DEVELOPING METHODS OF USING WATER ENERGY IN IRRIGATION NETVORKS

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Annotation.
The article presents the results of research on improving the reliability of electricity for the local population through small and micro hydroelectric power plants, as well as providing electricity supply to settlements located in hard-to-reach places in the event of sudden or pre-planned outages in individual energy regions or consumer power networks. In particular, the scheme of micro HPP for the Sichankul collector was developed based on the hydrological regime of the stream, topographic data of the area.

Enter. More than 45 hydroelectric power stations are used to meet the national economy of the republic, including agriculture, for electricity. Their age is 30-40 years and more. These facilities are of strategic and vital importance as they generate cheap electricity. Today, the total installed power of power stations belonging to "Uzbekenergo" JSC is 14140 MW. Of these, 12,129 MW are due to thermal power stations and 1,878.7 MW are to hydroelectric power stations. Natural gas, fuel oil, and coal are used as fuel in thermal power stations.

All the energy capacities of Uzbekistan have passed their operational period's, and their further use may lead to a decrease in the stability and efficiency of power plants. Today, the level of deterioration of equipment and structures at these hydroelectric power plants has reached a limited level. In addition, in recent years, small farms have developed on the banks of the Kashkadarya and Bukhara canals, and due to land development around the canal and the river, climate change has led to a sharp decrease in precipitation, and on the other hand, a sharp decrease in the amount of flow in these water sources.

According to the decision of the President of the Republic of Uzbekistan No. PQ-2947 dated 02.05.2017, in accordance with the program of measures for the further development of hydropower in 2017 - 2021, implementation of modern and based scientific and technical solutions in the field of design and construction of large, medium, small and micro hydroelectric power stations, on this basis, the republic increasing the share of hydropower in the energy balance was defined as an important direction [2].

Research method. As a research method, development of a micro HPP scheme taking into account the hydrological regime of the flow, development of a method of using flow energy in the Sichankul collector using generally accepted laws in the design of hydrotechnical and hydropower facilities is considered.

Resilts and discussions. Small hydroelectric power stations are not particularly important in the development of the regional economy or in the energy system. But the expediency of their presence and constantly increasing their number is, first of all, the desire to attract renewable energy resources to the fuel-energy balance as much as possible to save fossil fuels and protect the environment [6]. Compared to the capacity of power plants in modern energy systems, which is currently measured in millions of kilowatt-hours, the share of small and micro hydroelectric power plants is small. Also, small and micro hydroelectric power plants cannot perform the same functions as large and medium hydroelectric power plants, that is, regulation of current and voltage frequency in the network of intersystem energy and energy flows, providing the function of system power reserve, etc. But small and micro hydropower plants can increase the reliability of electricity supply to the local population. In particular, it is a reliable system in the provision of settlements located in hard-to-reach places, and in case of sudden or pre-planned interruptions in the electricity networks of individual energy regions or consumers [1-8].

Brief description of Sichankol collector. Sichankol collector starts from Sultandag Lake. The length of the Sichankol collector is 5.0 km, the average water flow is 20 m^3/s, the average water flow is 1 m/s, and in the narrowing part it reaches 1.5-2.0 m/s [2]. The canal has a trapezoidal section, and the average annual flow is 160.05 million m3.

FIGURE2.VIEW OF SCHANKOL COLLECTOR

Table 1. Average monthly and average annual water consumption of Sichankol collector (m^3/s).

Years	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Year of construction
2015	1,07	0,95	1,36	1,13	3,49	2,63	2,37	3,18	1,47	2,02	3,08	10,7	2,79
2016	16,8	11,3	5,53	14,0	9,25	5,11	4,58	4,43	4,18	4,27	5,72	7,92	7,74
2017	16,7	13,2	5,40	5,57	5,34	5,95	6,36	4,12	4,62	4,89	6,42	5,77	6,99
2018	5,64	9,55	11,5	11,1	8,49	6,14	4,89	4,84	5,29	5,72	5,85	5,69	7,05
2019	5,53	5,14	6,59	6,74	6,19	4,54	4,56	4,71	4,14	3,92	4,04	4,62	5,08
2020	3,63	3,80	3,99	4,88	7,59	4,65	4,11	3,80	3,83	4,12	5,33	6,78	4,68
K.mont (5 year.)	9,87	8,78	6,87	8,68	8,07	5,80	5,37	5,01	4,70	4,98	6,08	8,29	6,86

Using this table, we will construct a water consumption hydrograph of the Sichankol collector.

