Analysis and Research on the Power Generation Numerical Model of River Dynamics and Fluid Dynamics

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Abstract. With the development of economy and the improvement of human living standards, the demand for energy will only continue to grow. As one of the main renewable energy sources, River energy has made great progress. The equipment of river kinetic energy generation is different from that of conventional large and medium-sized high dam hydropower stations because of the different energy conversion modes. If the technology and equipment of Gaoba Hydropower Station are mature, the river kinetic power station system and its series technology and equipment are still in the primary stage of development. Different water flow generation methods use different platform positioning systems. In order to collect unstable water flow energy, the water flow power generation device is required to convert the mechanical energy in the water flow energy into electricity that can be used by two-stage energy conversion. Based on the fluid mechanics analysis, this paper determines the factors related to the energy conversion efficiency of the primary conversion device and the relationship between the influencing factors. I hope that I can make some contribution to the development of renewable energy.

1. Introduction
Energy is an important material basis for economic and social development, and human development is accompanied by the emergence of high-quality energy and the use of advanced energy technologies. With the development of economy and the improvement of human living standards, the demand for energy will only continue to grow. As one of the main renewable energy sources, River energy has made great progress [1]. With the support of relevant high-tech support, River energy application technology is becoming more and more mature, which shows a bright future for human beings to make full use of river energy in this century. There are two ways of utilizing river water energy [2]. The utility model discloses a method for converting river water potential energy into mechanical energy or electric energy through dam construction, water storage and hydroelectric generating units. Another type of hydraulic mechanical device is installed in the river channel to convert the kinetic energy of the river water into the kinetic energy or electrical energy of the mechanical motion [3]. River flow energy generation equipment is different from conventional large and medium-sized high-dam hydropower stations because of the different ways of energy conversion [4]. The new river energy generating device can better adapt to the river's environmental characteristics, and can have good system performance, simple and reliable structure and low construction and operation and maintenance costs. This is the main goal of the article.
The energy-receiving device of a conventional hydropower station is a water turbine. It is divided into high, medium and low head turbines according to the level of the water head in the dam. There are already a series of products adapted to different head heights. Since the industrial revolution, global energy consumption has increased dramatically [5]. Greenhouse gas emissions have led to increasingly severe global climate change, and the sustainable development of human society is seriously threatened. In order to collect unstable water flow energy, the water flow power generation device is required to convert the mechanical energy in the water flow energy into electricity that can be conveniently used by two-stage energy conversion [6]. If the technology and equipment of Gaoba Hydropower Station are mature, the river kinetic power station system and its series technology and equipment are still in the primary stage of development. It requires a lot of manpower and material input, and is technically challenging. Determining which factors are related to the energy conversion efficiency of the primary conversion device, and how to improve the energy conversion efficiency are the key issues in the research of the primary conversion process.

2. Materials and Methods
The water flow river energy generating device is suitable for river flow energy application in principle, and the characteristics of the river structure and water flow should be fully considered in the design. In a device having a three-stage energy conversion portion, the primary energy conversion device directly interacts with the water flow, converting the captured water flow energy into mechanical energy of the device, or raising the water level to increase the potential energy of the water. The water wave power generation device utilizes the interaction between the pendulum plate and the water flow, and the pendulum plate swings around the pendulum axis under the action of the water flow. The mechanical energy of the water flow can be converted into a swing shaft, and the generator is used to generate electricity through a hydraulic device connected to the swing shaft. The device consists of a water chamber swing mechanism, an electromechanical conversion mechanism, and a power distribution mechanism [7]. The generator is a linear generator parallel to the slideway. The stator is fixed on the carrier and the rotor is fixed on the pendulum. As a first-order energy conversion device, the current is placed on the seabed and acts directly with the current. According to the current theory, the current swings back and forth under the action of the current force. Or a rotating generator is selected to convert the linear motion of the pendulum body into the rotating motion of the generator rotor through gear rack or gear train.

