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Irrigation System Pumping Station Avancamerasida Water Cylinder Disposal Device

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Abstract: The main goal of the research is to develop constructive measures to ensure even distribution of water in the pre-chamber of irrigation system pumping stations and water intake structures, and to improve hydraulic conditions when supplying water to pumps. The authors developed a technical solution that includes an element that affects the movement of water in front of suction pipes. This ensures stable, cavitation-free operation of pumps, prevents expensive and complicated reconstruction of pumping stations, and ensures reliable water supply of pumping stations.

Key words: operation, pump unit, vane chamber, water intake chamber, guide element, technical solution.

Introduction: One of the important issues in the world is the supply of water in the required amount for irrigation of agricultural crops. "Worldwide 4 billion 886.3 million agricultural products are grown per hectare, and 43.2 percent of them use pump stations to irrigate crops." It is of particular importance to ensure the reliable use of pump stations to supply the required amount of water to the ever-increasing cultivated areas. In this regard, some progress has been made in developed countries, including America, Asia and Europe, where special attention is paid to improving the hydromechanical equipment of irrigation system pumping stations to increase the reliability of pumping stations and to supply water continuously and in the required amount.

Pumping stations should ensure continuous supply of water with a high content of turbidity in the required amount during the vegetation period. A number of scientific research works have been carried out in the direction of removal of accumulations that occur in front of suction pipes when the water level drops in the vane chambers of large pumping stations [1]. The direct application of the proposed technical solutions and technologies to pumping stations does not give the expected results. Therefore, the issue of improving the technology for eliminating water accumulations that occur in front of suction pipes is an urgent problem.

Taking into account the above-mentioned points, in this work, the problems of improving the device for eliminating piles, which occur when the water level is below the norm in the advance chamber of the pumping station, are considered. Installation of the proposed device in the vane

chamber of the pumping station eliminates the ingress of air entering the suction pipes together with water and prevents the pumping device from operating in the cavitation mode[2].

Hydrotechnical structures of pumping stations are designed to supply a certain amount of water, and changes in water consumption directly affect the operating mode of pumping stations. Ensuring non-stop operation of pumping stations working to deliver water with a high content of turbidity requires the fulfillment of hydrological requirements. This situation is especially important in the advance chambers of the pumping station where flow control and regulation hydraulic structures are not installed. Ensuring the correct movement of the freely moving flow in the vane chamber with large cross-sectional dimensions ensures uniform entry of water into the suction pipes[3].

Taking into account the above, scientific research works were carried out at the Jizzakh pumping station to use the proposed device to eliminate the accumulations formed in the stream when the water level in the advance chamber falls below the norm. The movement of water in the advance camera and the formation of lumps on the water surface were determined using a water measuring device installed directly at the pumping station.

The obtained data showed that the water level in the lower reservoir is 4.75 m, that is, in the same condition, two types of water consumption of 2400V25/40 brand - 25m3/s and 1600V10/40 brand of water consumption -10m3/s occur in front of the suction pipes of pumping devices. It was found that the duration and recurrence of water accumulations are different, as well as the sizes of water accumulations are different from each other.

In order to prevent the cavitation operation of the pumping device as a result of the drop in the water level in the advance chamber of the pumping station, various devices are currently used to prevent the formation of water deposits in front of the suction pipes [4]. As a result of the analysis of the constructions of existing devices, it became clear that their use does not ensure complete elimination of water accumulations.

Water distribution fins are installed on the device to ensure uniform water supply to the suction pipes. The devices installed in the device are placed at an angle to the direction of water movement and serve to eliminate the circular movement of water piles. By changing the distance between the wings of the device in accordance with the dimensions of the width of the water intake facility, smooth penetration of water into the intake pipes is ensured. A cross-sectional view of the improved device is shown in Figure 2.

The device 1 for directing water to the suction pipes is installed in the vane chamber 2 of the pumping station, which ensures uniform penetration of water into the suction pipes 3. The wings of the device are installed taking into account the direction of the circular motion of the piles in the water. In this case, the rotating piles are resisted by the vanes installed at an angle to the movement of the flow, and forced straight movement is ensured. The wings directed to the right in relation to the direction of the flow are first installed under ao'ng=750, and the next wing is installed with a difference of 30 from the previous one, that is, ao'ng1=780; ao'ng2=810 and so on. The first of the vanes facing the left side of the flow is set at an angle of 1050, and the following wings are set at an angle of 30, that is, achap1=102°, achap2=99°, and so on.