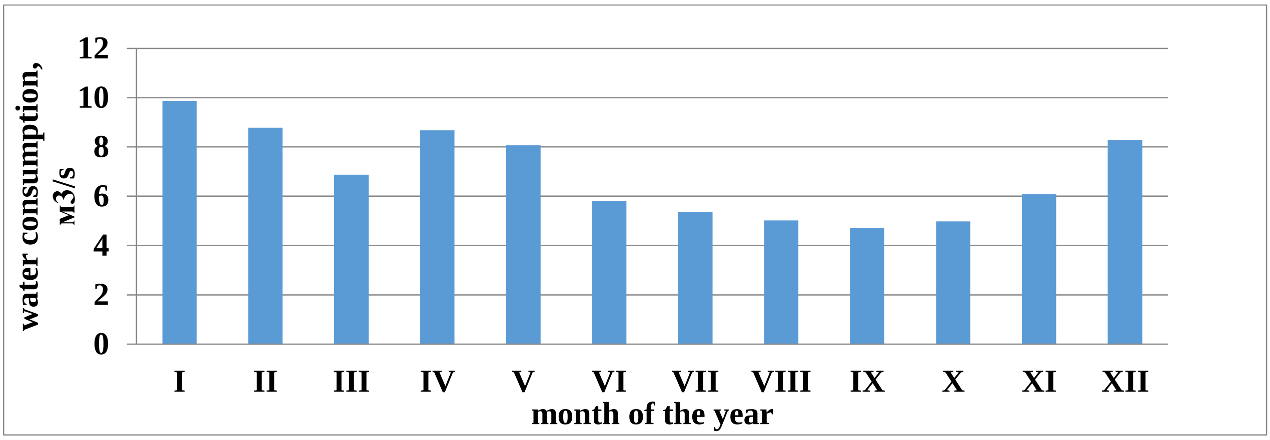


Figure 3. Average monthly and average annual water consumption hydrograph

Using these data, we propose to install the charxpalak scheme shown in Figure 4 in the narrowing part of the Sichankol collector. The proposed scheme can be used in objects with a water flow speed of 1.5-2 m/s and more.

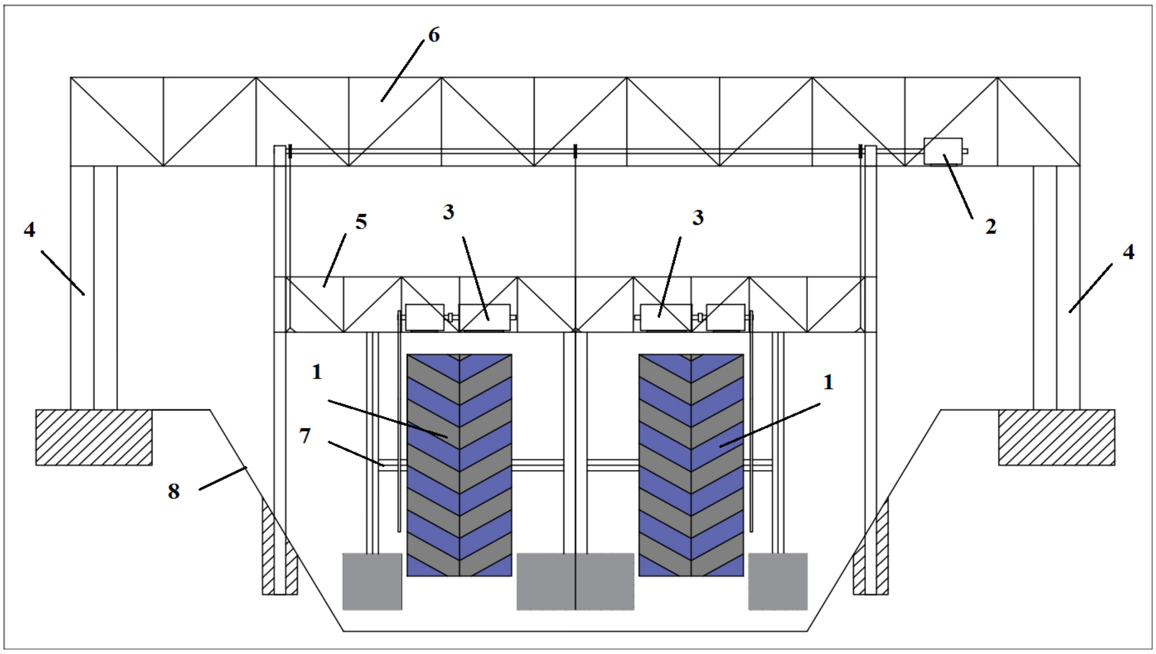


Figure 4. Micro HPP scheme proposed by the author: 1-wheel impeller (diameter 2 meters), 2-engine moving the wheel up and down, 3- generators, 4-supports, 5,6 farm, 7-wheel axle, 8 - the source.

We evaluate the efficiency of the proposed scheme in Figure 2 using data from the Sichankol collector.