In order to test the performance of the device, it also includes load system, power conversion system, data acquisition and analysis processing system. The general equipment of this kind of system is huge, and it has high requirements for seabed geology. It is difficult to transport and construct. On the other hand, the system greatly limits the degree of freedom of motion of the floating body, which makes the horizontal force of the pilot pile very large and easy to be destroyed. The pump body is composed of a suction chamber and a pressure chamber [8]. The inlet of the suction chamber and the outlet of the pressurized water chamber are a water pump inlet flange and an outlet flange, respectively, for connecting the inlet and outlet pipes. The function of the suction chamber is to introduce a flow of water into the impeller and provide the desired flow pattern to the impeller [9]. The function of the pressurized water chamber is to collect the liquid flowing out of the impeller and direct the liquid flow to the outlet. In the experimental study, the blade load, angle of attack and swing displacement were measured, the power output of the generator was measured, and the water flow environment was recorded. The experimental equipment includes circulating water tanks, data acquisition and analysis processing systems, angular displacement sensors, stress and bending moment measurement patches, and power supply. Figure 1 shows the schematic diagram of the pump body.
3. Result Analysis and Discussion

In the process of water flow development, combined with cost considerations, different water flow generation methods use different platform positioning systems. With cost as the primary condition, vertical guided piles are generally not used. A shaft is a mechanical part that supports a rotating part and rotates therewith to transmit motion, torque or bending moments. In this work, we use stepped shafts for positioning the mounted parts. Different heights of the shoulders can limit the movement or movement tendency of the parts on the shaft along the axis, prevent the parts from slipping and reduce some work. The influence of the axial pressure generated by the part on other parts [10]. It is necessary to determine the balanced position of the blade, i.e. the displacement zero. The tensioned mooring system is flexible in horizontal direction and rigid in vertical direction. Compared with catenary mooring system, floating body has high stability in water flow and strong ability to resist adverse environment. The sensor coefficients of the fixed angle displacement of the pendulum can also be adjusted quantitatively. Water flow can be destructive. In order to improve efficiency, water flow energy devices often need to be deployed where water flow is the largest, which is a challenge in itself. Figure 2 shows the structure of the rotor.

![Figure 2. Structure of the rotor part](image)

1 is the rotor, 2 is the round nut, 3 is the driving impeller, 4 is the deep rough ball bearing, 5 is the water throwing ring, 6 is the static ring, 7 is the moving ring, 8 is the centrifugal pump impeller.

It is reasonable to use catenary mooring system for power generation devices which need multi-degree-of-freedom motion and can collect water flow energy in multiple directions. Capacitance device is an important component of flow river kinetic energy generation device. Its hydrodynamic performance and power characteristics directly affect the power output of the whole power generation system. Because of the random fluctuation of water flow, the output power of water flow power generation device is unstable, which naturally becomes one of the key problems in the design process of water flow power generation device. The mechanical shaft of the impeller is coupled with the gear...
When the impeller is mechanically rotated, the low speed gear rotates, and the high speed gear meshed with the low speed gear also begins to rotate. The existing diversion irrigation pump has a submersible pump, but the prime mover of the pump is a motor, which consumes a large amount of electric energy if driven for a long time. Compared with the submersible electric pump, the device uses the flow kinetic energy to drive the impeller to rotate, thereby driving the pump to rotate to achieve the purpose of diversion irrigation.

4. Conclusion

The energy input of the existing water potential pump is the potential energy of water, energy saving and environmental protection, and can effectively utilize the energy of the water itself. However, the pump has a large geographical limitation, requiring a certain drop in the flow of water and sufficient flow. In engineering applications, in order to capture more water flow energy, not only the number of blades and the way of changing the blades, but also the size of the blades is increased. The development of new energy is a breakthrough in solving the current energy crisis. As one of the hot technologies in the field of new energy, river fluid dynamics power generation technology is an area with far-reaching significance and prospects. Because the blade load is fluctuating, the blade vibration can not be ignored when the device is large-scale. Vibration not only brings adverse effects on the structure, but also affects the hydrodynamic characteristics of blades. River kinetic energy is an inexhaustible and inexhaustible natural energy, and its reserves are enormous. The device uses river kinetic energy as energy and has zero power consumption. Siphons can be used to meet the requirements of harsh environment. Through the analysis of economy and energy saving, the pumping irrigation device based on river power has broad application prospects.

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