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Supply of Water Pumps With Electrical Energy Using the Energy of Solar Panels

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Abstract

The prospect of the development of solar panels, the use of solar panels is becoming popular today, its advantages and the increase in the efficiency of the panel lead to its popularity and the production of electricity for electric power consumers in remote areas where electricity does not reach. it remains in use. Electricity collected with the help of solar panels is widely used in the operation of water pumps and in the lighting system.

Keywords: *solar panel, pump, storage batteries, inverters, voltage, regulators, pressure transducer.*

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Currently, the main part of the electricity produced is NPP, HPP and thermal power plants. As we know, such power plants are mostly made by burning oil, coal and other natural resources. Today, renewable energy flows are constantly present in the environment.

Therefore, energy based on renewable sources should be aimed only at existing energy resources, without the goal of creating new renewable energy sources. For the development of energy based on renewable sources, it is necessary to clearly define their resources and capacity. Energy resources are determined on the basis of regular and long-term observations and analysis of indicators of the energy source. First of all, the available energy flow is determined, based on this, the part of this flow that can be used in energy devices is determined.

The use of renewable energy in water management enterprises is currently an important issue. Therefore, it is necessary to correctly calculate what obstacles there are in providing rural residents with sub, how to eliminate them, and what type of renewable energy can be used. Irrigation using solar energy and providing water to cattle is considered the best way. Some people think that solar water pumps are expensive to install. But if we take into account the maintenance and daily energy consumption compared to a regular pumping station, the payback period of the solar panel will be much shorter. [1].

Solar panel systems are very cost-effective in providing electricity in remote areas of farms, providing convenience for farming, gardening and other agricultural operations. Installing a pumping station to pump water to agricultural land and gardens that are far from electricity supply was considered a good option, but running a power line to an installed pumping station can be very expensive. instead of gravity we prefer to use solar panels[2].

There are two main types of solar powered water pump systems, battery connected and direct connected.

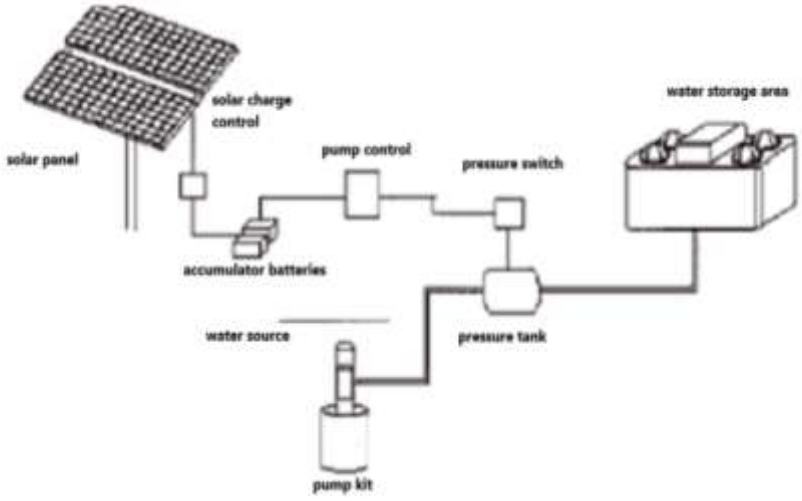

Fig. 1 Water pumping system using a solar panel connected to a battery

Battery connected water pump systems consist of solar panel, charge control regulator, batteries, pump controller, pressure switch and tank water pump. Solar panels collect energy from

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sunlight during the day and store it in batteries, because in order to ensure the continuity of water even at night, if water is needed, it transfers the energy to the pump and releases the necessary water. The use of batteries ensures stable operation of the pump and serves to provide energy when needed. Thus, during low light at night, the pump can be powered to water livestock or gardens. Because it is considered more effective to irrigate land in the evening, why is the level of evaporation of water in the evening lower than during the day? The use of batteries also has its own disadvantages.

First, batteries are less efficient and have limited energy collection because the operating voltage is not on the solar panel. Depending on their temperature and how well the batteries are charged, the voltage provided by the batteries can be anywhere from one to four. Volts below the voltage produced by the battery under maximum sunlight conditions. This reduced efficiency can be minimized. This can be overcome by selecting the battery that you choose based on the pump capacity.

