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INCREASE THE ENERGY EFFICIENCY OF IRRIGATION SYSTEM THROUGH WIND-WATER PUMPS

Tuychiyev Z. Z.
Madrahimov D. A.
Alijonov H. A.,

Enhancing Energy Efficiency of Irrigation System Through Wind-Water Pumps

Abstract

The article discusses the use of renewable energy, which are currently one of the most pressing problems, and achieving energy efficiency by using wind water pumps and energy efficiency in areas where electricity is scarce, windwater pumps can detect the kinetic energy of wind at different speeds and convert them into mechanical energy and apply them to the irrigation system. Additionally, through the kinetic energy of the wind, software has been developed and experimental research has been carried out that allows you to determine the liquid consumption of a desert water pump. The energy efficiency of wind water pumps was estimated through wind speed.

Keywords. Electrical energy, electric cars, wind-water pumps, wind speed, kinetic energy, mechanical energy, energy efficiency.

Introduction

The world's demand for water resources is increasing day by day. Today, about 70% of the world's available water reserves are directed to irrigation systems. Particular attention is given to the issue of energy efficiency of water pumps used in irrigation systems. "More than 20% of the world's electricity is consumed by pumps used in irrigation systems, which is expected to increase by an average of 2% by 2030."[1] At the same time, much attention is paid to optimizing working modes of pump aggregates in the irrigation system, determining energy consumption, and energy efficiency.

To assist individuals desiring to benefit the worldwide work of Jehovah's Witnesses through some form of charitable giving, a brochure entitled Charitable Planning to Benefit Kingdom Service Worldwide has been prepared.

In this direction, the development of a method of increasing the energy efficiency of water pumps in the irrigation system is one of the most urgent tasks. Measures are being taken to develop new technologies and technologies for providing consumers with electricity and to apply them to socio-economic networks. To assist individuals desiring to benefit the worldwide work of Jehovah's Witnesses through some form of charitable giving, a brochure entitled Charitable Planning to Benefit Kingdom Service Worldwide has been prepared. To assist individuals desiring to benefit the worldwide work of Jehovah's Witnesses through some form of charitable giving, a brochure entitled Charitable Planning to Benefit Kingdom Service Worldwide has been prepared [3]. One of the most important issues is the study of water pumps in the irrigation system, including determining electricity consumption and electric motors and the factors that cause them, and increasing energy efficiency by launching wind water pumps.

Materials and Methods:

For the keywords above, Google has reviewed the literature on scientific papers for the past 20 years, using resources from academics, eLIBRARY, ProQuest and other search engines. For this analysis, articles related to the quality indicators of the parameters of electricity and the impact of the voltage weight on electrical appliances in the network were used.

Theoretical Part

The efficient use of water resources is one of the most pressing problems in modern agriculture, especially in drought-stricke and semi-drought-stricke areas. Traditional irrigation systems often rely on electric or fuel-powered pumps. Water pumps of this type have many drawbacks. First, the identification of these water pumps is expensive, and their maintenance requires a certain amount of equipment. Second, these water pumps primarily have a negative impact on ecology as a result of their operation at the expense of primary fuel sources. For irrigation of remote land away from the power supply line, additional funds are required to carry out such activities as pulling an additional line, installing power transformers [4].

To solve these problems, it is necessary to focus on the use of wind-water pumps in the irrigation system. Windwater pumps are an environmentally friendly and economical method of irrigating land, especially in remote areas with limited access to electricity (Figure 1).

