American Journal of Science and Learning for Development

ISSN: 2835-2157
Volume 2 | No 11 | Nov - 2023

Basic Requirements for Renewable Energy Source Generators

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Abstract: In this article, as the world develops, people's lifestyle is improving and changing. This development naturally requires a lot of energy. Compared to the past, a very large number of mechanisms that were driven by manual labor in the past are now powered by electricity. In addition, information and communication technologies, which are entering our lives every year, have given us detailed solutions to many problems in our life.

Key words: Development, naturally abundant energy, information and communication technologies, mechanical energy.

Introduction

It is desirable to use a mechanical energy storage device to store low-power energy flows in different streams that can provide all mechanical energy. Such mechanical energy sources can be used to draw down water from small reservoirs, and from the flow of water in canals or wind current, even as a sports trainer for humans, to obtain electricity. Of course, the conditions of the environment are studied in depth. Windy days in the area or days when water flow is available are studied and installed in areas where the possibility of using an alternative energy source is high.

This alternative energy source is designed to store mechanical energy, and the effect of mechanical forces on the device is naturally much greater. Therefore, the device must first of all be strong, and in order to be strong, this device must be made of strong materials. It is recommended to use the most iron to make the device. Because iron is a strong metal and belongs to the group of heavy metals. A device made of iron is not only strong, but also quite heavy. We know in practice that various vibrations are rare in devices with heavy weight.

Vibrations have a negative effect on the device, when vibration occurs, the operation of the device elements is asymmetric. Since the elements of the device are mainly in rotary motion, even the slightest vibration has a negative effect on the rotary motion, interfering with its operation. Vibration affects first of all the bearings with the shafts, which ensure the movement of the rotating elements (drums, shafts). Because of this, bearings can fail quickly. Bearing failure can also cause the rotating drums to stop rotating and then stop altogether. The elements of the device are designed

in such a way that if any element fails, the device will not work. Therefore, vibration damping is of great importance in this device.[16] In order for the device to work well, it is recommended to use the most modern, minimal slip bearings with a large useful work coefficient in the construction. Because the device consists mainly of rotating elements, the role of bearings is very important in making this rotating movement smooth, without vibrations. Currently, one of the most modern bearings is magnetic bearings, the principle of operation of this type of bearings is based on the strength of the magnetic field, and they can work in a vacuum without any lubricants. Therefore, this type of bearing has the least amount of slippage. Minimal slippage is the main achievement of this bearing, and its disadvantage is that if it is affected by a magnetic field for various reasons, the operating mode of the bearing is disturbed and, in turn, it can cause the device to fail.

Another key element of the device is the elastic rope, which is used to store mechanical energy. The more the requirements for the elastic rope are met, the greater the power of the device. Because the mechanical energy accumulated through the rope is equal to:

$$W_0 = \frac{k \cdot \Delta l^2}{2}; \qquad (2.\ 11)$$

So, as can be seen from the formula, for the energy to be maximum, the stretch of the rope should be longer, because the energy concentrated through the rubber is quadratic proportional to the stretch of the rope. In this case, maximum force is required for maximum stretching of the rope. Secondly, k should be the single maximum of the rubber. Increasing the power of the device or increasing the operating time can also be achieved by extending the length of the rubber wrapped around the device.

Options for adjusting the output voltage and frequency of the renewable energy source generator.

In recent years, a number of laws and decisions on the development of alternative energy sources have been adopted in our Republic. Their implementation requires the search for renewable energy sources in our region and research into the possibilities of their effective use. Currently, in our Republic, more attention is being paid to the use of alternative energy sources, mainly solar energy, and considerable progress has been made in this field. Analysis shows that we also have sufficient potential for wind energy use. Today, an atlas of the country's winds has been compiled. According to him, the gross potential of wind energy is 2.2 million tons. is estimated as, and its technical potential is equal to 0.427 million t.sh.y. 75% of the country's land is unsuitable for wind power generation. This includes flat lands, where wind currents depend on the season.

