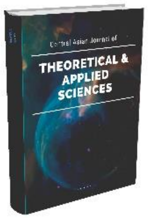

CENTRAL ASIAN JOURNAL OF THEORETICAL AND APPLIED SCIENCES

Volume: 04 Issue: 12 | Dec 2023 ISSN: 2660-5317
https://cajotas.centralasianstudies.org

Application of Micro-Hydroelectric Power Stations in Water Barriers using Siphon Pipes in Water Facilities

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Received 4th Oct 2023, Accepted 6th Nov 2023, Online 27th Dec 2023

Abstract: *The article discusses the issue of generating electricity using siphon water pipelines at water storage facilities. An improved safe method of using the potential energy of reservoirs in the production of electricity is highlighted. Water flow and energy indicators using the siphon method are analyzed and methods for effective use are shown.*

Keywords: *electricity, water resource, hydroelectric power station, siphon pipe, reservoir, consumption, power.*

Introduction.

The demand for organic fuels is increasing rapidly, but the resources of these fuels are limited. Fossil fuels such as oil, natural gas, coal and uranium are currently the basis of the world energy balance. However, the use of hydropower is economically efficient.[1]

In Uzbekistan, consistent work is being done on the formation of a unified system of management of water energy resources and the development of hydropower.

In Uzbekistan, there are few opportunities to build large hydroelectric power plants, but there are many opportunities to build small hydroelectric power plants and microhydroelectric power plants. There are many streams, water structures and reservoirs in Uzbekistan, which can be used to generate electricity using their flow energy and potential energy.

In particular, it is enough to build small hydroelectric power stations on the dams of water reservoirs.

It is possible to build small hydroelectric power stations on siphon dams while ensuring the safety of water facilities. By using siphon water traps, water traps located at the bottom of reservoirs reduce the strength of the butt of the water structure. Therefore, the siphon water catchment ensures the strength of the dam and makes it possible to use the reservoir water efficiently in terms of energy performance. For this purpose, a siphon pipeline construction scheme was developed (Fig. 1).

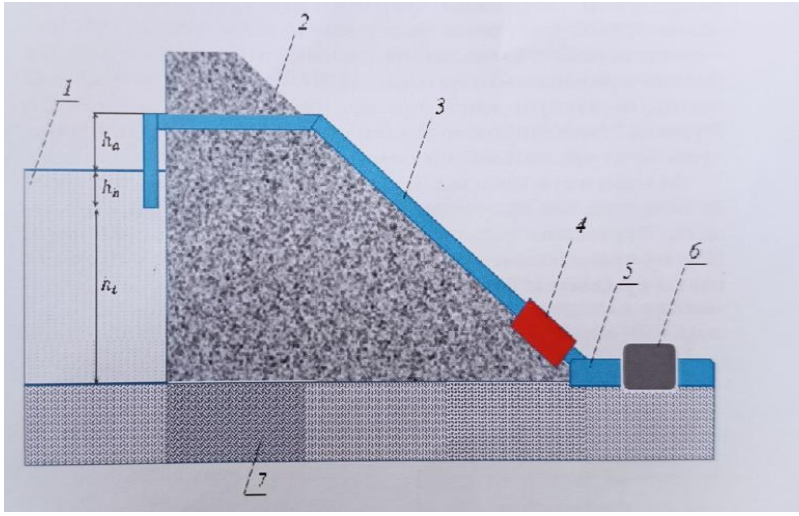

Figure 1. Technological scheme of obtaining electricity from reservoir water using an effective and safe siphon method.

1-water, 2-dam, 3-water transfer pipe, 4-turbogenerator, 5-discharge pipe, 6-primary water intake pipe, 7-soil, ht-water bottom height, hb- the length of the submerged part of the pipe, and the height of the pipe protruding from the water surface

The proposed siphon small HPP scheme works as follows:

Above the water level, the siphon pipe passed through the safety section of the dam is submerged at a depth hb below the water level, because there must be sufficient water pressure for constant supply. . To start the siphon water pipe, the air in the siphon pipe is sucked by the pump to create a vacuum, and the water movement is created and the pump is turned off. [2]

The water in the siphon pipe passes through the turbogenerator and drives the generator, resulting in the generation of electricity.

The consumption of water passing through a siphon pipe is determined by the following formula:

$$Q = \frac{\pi d^2}{4} \sqrt{\frac{2gH}{\lambda \frac{l}{d} + \Sigma\xi}}$$

where H- is the height between the upper and lower levels, which varies depending on the water level in the reservoir, d- the internal diameter of the pipe, l- the coefficient of hydraulic friction resistance.

$\lambda = 0.11 * (\frac{K_e}{d} + \frac{68}{Re})^{0.25}$ is found by the formula as follows.

Ke is the coefficient of equivalent unevenness of the pipe wall; d-the internal diameter of the siphon pipe; Re- Reynolds number.

According to the parameters defined above, we will determine the electrical power output that can be obtained through the proposed siphon system. We use the following formula to find the power.

$$N = g * Q * H * \eta_t * \eta_g$$

where N is the power generated in the generator in kW, H is the height between the upper and lower levels m, g=9.81$\frac{m}{sek^2}$- acceleration of free fall, s - useful work coefficients of turbine and generator, respectively.$\eta_t\ va\ \eta_g$

In order to find the height of the upper part of the siphon pipe from the water level in the reservoir, we determine the maximum height of ha by constructing the Bernoulli equation for the intersections of the water level and the upper part of the siphon. Experimental scientific research shows that for the stable operation of the siphon pipe system, it is required to be 8m. [3]

Analysis. Obtaining electricity through the proposed siphon system has the following advantages.

- receiving electricity in the water reservoir through an airless barrier;
- the potential energy of the water in the reservoir is used;
- dam integrity and strength are ensured;
- due to the high water intake level, the water content is clean, which prevents the erosion of the working parts of the turbine;
- if there is a malfunction in the water pipes, it is not required to stop work of other departments;
- it is possible to easily control the water level in the siphon pipe.

Summary. To use the potential energy of the water in the reservoir, a siphon pipe water barrier device has been developed, in this scheme it is safe and has many advantages because it is located above the level of the pipe.

By calculating the siphon method, the energy indicators of the flow were determined based on theoretical studies. The hydrostatic and hydrodynamic indicators of the siphon pipe were determined and the working condition of the system was analyzed.

The power of the turbine and generator was determined depending on the capacity of the siphon pipe, water consumption and pressure. Based on the obtained results, it is possible to control the working process by making graphs.

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