

Solar Water Pump

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Abstract-

Solar powered water pumping systems have become the interest of many people in the recent years. Acknowledging that nature has provided a bounty of energy which can be converted into electrical energy has created innovative ways of discovering materials that can be used to make a system that supports turning heat into electricity. In this regard, the paper presented different concepts that relate to how the whole energy creation process is done and discusses useful ways of turning heat into useful energy. Furthermore, the recommendations dictate that while advancements in the technology are given attention, the issue of the investment cost and how it will thrive in the market is still a question. Nevertheless, many developing and developed countries continue to express interest in this area, and most are actively using and exploring how solar power can be used in other ways. Photovoltaic systems which are used to pump water for people, livestock and plants are an important move for technology and use of solar energy. Pumping water system using this PV technology has shown that is simple and that it does not require a lot of maintenance. In this regard, the idea gained the interest of farmers whose main concern is providing sufficient water not only for themselves but also for their plants and crops and livestock. The only major difference to this is that the system relies on solar energy as a power source for the pumps.

Keywords: Solar Pumping System, Photo Voltaic Power Generation, Use Of Solar Energy.



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1. INTRODUCTION

A solar powered pumping system method needs to take account of the fact that demand for irrigation system water will vary throughout the year. Peak demand during the irrigation system seasons is often more than twice the average demand. This means that solar pumps for irrigation are under-utilized for most of the year. Attention should be paid to the system of irrigation water distribution and application to the crops. The irrigation pump system should minimize water losses, without imposing significant additional head on the irrigation pumping system and be of low cost. There are several technology alternatives for supplying power or lift to groundwater systems including wind turbines, windmills, generators, solar arrays, and hand powered pumps. The main driving factors for selecting the appropriate technology are regional feasibility, water demand, system efficiencies, and initial and long term costs. Other factors often include the need for power and water reserves in the form of batteries and storage tanks. Solar powered systems are often considered for use in developing countries instead of other forms of alternative energy because they are durable and exhibit long-term economic benefits. Solar powered water pumping has been recognized as suitable solution for grid-isolated rural locations in poor countries where there are high levels of solar radiation. Solar powered water pumping systems can provide drinking water without the need for any kind of fuel or the extensive maintenance required by diesel pumps. Photovoltaic (PV) solar panels are often used for agricultural operations, especially in remote areas or where the use of an alternative energy source is

desired. In particular, they have been demonstrated time and time again to reliably produce sufficient electricity directly from solar radiation to power livestock and irrigation watering systems. Solar water pumps may be especially useful in small scale or community based irrigation, as large scale irrigation requires large volumes of water that in turn require a large solar PV array. As the water may only be required during some parts of the year, a large PV array would provide excess energy that is not necessarily required, thus making the system inefficient. Solar PV water pumping systems are used for irrigation and drinking water India. STUDY: 1. Solar panel Solar panel refers to a panel designed to absorb the sun's rays as a source of energy for generating electricity or heating. Solar modules use light energy (photons) from the sun to generate electricity through the photovoltaic effect. The majority of modules use wafer based crystalline silicon cells or thin-film cells based on cadmium telluride or silicon. The structural (load carrying) member of a module can either be the top layer or the back layer. Cells must also be protected from mechanical damage and moisture. Most solar modules are rigid, but semi-flexible ones are available, based on thin-film cells. Electrical connections are made in series to achieve a desired output voltage and/or in parallel to provide a desired current capability. The conducting wires that take the current off the modules may contain silver, copper or other non-magnetic conductive [transition metals]. The cells must be connected electrically to one another and to the rest of the system. Externally, popular terrestrial usage photovoltaic modules use MC3 (older) or MC4 connectors to facilitate easy weatherproof connections to the rest of the system.

