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Problems In Exploiting Hydrotechnical Engineering Structures: Solutions And Suggestions

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ABSTRACT: Operating hydraulic structures in the country were built in the second half of the last century, and their technical reliability has been declining as a result of many years of maintenance and inadequate repair and exploitation. This article presents the results of research on the Langar flood reservoir. Proposals on ways to eliminate and mitigate identified problems are provided.

KEYWORDS: hydraulic structures, dam, safety, filtration, reservoir, operation, reliability, muddy sedimentation, degradation, deposition, slope.

I.INTRODUCTION

Currently, in the Republic of Uzbekistan has over 4.2 million hectares of irrigated land, and almost all crops are grown based on artificial irrigation. About 300 large hydrotechnic structures (HTS) serve for irrigation of these lands, including total volume over 20 bln m3 56 reservoirs, about 65 large hydroelectric dams, 60 main and inter-farm canals with a total length of 27,000 km with thousands of small HTS. Almost half of the existing land area has a total water use of 6.4 million m3/s irrigated through more than 1,500 small pump stations, including 24 large pump stations. More than 30 hydroelectric power stations are used to meet electricity demand in the country's economic sectors, including agriculture. These facilities are of strategic and vital importance, and some of them can be left without water from the whole of the areas, even the provinces, where our people live.

The age of these structures is 30-40 years and more, and their technical capacity and reliability are reduced due to the long-term maintenance of these facilities and the lack of adequate and quality repairs. In addition, the lack of attention to environmental factors in the operational process leads to a decrease in the reliability of HTS operation.

The importance of this is that, despite the apparent success of the HTS, there has been an increase in the rate of crash and even accidents in recent years, as well as particular concerns in reservoirs, pumping stations, rivers and streams. As a result, millions of Soums are required each year for their rehabilitation.

Significant problems, changes in HTS security, their continuous monitoring, immediate processing of data from measuring devices installed in reservoirs and other facilities, analysis of compliance with diagnostic guidelines and their impact on the robustness of buildings and the experience of foreign countries in this field and assessment of norms of security categories of HTS, which are used on the basis of acquired skills and abilities requires of the development.

Effective using to improve the reliability and safety of the existing HTS technical condition and proper use throughout the country have been adopted number of laws have been adopted, such as the Law on Water and Water Use and the Safety of Hydrotechnical Facilities. At the same time, a number of arangements are being developed to ensure the safety of HTS across the country. At present operational hydraulic structures are carried out on the basis of existing methods of evaluation of safety category evaluation on the basis of the following factors:

1. Characteristics of the reservoir and dam area, river flooding and geological conditions of the area;
2. Characteristics of the dam, its design and current state characteristics;
3. Expected standards for the management and operation of dams and their importance for safety;
4. Impact of flooding on the downstream area due to damages or emergencies.

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Determining the HTS security criteria and assessing the HTS accident risk, as well as examining the defects that cause complete or partial loss of facilities and emergencies and exploring several options to sustain them is a requires not easy engineering solution.

Analysis of the results of observations and operation data conducted in the Republic of Uzbekistan for 2005-2018 under the guidance of F.A.Gapparov showed that during operation the hydrological, technical and environmental factors might be involved in the accident and affect their reliability.

Together with scientists from the Irrigation and Water Problems Research Institute, the Langar flood reservoir is located 15 km away from center Kamashi district of Kashkadarya region. As a result of this work, the following information was obtained: reservoir filling started in 1975, with a total water intake of 7.35 million m3. The source of replenishment of this structure is Langardarya. As a result of the study, it was found that the reservoir was still filling due to the sedimentation. The current technical condition of all HTS at the Langar flood reservoir management department was determined by the dam: length - 1100 m; width of upper part - 6 m; height - 34 m; high slope - 2,5; 2,75; low slope - 2,5; 2,75; 3.0. The upper part of the dam is in satisfactory condition, the upper slopes are covered with concrete slabs and parapets are installed at the top. The waves caused by the wind and the discharge of the reservoir at the slabs caused some non-hazardous fractures and faults in some areas. There was an increase in different grasses on the slopes of the dam (Fig. 1).

Figure 1. Defects in the pressure slope of the dam

The dam has 35 piezometers installed to monitor filtration rate, with 24 currently in operation and 11 pyzometers overflowing with rocky sands. There are devices that can detect the sensitivity of pyrometers, where water levels are monitoring and recording every ten days.