Taking into account that this device works only due to the kinetic energy of water, its power is determined as follows [9-12].

$$N = 120 \cdot v^3 \cdot D^2 \cdot \eta_ч, \text{vatt}$$

Here: gde N is the power of the waterwheel, watt, v is the speed of the water flow, $v = 2$ m/s, D is the diameter of the working wheel of the waterwheel, m, $D = 2$ м, $\eta_ч$ – the efficiency of the waterwheel is 40%.

$$N = 120 \cdot 2^3 \cdot 2^2 \cdot 0{,}4 = 1\,552 \text{ ватт} = 1{,}552\ kw$$

We determine the annual average electricity energy using the following formul

$$Э = N \cdot t, \quad \text{kwh}$$

Here N - waterwheel power, kw, t – time, hours

$$Э = N \cdot t = 1{,}552 \cdot 365 \cdot 24 = 13\,315\ kwh$$

These calculations have been calculated for single-water wheeled lathes. The capacity of the device may change depending on the number of worker 0wheel, diameter and speed of the water flow [7-12].

In the presence of hydrometric monitoring data of sufficient duration, the determination of the calculated hydrological characteristics is carried out by using the analytical functions of the probability distribution of the annual increase.

Empirical curves for annual excedance probability distributions were constructed in probability bins. The type of the probability box is chosen according to the accepted analytical probability distribution function and the resulting ratio of the asymmetry coefficient Cs to the coefficient of variation Cv. The parameters of the analytical distribution curves - the average long-term value, the coefficient of variation and the ratio of the coefficient of asymmetry to the coefficient of variation Cs - are determined by maximum likelihood from the hydrometric series of observations of the considered hydrological characteristic. method or method of moments [4-5]

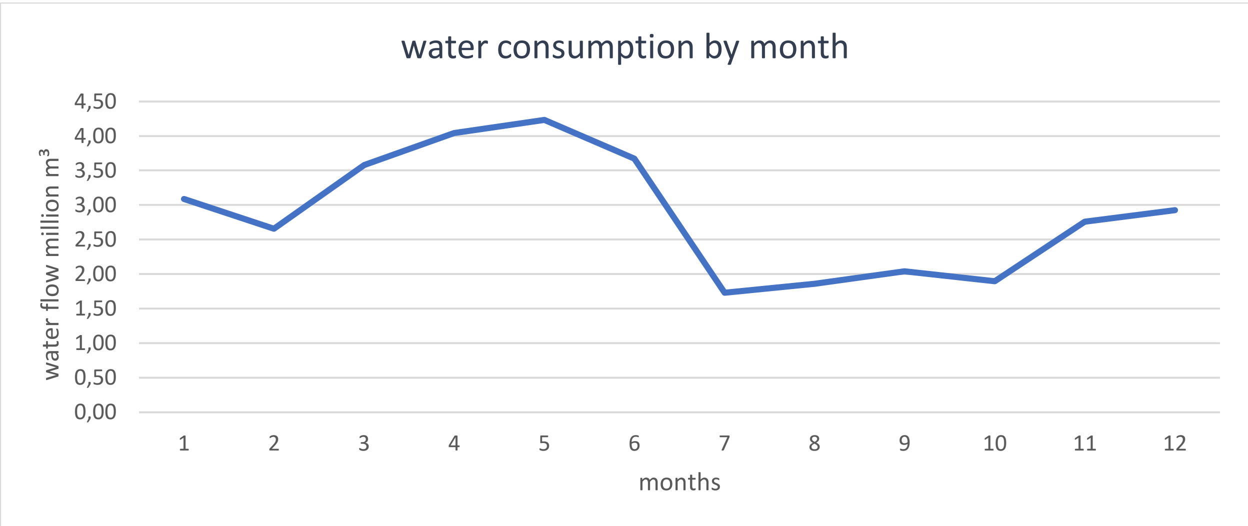
$$C_v = \sqrt{\frac{(1-k)^2}{n-1}}; \qquad c_s=2c_v$$

Here k is the modular coefficient of the considered hydrological characteristic determined by the formula

$k=Q_{cp}/Q_0$

Q_0 is Arithmetic average (long-term average) value of water discharges determined by the formula according to the number of years of hydrometric observations.

№	Q,м³/s	Cv	K
1	3,09	0,022692	1,074419
2	2,65	0,074485	0,924739
3	3,58	0,122916	1,247038
4	4,04	0,142876	1,407666
5	4,23	0,084045	1,473868
6	3,67	0,119764	1,278746
7	1,73	0,106422	0,602787
8	1,86	0,087302	0,647038
9	2,04	0,10222	0,710453
10	1,90	0,011556	0,660976
11	2,76	0,005778	0,961672
12	2,93	0,301511	1,019164



When choosing a place to build a hydroelectric power plant, first of all, the potential resources of different sections of the river are assessed. The potential energy resources of rivers are the power and energy of the flow. Before determining the potential energy resources of each river, it compiles its water cadastre, which contains the available preliminary data on the general description of the river, hydrometry, hydrology, topography, etc.