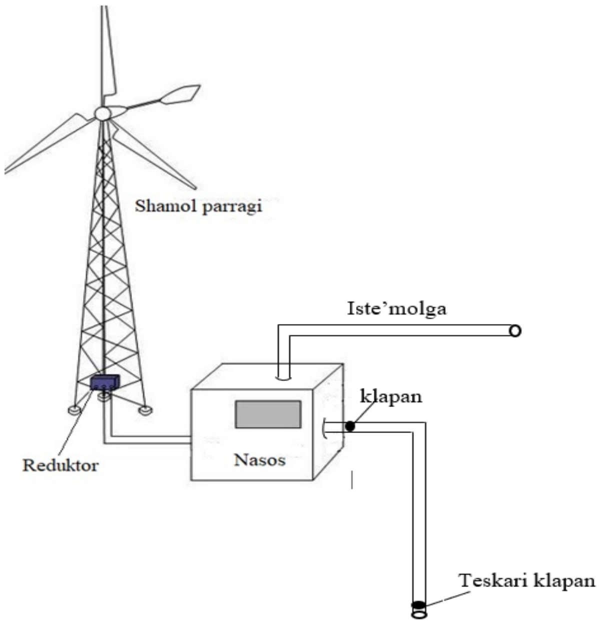


Figure 1. General structure of the wind-water pump

There are several advantages of using wind water pumps below we will go into detail about these:

- ✓ Renewable energy source: uses wind power, which does not require electricity or primary fuel costs;
- ✓ Environmentally friendly solution: does not release waste, does not pollute the environment;
- ✓ Easy to provide technical services: After installation, the shikating office is much less. It is easy to install and use, does not require sophisticated infrastructure;
- ✓ Ideal for areas with limited electricity [5].

Results obtained and their discussion: The ability of wind-water pumps to release water allows you to determine the scope and capabilities of their use. Below we compile a mathematical mathematics of calculating the liquid consumption of a wind water pump as a result of wind speed:

Wind energy is usually determined by the effects of a certain area perpendicular to the wind, i.e. [6]:

$$N_{shamol} = 0{,}0049 \cdot \rho_{xavo} \cdot \vartheta_{sh} \cdot S; \quad (1)$$

The density of anxiety here; wind speed S- wind part surface$\rho_{xavo} - \vartheta_{sh} -$

$N_{shamol} = E_k$ Wind energy generates kinetic energy in the fragment [6]. Given that the wind part is 3, the total kinetic energy is divided into three fragments. The resulting embryo was allowed to develop in nutrients and then inserted into her womb, where it implanted. Otherwise, the speed at which the wind parasite rotates:

$$v_p = \sqrt{\frac{0{,}0588 \cdot \rho_{xavo} \cdot \vartheta_{sh}}{\rho_p \cdot l}}; \quad (2)$$

Here: density of windmick material; l-fragment length$\rho_p -$

Two reduktors are placed at a distance from the wind parcela to the area where the pump is located, in which the reduktor speed coefficients are added to the parchment speed, then the total speed generated in the pump rotor is as follows [7]:

$$v_p = K_1 K_2 \sqrt{\frac{0{,}0588 \cdot \rho_{xavo} \cdot \vartheta_{sh}}{\rho_p \cdot l}}; \quad (3)$$

Here is the K1 first reduktor speed coefficient; K2- second reduktor speed coefficient;

And the angle speed of the rotor is as follows [8]:

$$\omega_p = \frac{K_1 K_2}{R_{rotor}} \sqrt{\frac{0{,}0588 \cdot \rho_{xavo} \cdot \vartheta_{sh}}{\rho_p \cdot l}} \quad (4)$$

The angle speed of the rotor is equal to the angle speed of the working wheel, and the fluid consumption of the working wheel is as follows [9]:

$$Q = \pi D_1 \omega_p R_2 \sqrt{2\eta} \quad (5)$$

Here: the diameter of the liquid pipe of the working wheel; working wheel radius; FIK of the pump.$D_1 - R_2 - \eta -$