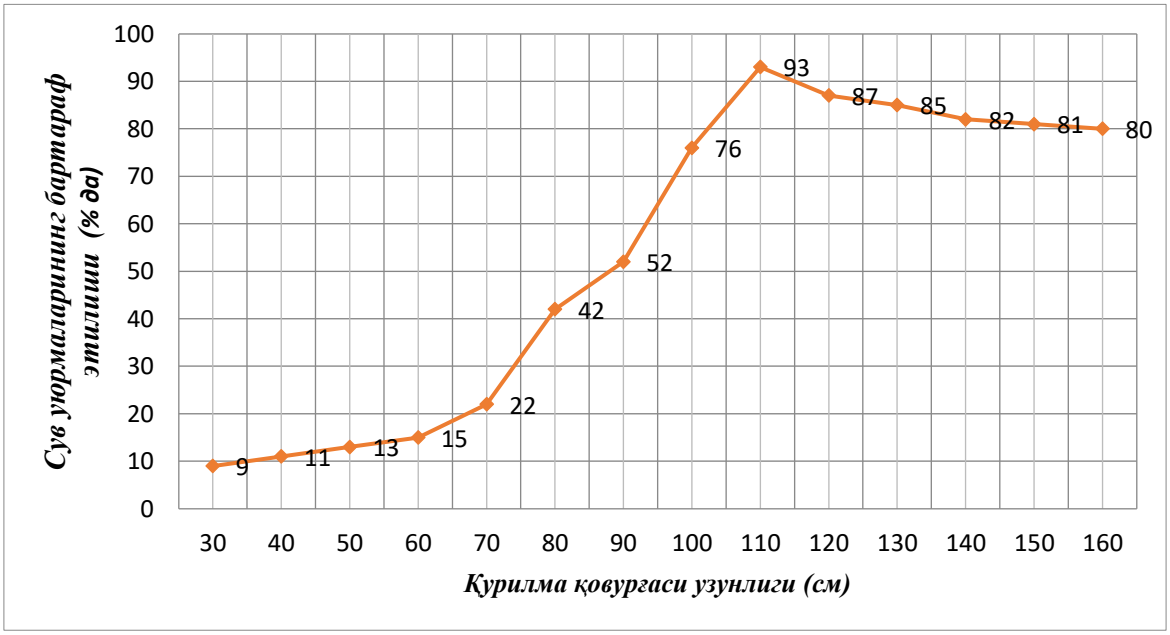

Figure 1. Graph to find cost-effective length of anti-flood fin

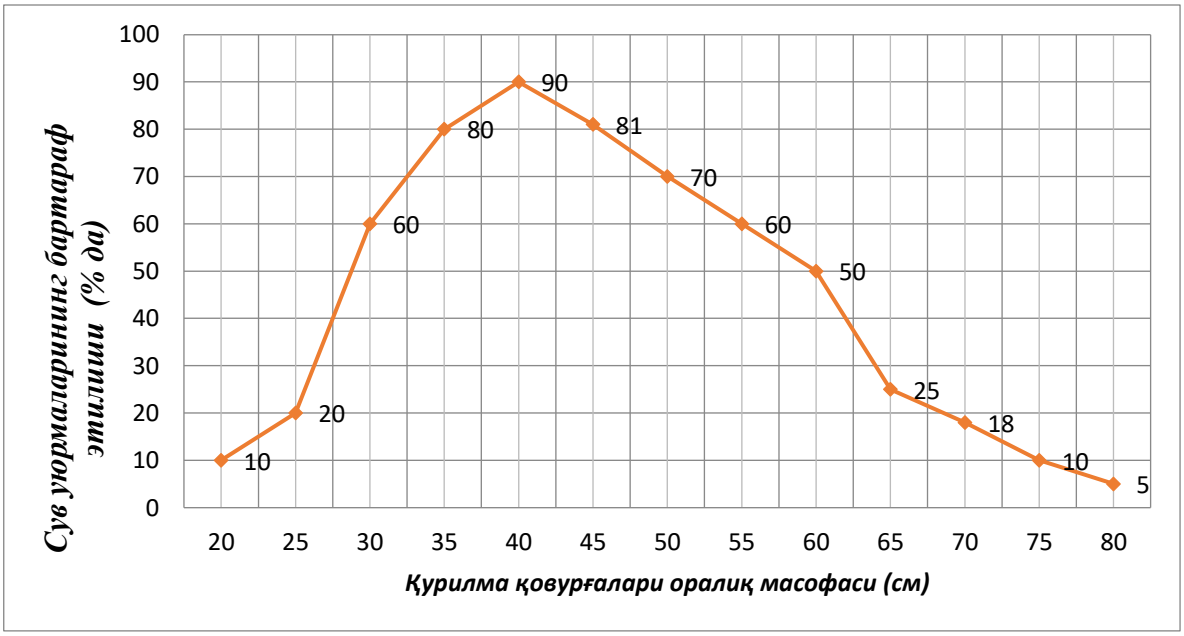

Figure 2. Graph to find cost-effective anti-flood fin spacing

Figure 3. Graph to find the cost-effective depth of a dewatering device rib

Whether these angles are large or small is determined by experiments, taking into account the size and shape of the vane chamber, the direction of flow and the direction of pump water consumption. Many years of experimental work carried out at the Jizzakh pumping station have shown that the water level in the vane chamber drops, and piles appear on top of the suction pipes in front of the walls of the diverter installed longitudinally in relation to the flow. It was observed that the direction of the flow of water in the water piles changed to the right and left.

The first version of this device was prepared and tested in the vanchamber of the Jizzakh main pumping station. Due to the elimination of accumulations that occurred when the water level fell below the norm, the operating modes of the pumping devices were regulated and their forced operation in the cavitation mode was prevented. This, in turn, ensures the extension of the resources of pumping devices.

Conclusions

1. Rapid change of the water level in the advance chamber of the pumping station and less than the norm leads to the formation of water piles in the advance chamber. Air entering the pump suction pipe together with the formed water lumps causes the pump device to operate in cavitation mode.
2. A special device was offered to prevent and eliminate water accumulations that occurred in the advance camera. Water distribution fins are installed on the device to ensure uniform water supply to the suction pipes. The devices installed in the device are placed at an angle to the direction of water movement and serve to eliminate the circular movement of water piles. By changing the distance between the wings of the device in accordance with the dimensions of the width of the water intake facility, it ensures uniform penetration of water into the intake pipes.

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