This situation, in turn, promotes the idea of generating electricity for small power consumers, after initially collecting the energy of weak currents, when there is a need for energy consumption [2]. Bringing electricity networks to the remote areas of our republic, in field sheds, in the deserts of people who are engaged in animal husbandry or agriculture, requires a lot of expenses. However, energy consumption in these places is needed for a short time and in a small amount. Therefore, it is precisely in these places that the installation of such alternative energy sources provides economic efficiency.

We determine the conditions necessary for the device to work at the given power. The mechanical power required in a small drum to rotate the generator at a given speed is determined from the following expression, kW:

$$P_{d2} = \frac{P_{ген}}{\eta_г \cdot \eta_p \cdot \eta_m}, \qquad (2.\ 12)$$

Here $\eta_г$, $\eta_р$, $\eta_т$ - generator, belt drive and gear drive useful duty ratios.

In this case, the torque on the drum is determined as follows, Н·м:

$$M_{d2} = F_{б} \cdot R_{d3} = k \cdot \Delta l \cdot \frac{D_3}{2}, \qquad (2.\ 13)$$

where: G'b is the pulling force of the elastic rope, N·m; Rd3 - the average radius of the drums, m; k - elasticity of the elastic rope, N·m/m; Dl- stretching of the elastic rope, m.

The amount of mechanical reserve that ensures the time of operation of the generator at the given power, kW·h:

$$W_{зах} = P_{d2} \cdot t_{зах} \cdot \qquad (2.\ 14)$$

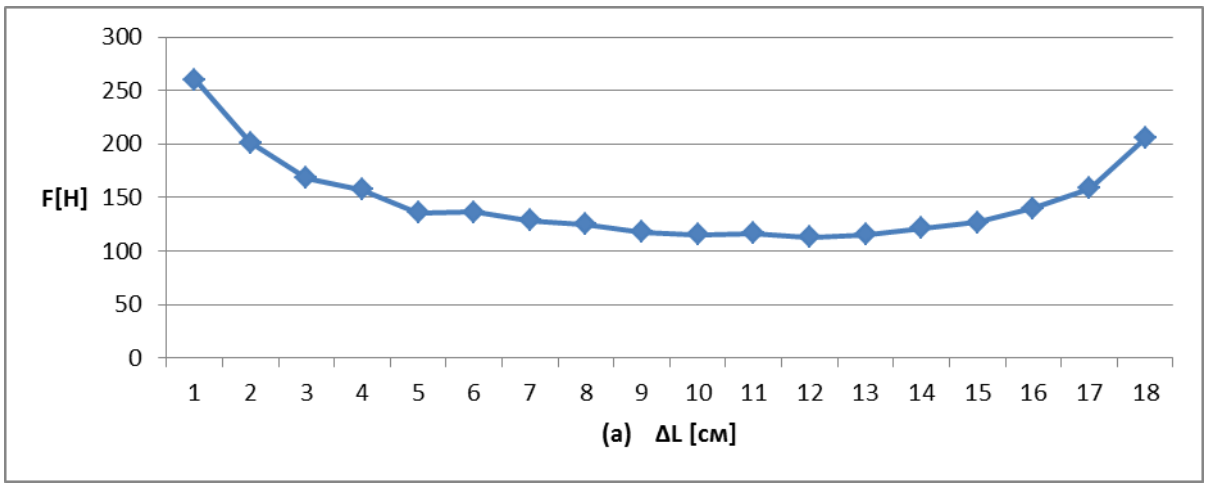
As can be seen from the expression, even when the input power to the device is weak, the required amount of energy can be collected by increasing the storage time. The output power depends on the time of use of the stored energy.

