CHARACTERISTICS AND IMPORTANCE OF MICRO-HYDROPOWER PLANTS DESIGNED FOR LOW-PRESSURE FLOWS

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Abstract: Micro-hydroelectric power plants (micro-hydropower plants) are power generation systems optimized for operation in low-pressure flows. This technology is designed to operate in small and medium-sized rivers or canals. Micro-hydropower plants are important as an efficient use of natural energy and an environmentally friendly source of energy. In this article, we will provide detailed information about micro-hydropower plants operating in low-pressure flows**.**

Keywords: Microhydroelectric power plant, energy, low pressure, flow, water, wheel, number of revolutions.

Login. A micro-hydroelectric power plant is a small-scale hydroelectric power plant. Its capacity is usually less than 100 kW, which makes it suitable mainly for small streams, rivers or artificial canals. The main advantages of micro-hydroelectric power plants are that they do not take up much space, are easy to install and operate, and are characterized by low energy production costs.[1]

Low-pressure streams are large, non-moving water streams. These streams are often found in small rivers or canal systems. Due to their low pressure and slow flow, these types of streams do not provide the economic benefits that large hydroelectric power plants can provide, but they are excellent options for micro-hydroelectric power plants.

Low-pressure streams have the following characteristics for micro-hydroelectric power plants:

Low velocity: Low flow velocity is suitable for micro-hydropower plants, as these systems operate at low power.

Continuous energy production: The flows are constantly available, which ensures stable energy production.

Environmental friendliness: Generating energy through the natural flow of water has minimal impact on the environment, as micro-hydropower plants are considered an environmentally clean energy source.

Today, scientists who have made a significant contribution to the development, preparation, improvement of efficiency and implementation of microhydroelectric power plants operating on low-pressure water flows include Harald Muller (Great Britain), Danilo Capecchi, Paolo Cavagnera, Yemanuyele Quaranta (Italy), Liye Jasa, Ardiono Priyadi (Indonesia), Farid Ullah, Adeyel Akhmad (Pakistan), R.P. Saini

(India), M. Danny (Canada), K.F. Kostina, L.P. Mikhailova, A.D. Obozov, S.G. Obukhov, P.P. Svit, O.A. Guseva, K.V. Barkov (Russia), L.N. Gobadze (Georgia), V.M. Ivanov, T.Yu. Rodivilina, A.P. Maslov, B.A. Kartanbayev, K.A. Jumadilov, A.A. Zazulsky (Kyrgyzstan), M.M. Mukhammadiev, B.U. Urishev (Uzbekistan) and others can be included.[5].

Methods. The founder of theoretical and practical developments in low-power hydroelectric power plants on free-flowing waters, K.F. Kostina, in 1939, developed an experimental model of a propeller turbine with a diameter of 1.5 m in collaboration with the “Elektrosila” enterprise (Fig. 1).[4]

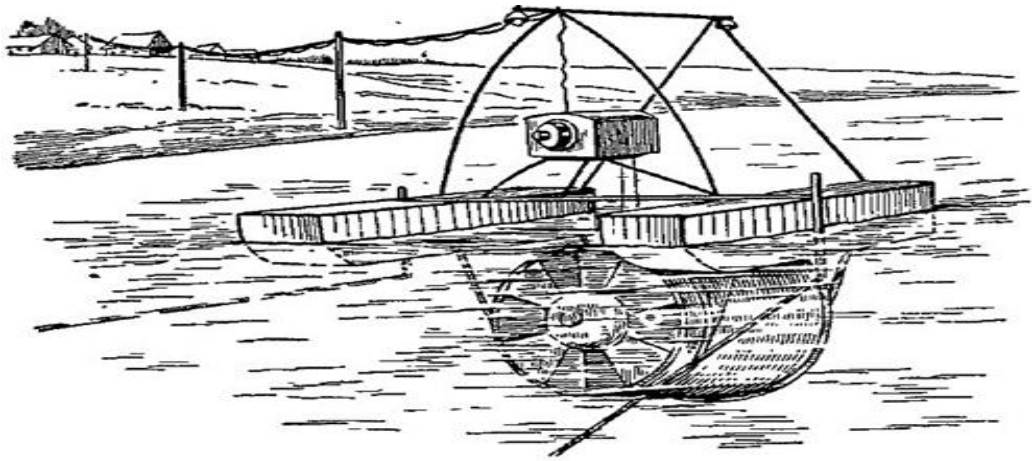

Figure 1. Construction by K.F. Kostina, made at the “Elektrosila” enterprise

This design was developed for rivers, it is adapted to float on water. Its disadvantages are:

- the difficulty of the operation process, that is, violation of technical safety rules;
- the possibility of water weeds and various wastes from the water flow getting entangled in the blades;
- the need for water basins with a depth of at least 2 meters and a width of more than 3 meters.