2. LITERATURE SURVEY

1. Mr. M. A. Murtaza, Mr. Mragank Sharma, Rohit Yadav "Solar Powered Automatic Irrigation System" International Journal of Engineering Science and Computing, vol.7, issue no.4, April 2017. This study was to present the benefits of an automatic agricultural irrigation system, operated by current obtained from the Sun. The system may profit the country's economy if it may be extended for use within the large irrigated lands of the east and southeast. With technological advances, the system might provide farmers, worker, water, time and potency blessings. If the system is employed for landscaping in town parks and green areas, it should bring different blessings. With the system, water waste and therefore they would like for human power might be attenuated. The system is economical and simple to use. If future studies can augment it sensible mobile device applications and remote controlled RF systems, it'd be also potential to observe the system on-line.

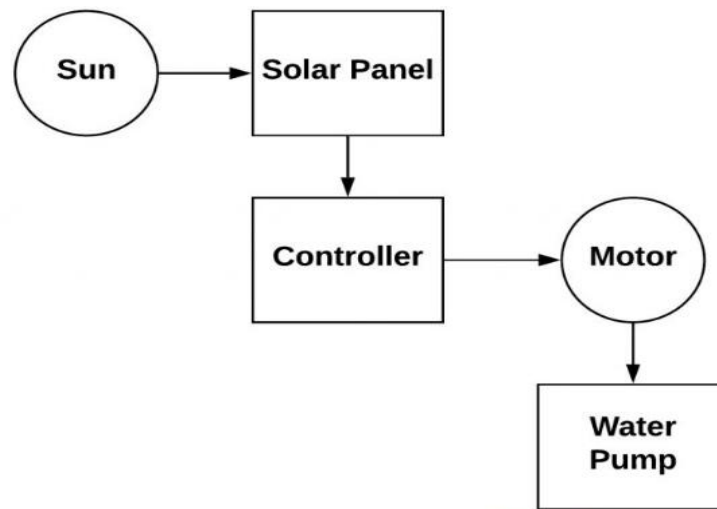
2. Er. Upendra Singh, Mohit Vyas, Gaurav Sharma," Solar Based Smart Irrigation System" International Journal of Recent Research Aspects, vol.3, issue no.1, march 2016. In this paper implementing the projected system there are numerous benefits for the government and therefore the farmers. For the government an answer for energy crisis is projected. By using the automated irrigation system it optimizes the usage of water by reducing wastage and reduces the human intervention for farmers. The surplus energy produced mistreatment solar panels also can tend to the grid with little modifications within the system circuit, which can be a supply of the revenue of the farmer, thus encouraging farming in India and same time giving a solution for energy crisis.

Projected system is straightforward to implement and atmosphere friendly resolution for irrigating fields. The system was found to achieve success when enforced for bore holes as they pump over the whole day. Solar pumps conjointly provide clean solutions with no danger of borehole contamination. The system requires stripped-down maintenance and a focus as they're self-starting. To more enhance the daily pumping rates tracking arrays may be enforced. This technique demonstrates the practicability and application of mistreatment solar PV to supply energy for the pumping necessities for mechanical device irrigation. Even if there's a high capital investment needed for this technique to be implemented, the edges are high and in long run this technique is economic.

3. BLOCK DIAGRAM

Solar pump definition is, as the name suggests the pump uses solar energy to function. Solar-pumps are robust, installation is simple, minimum maintenance is necessary and very expensive when we compare with normal water pumps. The life span of these pumps is a maximum of 20 years. But time to time the solar panels need to be cleaned for running. These kinds of pumps mainly used where there is an electricity problem otherwise consistent power supply is not accessible.

The solar pump block diagram mainly includes a solar panel, water pump, electric motor, and controller. This pump is basically an electrical pump, and this pump uses the electricity which is received from the solar panels to work. These panels store the energy from the solar. The electric motor manages the alternating current or direct current. The controller used in this system adjusts the output power as well as speed.