In direct-coupled pump systems, the electricity produced by the lean modules is transmitted to the pump and the pump drives the water (Figure 1). This system is adapted only for daytime use and does not work in night mode. The disadvantage of the system is that the amount of collected water depends on the sunlight, the better the sun shines, the more water can be collected. Because the intensity of the sun and the changes in the angle of incidence of the PV panel during the day had their effect on the accumulation of water. For example, the pump can operate at 100% by assuming optimal sunlight during the day. However, the efficiency of the pump decreases as the intensity of the sun decreases in the morning and afternoon, and can drop by 25% or more in the morning and evening under low light conditions. On additional cloudy days, we can observe a further decrease in the efficiency of the pump. To compensate for these variables, flow rate, average pump efficiency, and system efficiency required by the modules.

A typical solar irrigation system includes a solar array, a pump, a storage tank, and a control panel.

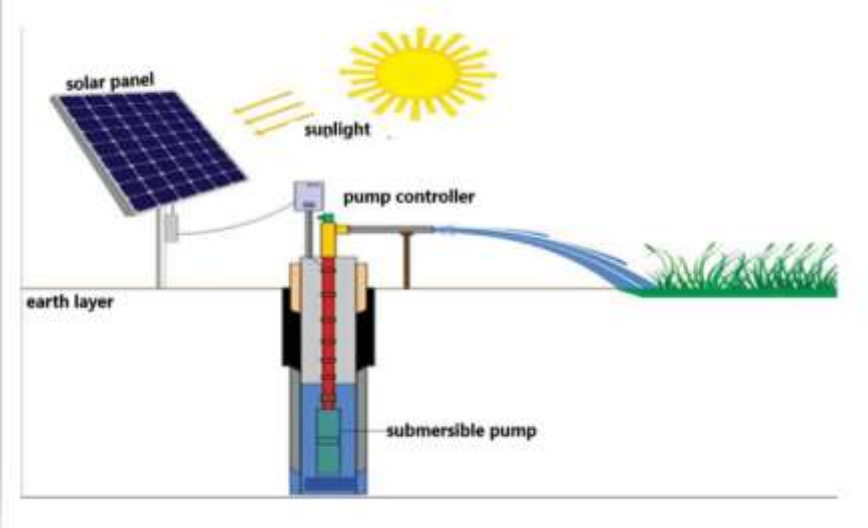

Figure 2. A typical solar irrigation system

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Advantages of a conventional solar irrigation system include:

1. Allows irrigation in remote areas;

2. Environmentally friendly

3. No network connection required;

4. Electricity bills are not paid;

5. No fuel required;

6. Durable and requires minimal. technical service.

Solar power systems are sometimes called photovoltaic systems. The word "photovoltaic" is often shortened. Most solar panels or modules produce direct current direct current. A group of modules is called an array.

The pump has a motor that runs on electricity generated by the solar panel. Depending on the motor type (AS or DS), the voltage of the solar pump motor can be AC or DC. DS motors are mainly used for small and medium applications such as garden landscaping, landscaping, livestock drinking water or small irrigation projects. Most city pumps run on 24 volts, not 12 volts. However, smaller 12-volt systems are available for light-duty routing, and 48-volt systems are available for heavier applications. Engine power is measured in watts or horsepower. [3]. There are two types of pump controllers: inverter and variable frequency drive. If an AS solar pump is used, an inverter is required to convert the DC power from the solar panels to the AS. A typical inverter's supported power range is from 0.15 kW to 55 kW, and a high-power inverter is used for larger irrigation systems.

The solar panel and the inverter must be matched to match the transient characteristics of the AC motor.Since the AS pump requires higher starting power, the inverter must be able to handle this additional starting load. Sometimes a controller is used to ensure that the pump motor gets the correct voltage and current. Some typical specifications for various AC pumps and pump controllers are listed in Table 1.

Table 1.

Technical parameters of a typical alternating current pump and its control				
AS pump power kW	Tension	Transformer power	Solar panel power	Battery capacity
1	60	4 kVa	1500	100 As
1.5	72	5 kVa	1800	100 As
2	96	6 kVa	2400	100 As
2.5	96	6 kVa	2400	100 As

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Most solar DC pumps require a special controller if they are to be powered directly by their modules (without batteries). A controller or linear flow amplifier (peak power point tracker) allows the pump to start and operate on cloudy days or in low light conditions in the early morning and evening. With a battery powered source, a DC pump controller may not be required at all.