The drainage system built for take-out groundwater in the dam is in operation. Ground water levels in the drainages always in monitoring. Some drainage system wells have filled with some rocks.

The drainage system takes out the water from the flood reservoir to the drainage canal. The type of water drainage underneath the drainage system, the inlet water pipe is connected to the main drainage. The discharge capacity of the facility is 20 m^3/s, the absolute level threshold is 639.0 m. The structure of the water intake structure is as follows:

- two pressure pipes with a length of 26.5 m and a cross-section of 1.4x2 m;
- There are four gates, 1,1x1,0 m, with two gates for repair;
- reinforced concrete pipes with the size of 1.4x2.0 and 135 m.

There was moisture on the gallery walls now. The structure is equipped with flat work and repair gates. As the basin is full of muddy sediments, the intake area of the drainage system is have buried.

The catastrophic drainage facility is located to the left of the dam. The structure consists of a fast track, cross-section in the form of trapeze, with a total length of 650 m, the capacity designed of 242 m^3/s. The building is in working condition. At present, repair works are have carried out to correction of damages of the highway and pressure slopes.

The reservoirs are observed filled with sediment as well in Tashkent, Talimarjan, South Surkhan, Kuyimazar, Tudakul, Akhangaran, Andijan, Jizzakh, Kattakurgan, Tupalang, Hissarak, Chimkurgan, Pachkamar and Akdarya reservoirs. One of the main reasons why the rate of basin sedimentation is higher than that specified in the project is that mudslides have not been proposed in the project or in the operation of reservoirs.

The above factors are summarized for all reservoirs and represent:

- overloading of the reservoir;
- inflow of the reservoir to muddy sediments (mudflow, coastal disturbance, landslides);
- Damage to protective elements on the upper slopes of the dam;
- changes in the body of the dam filtration process;
- excessive sinking and displacement of the dam body;
- faults in water intake structures;
- changes in drainage and other tunnels;
- washing of the lower beam and demolition of the last adjacent structures;
- Failure of electrical and mechanical components of HTS;
- power outages in the reservoir or power failure in the reserve;
- damage to the water intake and discharge channels;
- deterioration of water quality in the reservoir;
- breach of water protection boundaries of the reservoir basin.

In order to ensure that each factor does not occur or is ineffective, it is necessary to identify the causes of each of these factors and to take measures to prevent them.

In recent years, innovative technologies have been used extensively in hydrotechnical practice to address or mitigate problems. The purpose of these technologies is to quickly identify the causes of HTS deficiencies, promptly process the information received, transmit the information, and quickly identify the emergency response.

An analysis of major accidents in recent years in various countries around the world shows that one of the main reasons for their occurrence is the human factor and the failure of services during the operation to localize HTS emergencies. About 50% of accidents and emergencies are caused by inadequate training of operational staff, improper organization of work, violation of HTS safety rules and regulations, and failure to monitor their safety. That is why training of operational staff is one of the key issues in ensuring HTS security.

REFERENCES

[1] Gapparov F.A., Narziev J.J. Predicting and preventing reservoir overflow // Collection of International Scientific and Practical Conference on "Improving the efficiency, reliability and safety of hydraulic structures". - Tashkent, 2018

[2] Gapparov F.A., Mamatov S.A. Factors Affecting the Reliability of Reservoir Operations // “Ecological and Geographic Aspects of the Use and Protection of Natural Resources in the Single Natural Historic Area” - Ferghana, 2010. - B. 108-109.

[3] Gapparov F.A., Nazaraliev D.V., Narziev JJ Organization of safe and efficient use of water reservoirs // International scientific-practical conference. - Tashkent: EITI, 2017.

[4] Mahmudov E.J., Paluanov D.T. The organization of monitoring of the quality of the search and maintenance of the water supply facilities // The journal of "Putting on the efficiency of irrigating croplands". Issue No. 3 (67). - Novocherkassk, 2017. - p. 134–139.

[5] Skrylnikov VA, Keberle S.I., Beleskov BI Effective exploitation of water. - Tashkent: Labor, 1987. - 244 pp.

[6] Rozanov N.S., Tsarev A.I., Mikhailov P.P. Accidents and damage to large dams. Design and construction of large dams. - M .: Energoatomizdat, 1986.

[7] Bellendir B.N. and other Probabilistic methods for assessing the reliability of soil hydraulic structures. // Ed. VNIIG named after B.E. Vedenev. " - SPb: 2003. - T.1. –556 p., T.2. - 524 s.