We analyze the factors affecting the production of high-quality electricity in the device. We determine the total length of the rope, which provides the amount of stored energy.

$$L = l_0 \cdot N = l_0 \cdot \frac{W_{зах}}{W_0} = \pi \cdot D_0 \cdot \frac{W_{зах}}{W_0}, \qquad (2.\ 15)$$

where l0 is the length of a coil of rope wound on a small drum, m; N-number of packages, pcs.; W0 is the potential energy accumulated by a coiled rope and is determined from the following expression:

$$W_0 = \frac{k \cdot \Delta l^2}{2}. \qquad (2.\ 16)$$



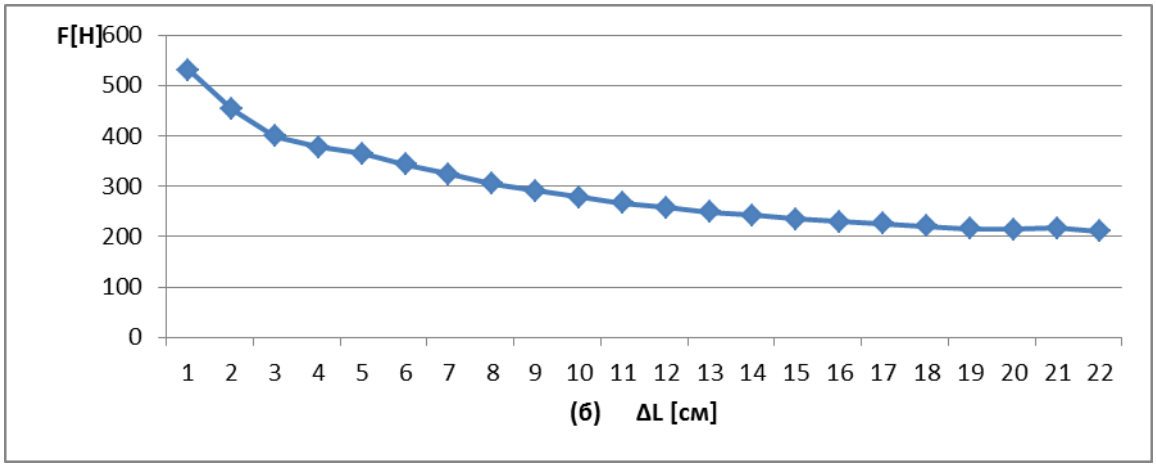


Figure 2.8. The length of the elastic rope is (a) D=10 mm, (b) D=15 mm.

It can be seen from the above expressions that the quality and quantity of the output voltage of the alternative energy source depends on the properties of the elastic rope. Small (100-500 W) power sources can use elastic ropes used in sports. Fig. 2.8 (a) shows the uniformity of elastic ropes made of multi-core with a diameter of 10 mm and in Fig. 2.8 (b) with a diameter of 15 mm. It can be seen from the pictures that the ropes are non-linear and have a negative effect on the output voltage of the source. This negative effect can be reduced by keeping the tension of the elastic cord constant in the energy source.

To fulfill this requirement, 2 rollers were installed on the gear disc of the small drum by means of a gear connection (Fig. 2.8). The diameter of the rollers and the number of gears are selected so that the length of the opening rope and the rope coming out of the roller are the same, and there is no tension in this area. The rollers release the rope in such an amount that the rope winding around the big drum is under maximum tension.

Experimental studies have shown that the frequency and voltage stability of alternating current coming from an alternative energy source has increased by 15-20%. Thus, the generator will be able to obtain the specified output power at any input power. Only, it affects the energy storage time. This allows using the device at the given power even in weak currents. For example, to operate a 500 W generator for 30 minutes, the input power to the battery is 25 W, and the primary energy source must be stored for 20 hours. Because the accumulated energy is spent 20 times in a short time, and this allows to increase the power by 20 times. This reserve device allows the wind generator to operate efficiently even in weak wind currents.

Conclusion: Currently, the disadvantages of alternative energy sources are: non-permanence of primary power flows (wind and water flow, sunlight and temperature, etc.), their weakness or absence at all; high cost of power generation equipment and electricity; These devices are not widely used in production due to the fact that the generated alternating current is converted to direct current and converted back to alternating current due to its unusability and therefore very low FIC [1]. For example, the efficiency of wind generators is around 15-20%.

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