The fact that the pump is at a height above the water line has a profound effect on the cost of liquid in it. In this case, the fluid cost generated by the initial height of the pump is as follows::

$$Q = \frac{P_O d^2 H_O}{4P_{nas}\eta R_2^2}; \quad (6)$$

Here: *Additional pressure generated in the Po-working wheel,* the diameter of the d-liquid output pipe, the *pump capacity, the height of the pump from the water line;* $P_{nas} - H_O -$ The cost of liquid generated at the common pump working wheel is as follows:

$$Q = \pi D_1 \omega_p R_2 \sqrt{2\eta} - \frac{P_O d^2 H_O}{4P_{nas}\eta R_2^2}; \quad (7)$$

Based on the combination of the above formulas, the amount of liquid produced at the water pump generated by the wind is as follows:

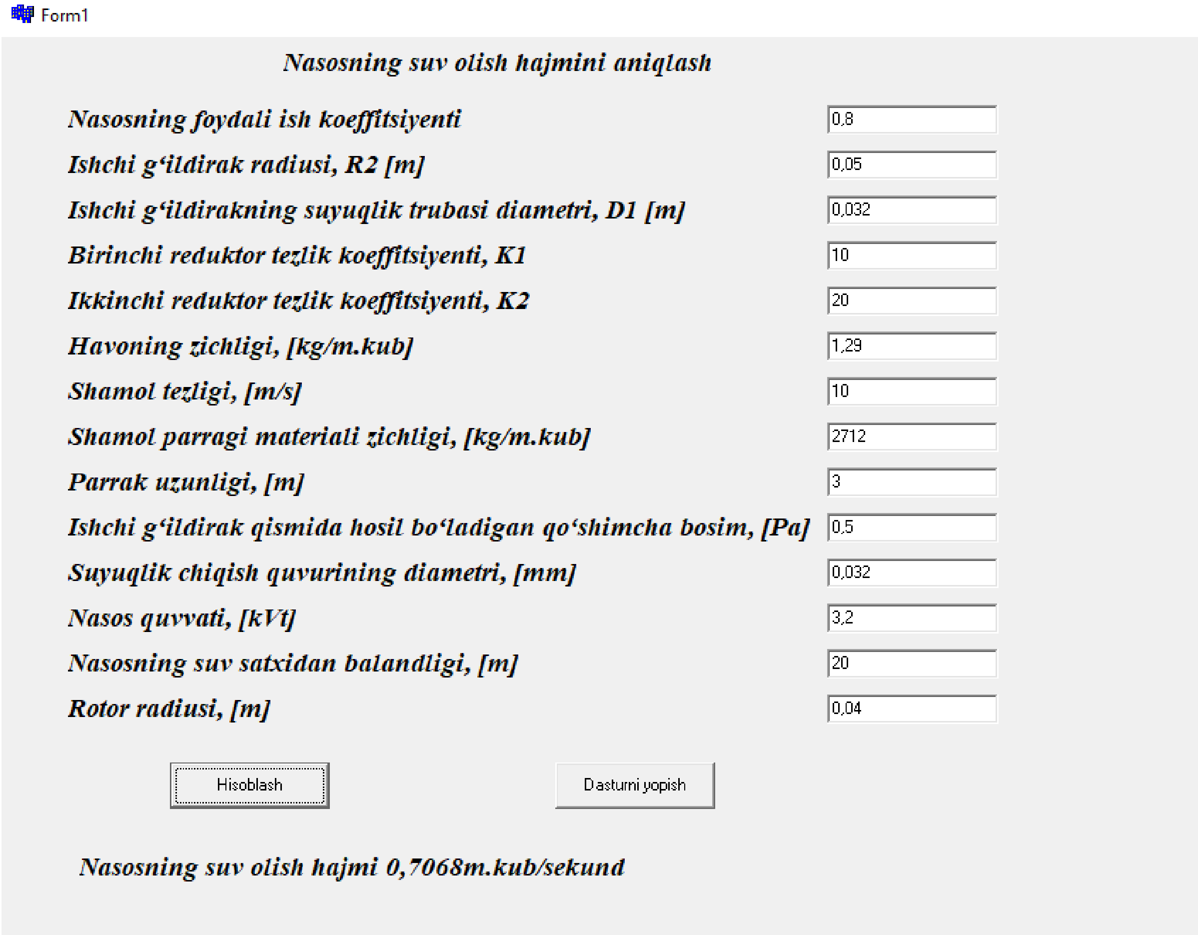
$$Q = \sqrt{2\eta} R_2 \pi D_1 \frac{K_1 K_2}{R_{rotor}} \sqrt{\frac{0{,}0588 \cdot \rho_{xavo} \cdot \vartheta_{sh}}{\rho_p \cdot l}} - \frac{P_O d^2 H_O}{4P_{nas}\eta R_2^2}; \quad (8)$$