In 1945, engineer S.P. Klikov created a small low-power propeller hydropower plant design operating in free-flowing waters (Fig. 2).[3]

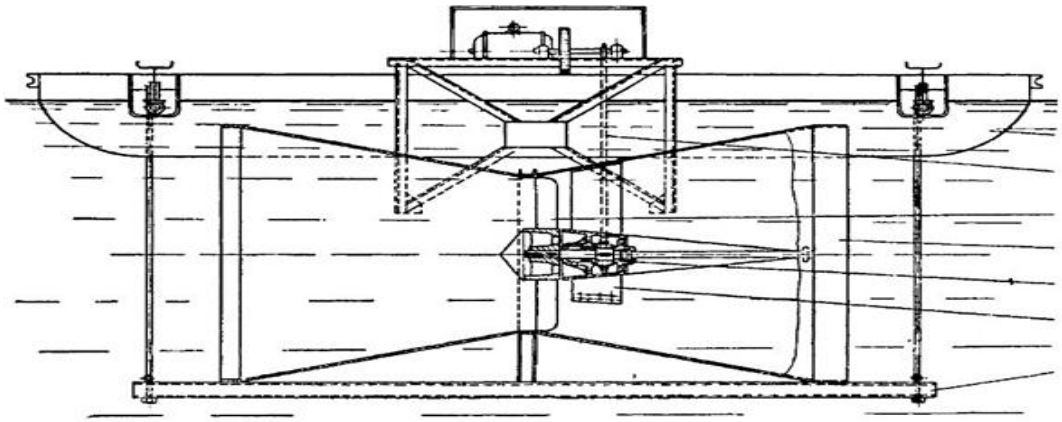

Figure 2. Construction created by S.P. Klykov

This structure was also designed for rivers, and it was installed on the water, fastened to both banks and under water with metal cables. It also has the disadvantages of the K.F. Kostina device. The advantage of the S.P. Klykov device is that it is fastened on the water with cables

One of the scientists conducting scientific and practical work on microhydroelectric power plants operating in low-pressure water flows in Europe is Gerald Muller. The designs of microhydroelectric power plants designed for low-pressure water flows developed by the author have been studied (Figure 3) [2]

a) b)

a) catamaran-shaped microhydroelectric power plant, b) rotary blade microhydroelectric power plant

Figure 3. Gerald Muller's microhydroelectric power plant designs for low-pressure water flows

Micro-hydropower plants have great potential for low-pressure flow. This technology can be very useful for powering small and medium-sized networks, especially in developing regions. Micro-hydropower plants, which can be used on artificial waterways, small rivers and canals, offer a new and environmentally friendly way to generate energy.

Conclusion: Micro-hydroelectric power plants are efficient and environmentally friendly energy generation systems suitable for operation in low-pressure streams. These technologies are effective in meeting small energy demands and have minimal environmental impact. As a new method of energy generation, the widespread use of micro-hydroelectric power plants can play a major role in ensuring environmental sustainability..

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1. Кажинский Б.Б. Свободнопоточные гидроэлектростанции малой мощности // Государственное энергетическое издательство, Москва. 1950 с.76

2. Muller G.& Kauppert K. Old water mills – Britain‘s new source of energy? // Proceedings of the Institution of Civil Engineers-Civil Engineering, 2002, 150, No. 4, 178–186
3. Кусков А.И. Разработка и исследование мобильной гидротурбинной установки для энергообеспечения и водоснабжения сельскохозяйственных объектов // Кандидатская диссертация. Москва. 2015. с.115
4. Müller G., Wolter C. The breast s hot water wheel: design and model tests / Proc. ICE Eng. Sustain ability , Vol. 157, Issue E S4, 2004, 203 – 212
5. O‘G‘Li, I. M. M. (2022). QUVVATNI KUZATISH VA DIAGNOSTIKA QILISH UCHUN TIZIMDAGI MAVJUD TRANSFORMATORLAR. Talqin va tadqiqotlar ilmiy-uslubiy jurnali, 4(4), 66-69.