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A NEW WAY OF GETTING ELECTRICITY

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Abstract. *In this article, the methods of obtaining electricity by installing small water generators in the water supply system are studied.*

Keywords*: Dare rotor, stator, blade, turbine, frequency, pressure drop, angular velocity, kinematic viscosity, energy characteristic.*

НОВЫЙ СПОСОБ ПОЛУЧЕНИЯ ЭЛЕКТРОЭНЕРГИИ

Аннотация. *В данной статье изучены способы получения электроэнергии путем установки в системе водоснабжения малых водогенераторов.*

Ключевые слова: *ротор Дэре, статор, лопатка, турбина, частота, перепад давления, угловая скорость, кинематическая вязкость, энергетическая характеристика.*

INTRODUCTION

The fuel energy complex is the largest consumer of energy resources. In 2013, 400 mln.t for the development of electricity in European countries. t is the conditional fuel consumption, which is almost twice as much as the consumption in the metallurgical industry. Today, 10% of the produced gas is used for natural gas transportation, and 9% of the produced energy is used for electricity transmission. The development of energy-efficient methods in the fuel-energy complex and in the first place in the production of electricity is one of the urgent problems.

MATERIALS AND METHODS

Getting electricity is a problem in the world today. Currently, there are several ways to get electricity: thermal power plants, nuclear power plants, hydroelectric power plants, and the most advanced solar power generation today. The recommended method is to obtain electricity from the water supply system. We know that water pressure and velocity are high in main water pipes. This water is always moving and with the help of a turbine it is possible to convert mechanical energy into electrical energy. A small amount of electricity can be obtained by placing small water generators in these places.

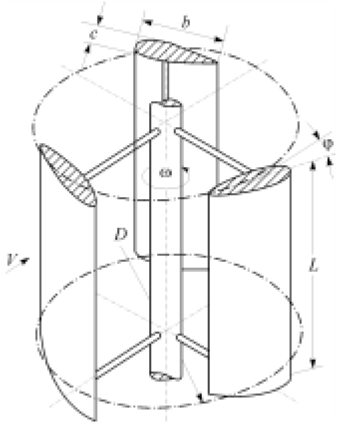
RESULTS

Hydroelectric power station (HPS) converts the kinetic and potential mechanical energy of water into electrical energy. The power of the hydroelectric power station is determined using formula 1:

$$P = 9.1 * QH\eta \, , kVt \qquad (1)$$

Here Q-water consumption, m3/s; H-water pressure, m; - UWC of the hydroelectric power station.

The faster the turbine rotates, the higher the frequency of the electricity. There are several types of turbines, these are; Pelton turbine, Tugro turbine, Bank turbine, Kaplan turbine, Francis turbine. 4 The structure, operation and UWC of each of these turbines are different from each other. But these pipes cannot be used in the water supply system, because the resistance of these turbines is very high, which in turn leads to an increase in local resistance and pressure loss in the water. But the Darie turbine is an exception, the resistance of this turbine is 35-45% less than the others, so it is appropriate to install such a turbine inside the water supply pipeline. (Fig. 1) or gas) depending on the flow. The main parameters are described in Figure 1. This picture shows a Dar'e rotor with 3 blades.3.[3]



1- figure.

Here L,b,s are the length, width and thickness of the shovel. D=2R is the diameter of the rotor. ω is the angular velocity. V is air (liquid or gas) velocity.

Constant parameters z= ωR/V - speed of the rotor, λ=L/b is the ratio of rotor length to width, nb is the number of blades in the tier, s is the filling coefficient, φ is the turning angle of the blade, Re= ωRb/n is the Reynolds number, n is the kinematic viscosity coefficient.