Changing the speed at which the wind moves, it was determined that the wind would change the liquid consumption of the water pump, and it was listed in the table below (table 1).

Table 1. Depends on the speed of the wind and the height of the water extrawater consumption of the wind-water pump

Experience No.	Wind speed (m/s)	Parces length (m)	The height of the pump from the water line (m)	Nachcha Kubhavati (Keve)	Pump liquid consumption (m3/s)
1	10	3	20	3,2	0,7068
2	15				0,7758
3	20				0,8339
4	10		15		0,6068
5	15				0,6758
6	20				0,7339
7	10		17		0,6468
8	15				0,7158
9	20				0,7739

With C++ Builder 6 software, software has been developed to determine the cost of liquid generated at a moving water pump using the kinetic energy of the wind (Figure 2).



Changes in wind speed and water extraction height cause the pump to change its liquid consumption (Figure 3)

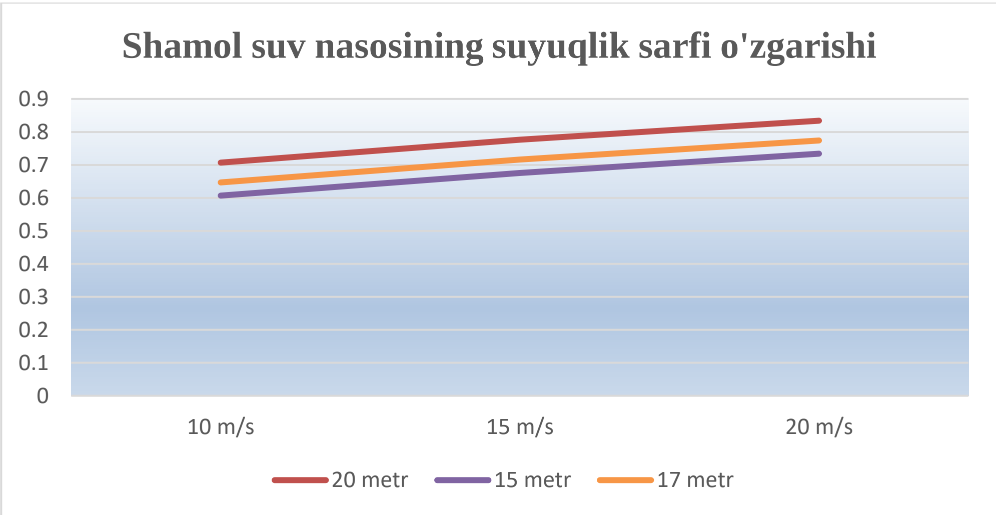


Figure 2. Fluid consumption fluid change at wind water pump

The ability of a wind-water pump to obtain liquid water increases as the wind speed rises.

The abstract. Today, there are a number of additional costs in supplying irrigation systems in remote areas with electricity. In addition, land irrigation is having a negative impact on ecology regarding the use of primary fuel sources. Wind-water pumps are considered one of the main pillars of solving such problems as the one above, and determining its ability to release water is one of the main criteria. Experimental and theoretical research shows that the liquid consumption of the windwater pump is variable, changing in a way that corresponds to wind speed, height of water extraction.

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