The flow in the river increases as it approaches the mouth along the entire channel, the lateral flow of rivers and streams flowing into the river, precipitation, etc. Therefore, the average value between parts 1 and 2 is used to get its approximate value in the river section:

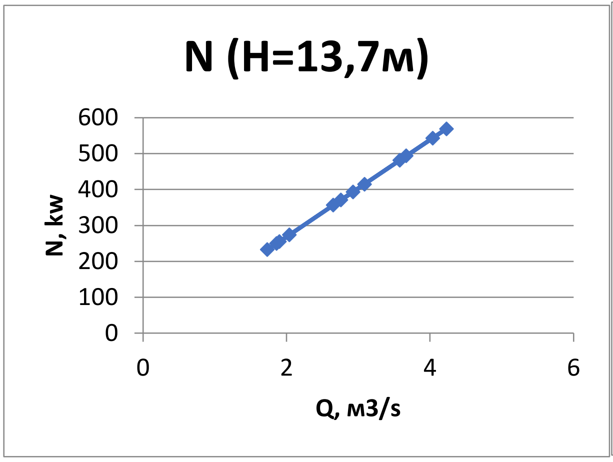
$$Q1\text{-}2=\frac{Q_1+Q_1}{2}\,M^3/S$$

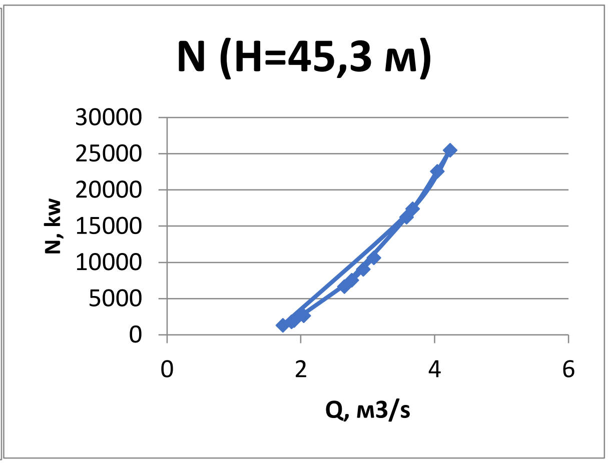
After some simplifications, Bernoulli's equation can be transformed into a power equation and takes the following form:

$$N_{1-2}=\frac{Э_{1-2}}{t}=pgQH, VT$$

$Э_{1-2}$ - energy difference between two sections 1 and 2,

if: $p=1000\frac{kg}{m^3}$, $g=9{,}81\frac{m}{s^2}$





In this regard, we determined the optimal section, the length of sections, so that pressure, flow and power values can be calculated.

Based on all the received information, it was concluded that certain plots have the greatest energy potential and can be used for the construction of MGES.

Channel parameters in MGES construction plan

The name of the ditches	**Pointers**
South ditch – sichankol settlement	**L=5.0 км Q=15 м^3/s**
Construction part of Dengizkol ditch	**L=29.5 км Q=34.0 м^3/s**
GVST	**L=99.7 км Q=74 м^3/s**
GYUKK	**L=300.0 км Q=25 м^3/s**

PRESENTED EVENTS

Stages	**Naming**	**Indicators**
I	**Bukhara central ditch from parsankol to Madami low part**	**L=128,2 км, Q=25,0 м3/S**
IV	**From the sea, lake up to GVST of part**	**L=16,0 км, Q=25,0 м3/S**

V	**From sichankol up to sea, lake, of part**	**L=22,0 км, Q=35,0 м3/S**
VI	**From the southern ditch, tashlama up to sichankol**	**L=5,0 км, Q=60,0 м3/S**

The water level difference between Sichankol and Dengizkol lakes is approximately 60m. Several options were considered to dissipate the energy in this part of the wighway:

-reinforced concrete flow fast, a combination of flow fest and two waterfalls.

- 40-60 million per year through the use of water energy for the development of electricity. Two small HPP construction options have been developed, which will ensure the production of electricity per kWh.

MAIN CONCLUSIONS

1. The proposed water-wheel device is simple and economically low-cost, and can be installed in hydrotechnical structures with a water flow speed of 1.5-2 m/s and more.
2. Waterwheel working wheel can move up and down depending on the water level, allowing the device to be used even in low water periods.

Since this device belongs to the type of micro hydroelectric power stations, it is appropriate to increase the reliability of the supply of electricity to the local population, to prevent sudden or pre-planned outages in the electricity networks of consumers, and to provide electricity to settlements located in hard-to-reach places.

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