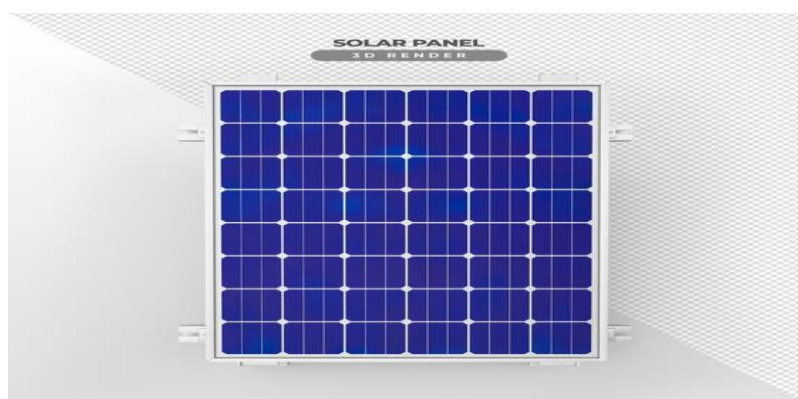
4. PROBLEM STATEMENT

Sometimes the solar pump inverter may produce a low voltage output. This may cause the water pump to run slower than intended, resulting in inadequate water flow. In conclusion, solar pump inverters are essential components in solar pumping systems, and they are known for their durability and reliability. Despite being very reliable, they may develop problems from time to time, leading to reduced efficiency or complete failure of the system. To avoid such situations, it is important to troubleshoot problems as soon as they arise using the guidelines discussed above. If you need high-quality solar pump inverters, get in touch with reputable solar pump inverter manufacturers. They can provide you with reliable and durable solar pump inverters to meet your needs.

Component used:

Solar Photovoltaic System

The solar panels used in our solar water pump systems produce electricity by using the photovoltaic effect. These solar panels absorb the sun's photons and convert them into energy. This is the main component of a solar water pump system. A group of solar panels is called an array. At Advanced Power, we create all of our own photovoltaic solar panels with durable material that will allow our solar panels to last for years to come. Most of our solar panels comes with mounting poles as well. While this is the component of the solar pump system that actually creates the electricity, there are many other important components of the water pump system.



Water Pumps

The water pump is another part of the solar water pump system that is extremely important. Without the pump, you wouldn't have a water pump system! The pump is the piece of equipment that draws water from the source to be used for different applications. Water can be drawn from a well, pond, or other sources and used to help with agriculture, irrigation, and other settings. Advanced Power offers our pumps in both AC and DC power.

Controllers

Solar pump systems are important in maximizing pump performance. Controllers can be used to essentially control the water pump. Advanced Power offers a variety of controllers that can help your water pump run more efficiently. Controllers can be used to set a pumping schedule, turn the pump on or off, and help maximize the life of your pump. If you are pumping from a well or water source that often faces low water levels or dry situations, we offer controllers with water sensors, which will turn off the pump when water is low. This allows wells or water sources to replenish before the pump starts up again. Controllers can help make your pumps more efficient and perform better.

These are the main components of a solar water pump system, but not the only parts that can make your system more efficient! At Advanced Power, we offer a variety of solar pump accessories that could help further your water pump's performance. Hopefully, this blog helped you understand the different solar water pump components. When you choose to install a solar water pump system to your business, home, or farm, you want to make sure you have all of the best equipment and components.

Battery

Batteries come in different shapes, sizes and differ in their uses. The 12V battery is one of such common batteries. A 12 volt battery is a kind of battery that is often used for various electrical gadgets and appliances. The 12 volt battery is distinct and different in its use, as it comes in different shapes and sizes. In some instances, they might be large and heavy or small and light. They may be cylindrical or square batteries.



DC Motor

A DC motor is an electrical motor that uses direct current (DC) to produce mechanical force. The most common types rely on magnetic forces produced by currents in the coils. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronics, to periodically change the direction of current in part of the motor.

DC motors were the first form of motors widely used, as they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor, a lightweight brushed motor used for portable power tools and appliances can operate on direct current and alternating current. Larger DC motors are currently used in propulsion of electric vehicles, elevator and hoists, and in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications.



