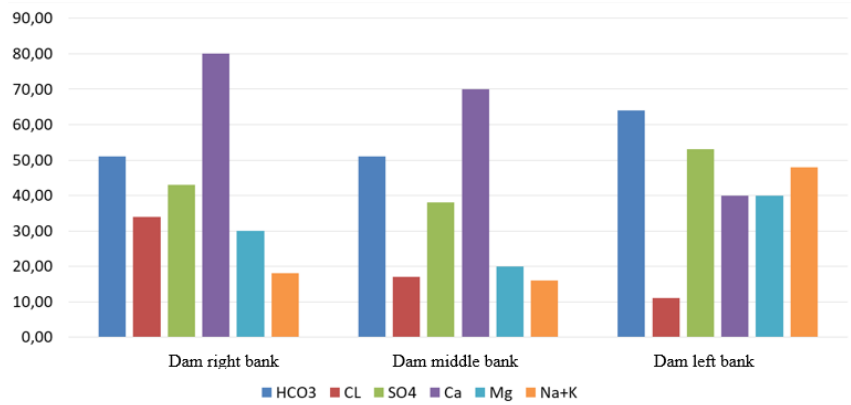

Figure 7. Chemical composition of particles in a reservoir dam.

In the course of research, when the chemical composition of muddy sediments is studied, we can see elements such as nitrogen, phosphorus, potassium and humus, which increase the productivity of cultivated fields. It is known from the analysis of scientific research and research carried out by many scientists that river sediments contain nutrient particles rich in minerals (useful for agricultural fields). Due to the fact that the research reservoir is located in the river bed, it was found that the fraction of particles rich in minerals in the composition of sediments is 25-30 percent. If the muddy sediments rich in mineral substances are supplied to cultivated areas through irrigation networks, it contributes to the increase of land fertility, the quantity and quality of agricultural products.

5. Conclusion

On the basis of field research, the quantity, fractional and chemical composition of turbid sediments entering the Chartak reservoir were studied. According to the results obtained on the basis of laboratory analysis, the average amount of turbidity flowing through the reservoir bed at the time of research was 0.31 g/l, and the average amount of turbidity in the samples taken from the water outlet was 0.08 g/l. Based on the analysis of the measurement results, the amount of turbid sediments entering the reservoir with the current and the turbid sediments leaving the stream were compared. According to the results of the analysis, the fractional composition of the sediments is d>0, It was found that the share of particles larger than 2 mm is 35-40 percent, and the fraction of small particles is 55-60 percent. Small fractional particles contain trace elements such as nitrogen, phosphorus, potassium and humus, which increase the productivity of cultivated fields. It was proved that if these microelements are supplied to cultivated areas, they will contribute to the increase of the fertility of the land, the quality and quantity of agricultural products.

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