The main energetic characteristic of the rotor depends on the flow of air (liquid or gas) CN and the acceleration of the rotor z. In air power or water power, the useful power depends on the flow energy coefficient N, which depends on the speed of the air flow power Nf.

$$C_N=N/\ N_f\ \ N_f=\rho V^3S/2, \qquad (2)$$

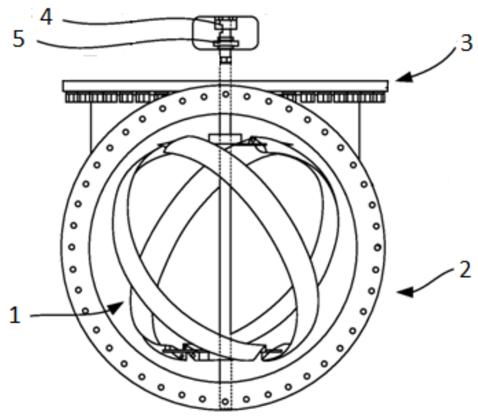
Here S=2RL, r is air (liquid or gas) density. Taking into account (2), the useful power can be determined as follows:

$$N=C_NN_f=\rho V^3SC_N/2 \qquad (3)$$

The same power represents the aerodynamic moment M, the rotating rotor and the angular velocity N=Mω. Therefore, the aerodynamic moment can be written from formula (2) and (3) as follows.3

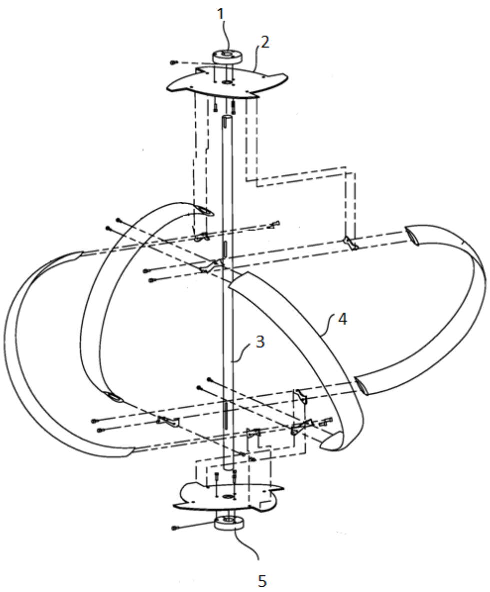
$$M=C_nN_f/\omega=\rho V^3C_N/2\ \omega \qquad (4)$$

To install this rotor in the water supply network, i.e. inside the pipe, we use a rotary (twist) rotor. The appearance of this rotor is illustrated in Figure 2.



2-figure.

Here is the 1st screw rotor blade, 2nd pipe, 3rd rotor housing, 4th gear, 5th clamp. The length of the shovels depends on the diameter of the pipe. The shovels are placed by turning 180 degrees relative to each other (Fig. 3).



3-figure.

Here, 1 and 5 are the compactor, 2 is the part where the shovels are fastened, 3 is the rotor, and 4 is the shovel.

DISCUSSION

The placement of the blades as above does not affect the direction of movement of the water. The cross-sectional surface of these shovels is rectangular (Fig. 4a). In order to reduce the resistance of the blades to water and increase the power of the generator, we change the cross-sectional surface of the blades to the shape of Fig. 4b.

а) б)

4-расм.

The geometric calculation of the cross-sectional surface of the shape we recommend is determined using the following formula 5.[2]

$$y = c\frac{t}{0.20}\left[0.2969 \times \sqrt{\frac{x}{c}} - 0.1260\left(\frac{x}{c}\right) - 0.3516\left(\frac{x}{c}\right)^2 + 0.2843\left(\frac{x}{c}\right)^3 - 0.1015\left(\frac{x}{c}\right)^4\right] \quad (5)$$

Here c is the length of the shovel, x is the value of the x coordinate axis depending on y, y is half the thickness of the shovel at point x, and t is the maximum thickness of the shovel along the section length.

Research shows that the advantage of such a cross-sectional area is that the angular speed of the rotor increases by 5% and the power generation increases by 3%.

CONCLUSION

For example, if the speed of water in a pipe with a diameter of 500 mm is 1.3 m/s, and the pressure of water in the pipe is 0.17 MPa, the power of one such power plant will produce 45 kW of electricity as a result of calculations. If we combine several such devices, we can get 1-2 MW of electricity without harming the environment.

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