Diodes

A p–n junction is a boundary or interface between two types of semiconductor material, p-type and n-type, inside a single crystal of semiconductor. It is created by doping, for example by ion implantation, diffusion of dopants, or by epitaxial (growing a layer of crystal doped with one type of dopant on top of a layer of crystal doped with another type of dopant). If two separate pieces of material were used, this would introduce a grain boundary between the semiconductors that severely inhibits its utility by scattering the electrons and holes. p–n junctions are elementary "building blocks" of most semiconductor electronic devices such as diodes, transistors, solar cells, LEDs, and integrated circuits; they are the active sites where the electronic action of the device takes place.



5. Working

Essentially, solar-powered water pumps work by converting the sun's rays (photons) to electricity that will operate the water pump. It uses solar panels to collect the photons (units of light) from sunlight, producing the direct current (DC) that provides the energy for the motor to pump water out from its source. An inverter is used if the pump motor needs alternating current (AC) rather than DC.

SOLAR WATER PUMP



6. ADVANTAGES

- 1) Utilize Renewable sources.
- 2) It does not require any external or additional electricity to work/start.
- 3) Easy to operate and maintains.
- 4) No fuel cost-uses abundantly a vailable free sunlight.
- 5) Long operating life.
- 6) Highly reliable and durable free performance.
- 7) Environment friendly, no noise, no pollution.
- 8) Saving of conventional diesel fuel.
- 9) One time investment, on running cost.
- 10) It can be used also in dark with the helpof energy stored in battery.
- 11) Most useful in remote location or area where electricity not available.

7. RESULT

The study showed how solar energy can be converted and turned into useful energy to power water systems. However, there are considerations to the use of well pumps to extracting water. While there is an increasing awareness of its usefulness and that alternatives to materials used in creating solar panels that would provide the energy to pump water systems, the materials used are still expensive materials and would need a considerable amount of investment and that there would be implications to doing so as well. However, this is outweighed by more important effects. For instance, a swimming pool requires massive amounts of energy to keep it clean. A solar pump would save on energy bill and would also ensure that the pool is environmentally clean. It is worth noting, however, that while a proposal to extracting water through solar energy is environment-friendly and would lead to many benefits, it is important that more studies be taken to further develop more economical ways of extracting water by solar energy.

8. CONCLUSION

Solar pumps are evidently seen as efficient, environmentally friendly way to produce and supply water demands of many domestic and commercial purposes. Nowadays, the use of the solar system is highlighted in many agricultural and residential irrigation and cattle or livestock watering solutions. One clear advantage of solar pumps is that they can be easily installed and do not require heavy maintenance. Additionally, these pumps can survive up to 20 years, so that the benefit made on it outweighs the initial set up costs. However, aside from the economic and environmental benefits of solar powered water pumps, there are many other advantages that make them more appealing than battery or any other conventionally powered pumps. For instance, as solar pumps do not rely on electricity or produce dangerous toxins. Thus, they are safe. Secondly, solar power pumps can be used to supply heat to homes and public buildings. Another benefit is that they operate quietly. Finally, they are self-priming and are easy to install.

Today, the viability and practicality solar energy as a future energy source is quickly becoming known all over the world. Installations of small and Solar PV Power Systems are increasing significantly. Solar PV systems show that people are becoming more aware of the potentials and possibilities of solar power energy. It goes on to say that the idea of solar power has become an interest for many including businesses that many investments are made in different types of energy conversion systems to suit the people's needs. Such is seen in Solar PV & Solar Thermal Power Plants, Solar Powered Electronic items, Solar Water Heater systems. Even satellites are now powered by solar panels. The discussion on how solar energy systems can be utilized to pump water and serve people effectively without depending on the grid power supply leads to clean energy that a continuous development of the idea of solar energy is being raised and is observed in many parts of the world.

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