

River Energy Resources for Production of Electricity in Agriculture

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Abstract: The analysis on the use of energy resources of the rivers for electricity production was performed. Design of a transportable hydroelectric power station for agriculture was presented and a principle of its work was shown.

Key words: Water • Sources of energy • Hydroelectric power station • Hydraulic power • Electric power • Capability

INTRODUCTION

Currently, the actual task is the use of energy from renewable primary energy sources, which include energy, water resources, rivers (hydropower). This type of energy has its background in solar energy. The sun evaporates the water of rivers, seas and oceans, which is then in the form of rain falls on the entire territory of the globe [1-3].

It has been estimated that the planet Earth has reserves of water in an amount of 1018 tons and only 1/2000 part of a year are involved in the cycle. Every year from all continents to the oceans drain about 40 thousand km³ of water and only 15% of this amount of water can be used for electricity production [1].

In 1950, the share of hydropower plants (HPP) accounted for about 40% of all electricity generated in the world. By 2000, hydro began to develop only 23 % of electricity [4].

Now there are more than 70 hydroelectric power plants (HPP), the power of which ranges from 1, 000 MW to 10, 000 MW and more than 1 million power plants with capacity of several kW.

The first small hydroelectric power (SHP) in the world began to build in the late 19th century.

In Russia, in the period from 1945 to 1950, a significant attention was paid to the development potential of small rivers and during this period we have built more than 6000 small hydropower plants with a total capacity of 500 kW. The main disadvantages of small hydropower plants (SHPP) can be attributed to the high costs of labor exploitation of power plants of this type that led to the fact that a large part of earlier constructed small HPPs in the 60s were liquidated or mothballed.

In recent years, the difficulties associated with increasing consumption of non-renewable primary energy sources in the form of oil, natural gas and coal and a significant rise in price has pushed scientists and researchers to the search for progressive and economically reasonable technical solutions for small hydropower plants (SHP), aimed at improving their efficiency and competitiveness. There is no doubt that HPP and SHPP can serve as a reliable provision of electricity to remote consumers.

According to [1] at the beginning of the 80s on balance of the Ministry of agriculture of the USSR consisted of 70 small hydropower plants with a total installed capacity of 10100 kW. The average capacity of one small hydropower plant amounted to 143 kW. These small hydro power (SHP) was developed to 0.01 % of the electricity consumed by the needs of the rural economy.

On the basis of summarizing the technical and economic advances for the construction of small hydropower plants, hydropower, agriculture energy, formulate the principle the main directions in the construction of hydroelectric power for farming needs. All the existing hydroelectric plants of small capacity can be divided into stationary and transportable. This classification is introduced with respect to the types of consumers. The most effective is the use of the transportable hydroelectric power plants due to their mobility.

Figure 1 presents the scheme of the transportable hydroelectric power station [2].

The principle of operation of the transportable hydroelectric power station the next. 1 water enters the water intake device 2 and then, moving through the

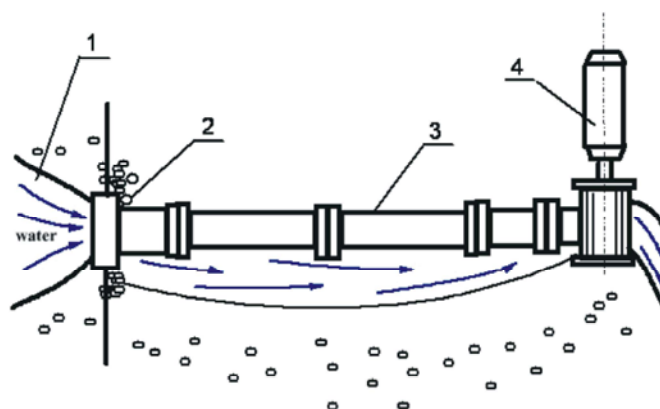


Fig. 1: Diagram of the transportable hydroelectric power station [2]
1 – first; 2 – the water intake; 3 – discharge hose; 4 – power unit

pressure sleeve 3 is supplied to the turbine 4. Turbine 4 is connected with electric current generator which generates electric energy used for the needs of consumers. If necessary, the turbine can be used to supply water to consumers.

Unit 4 can be upgraded and used for converting hydraulic energy into mechanical energy. In recent years, from mechanical units, the main application got hydraulic motors to drive the mills.

Accordingly, the transportable hydroelectric power plant of small capacity can be used for the production of electric or mechanical energy and for the needs of water supply. This power plant may be used in the territory of the Republic of Tatarstan. The main advantages of the SHPP are mobility and easy maintenance.

REFERENCES

1. Berkovsky, B.M. and V.A. Kuzmanov, 1987. Renewable energy in the service of man / by B. M. Berkovsky. M.: Nauka, 1987.
2. Korablev, A.D., 1988. Energy Savings in agriculture / A. D. Korablev. M.: Agropromizdat, 1988.
3. SNIP 2.01.01 – 82. Construction climatology and Geophysics / Russian Ministry of construction. – M.: GP BSC, 1996. pp: 140.
4. Troitsky, A.A., 1986. Technical progress of energy of the USSR / A. A. Troitsky under the editorship of P. S. Neporozhny. M.: Energoatomizdat.