A special controller can also be used to convert the 12 volt battery power to a higher voltage to operate the pump at maximum speed. DS pumps range from 12V to 48V, starting torque from 12A to 96A. Typical characteristics of various DC pumps and charge controllers available from the vendor are shown in Table II as examples. The pumps are equipped with motors that receive energy from solar arrays. The rated power of a solar module is expressed in peak watts (Vp). The power of the solar panels depends on the demand and the motors used. In India, solar arrays between 200W and 5KW are recommended by the government. You can refer to the link for information on solar arrays and motor pumps for solar water pumping systems provided by Ministry of New and Renewable Energy under Jawaharlal Nehru National Solar Mission.

Table 2

DC pumps with charging regulator					
DS pump	0,125 horsepower	0,25 horsepower	0,5 horsepower	1 horsepower	2 horsepower
Volt	24V	24V	24V	48V	48V
Free flow	2A	4A	8A	8A	16A
Full load flow	4A	8A	8A	16A	32A
Initial moment	12A	24A	48A	48A	96A
Absorption	2 m	8 m	16 m	76 m	152 m
delivery or flow rate (liters per hour or minute)	500 l s	8 l	24 l	35 l	70 l
of the panel capacity	200 Vt	500 Vt	800 Vt	1500 Vt	3000 Vt
Battery power	50 As	150 As	200 As	200 As	200 As
Charge control device rating	24V, 40A	24V, 40A	24V 40A	48V, 40A	48V, 40A

A surface pump is usually installed above the water table, which requires suction. It is used to discharge from an open well, pond or river where high flow and low head (the height to which the water must be raised) is required. The solar module converts solar radiation into direct current power and this power is used directly (converted to AC using an inverter) to power an electric

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motor to drive the pump. a typical method of rural water supply using a pump is shown. Unlike other alternative pumping options, solar pumps generally require high investment costs; however, this cost can be offset by a long service life, as operation and maintenance costs are minimal over its economic life. Solar pumps are a very reliable technology and are well-suited to the amount of water you may need. However, it is necessary to make accurate calculations when choosing solar powered devices, because they are chosen based on the consumption of sunlight and water. Water tanks should be able to hold enough water for use during periods of solar radiation absence.

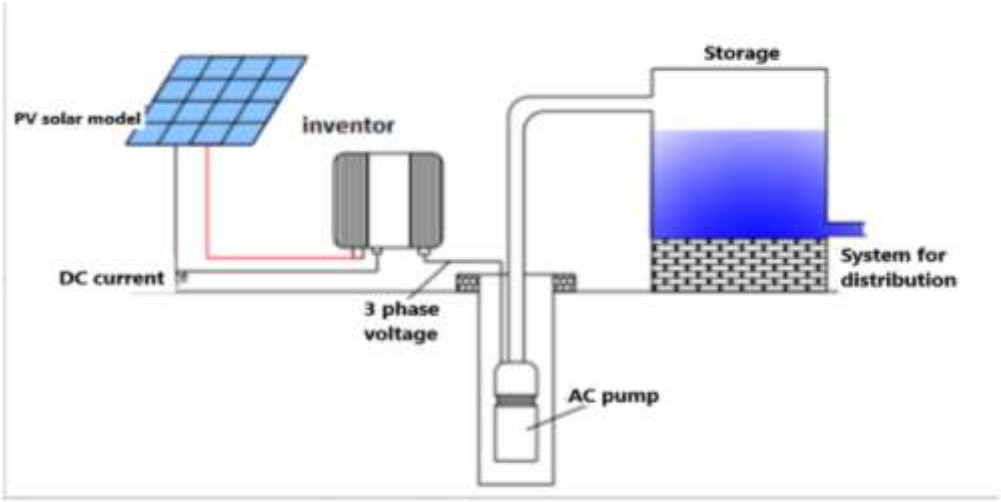

Fig. 3 A simple type of solar pumping station operating on 3-phase alternating current

Panels produced in Uzbekistan will be 30% cheaper than currently imported foreign batteries. The production of the new enterprise is 60-70 MW per year, which can be increased by 2 or more. Photoelectric modules produced here have an efficiency of 18% and higher. Also, the produced panels are designed to serve for 25 years. It will also increase production by 30% in the future. Existing problems in pumping and energy supply and measures for their creation. Today, the problem of energy efficiency has become one of the main directions in the field of national interests. The failure of this problem is based on ensuring that the country is without energy, which you cannot control the political security of the country.

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