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Solar Water Pumping System for Agriculture

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Abstract*: The technology of Agriculture is changing rapidly. Agricultural equipment, agricultural infrastructure and production facilities are being constantly developed. Most photovoltaic (PV) solutions are used in agriculture. These applications are the best solution for remote farming when the PV solution is found by utilities that combine individual systems. A sun oriented fueled water pumping framework is comprised of two fundamental segments. These are PV boards and have a few huge structures pumps. A PV board's littlest component is the solar powered cell. Each solar based Cell has minimum of two ordered material like semiconductor layers which, when presented to light, produce direct flow (DC) power. The cabling in the board accumulates this DC Current.. It is then fed to a DC pump so that the sun pumps water at any time, or is placed on the batteries following the use of the pump. The principle motivation behind this article is to explain how the sunlight based controlled water pumping framework works and the distinctions with different wellsprings of vitality.

***Keywords* : Solar photovoltaic system, water pumping system, MPPT, Solar pump, DC motors, solar pump testing, Batteries.**

I. INTRODUCTION

Farmers have constantly assumed a significant job in our general public as they give nourishment to the world total population. Nevertheless, it may be overlooked that they not only provide food but they also provide energy, which is of paramount importance nowadays, especially in terms of renewable energies[1]. Nevertheless, it should not be overlooked that they provide food but also energy, which is very important nowadays, especially in terms of re-usable energies. A sun powered controlled water pump frame work is comprised of two fundamental parts. These are PV panels and Farmers can really create control from wind, sun or biomass and use it for their own cultivate or exchange it to organizations on the off chance that they have a surplus.

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Solar vitality could be perhaps the most straightforward methods for delivering vitality for ranchers[2]. Ranchers, in actuality, normally have a few huge structures whose rooftops are straightforwardly under the sun, without being impeded by the trees shadows, make a perfect place for a photovoltaic system to be set up. The use of solar energy in agriculture is increasingly popular and energy produced from this renewable source is available either on the farm or at the local electricity grid, thereby providing the farmer with additional revenues. In agricultural operations, Power generators are popular to use diesel[3]. Whilst these systems can supply energy, some major disadvantages exist, including: The fuel has to be transferred to the generator site, which is a long way through some challenging roads and countryside. Livestock can be affected by their noise and fumes. Fuel costs are increased, and the soil may be polluted by spills. Generators require substantial maintenance and break down, like all mechanical systems, and need replacement parts that are not always available.

II. WATER PUMPING

Water pumping is one of photovoltaic easiest and most suitable application PV energized the system like pump contact a wide scope of water needs, from plant irrigation to stock watering to domestic and agriculture uses. A large portion of these frameworks have the additional advantage of putting away moisten for handle meantime the heat from the sun doesn't sparkle, neglecting the requirement for batteries, increasing the unity and decrease the costs. Most people are put off by the cost of installing a system using solar. Reviewing the price over a 10 year period, however, provides a better view of the actual cost. After looking more than 10 years at establishment costs (counting work), fuel expenses, and upkeep costs, you may find the sun-oriented decision is a realistic one. For the most part, a sun-based siphoning frame is extended in a similar value as another windmill will, however, generally be more solid and require less maintenance. Nevertheless, a sun-based powered pumping system at first requires far less help and effort than an oil, diesel, or propane-fueled generator. Nevertheless, a sun-based powered pumping system at first requires far less help and effort than an oil, diesel or propane-fueled generator.

III. MATERIALS AND METHODS

The aim of the present work is to investigate experimentally the Purpose of Solar Cell Water Irrigation Pumping System for Agriculture.Fig.1 shows the Fig. 1. Block diagram of Solar Water Pumping System

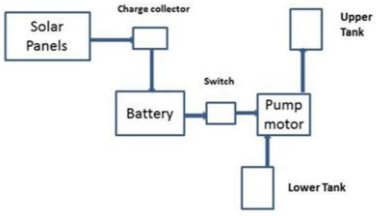

Fig. 1.Block diagram of Solar Water Pumping System

The double action Plunger pump shown in the fig.2.PV with pumb setup is shown in the fig.3.solar panel is shown in the fig.4Disc roating Reciprocating pump is shown in the figure 5.Configurations of water pumping usng solar is shown in the figure6.

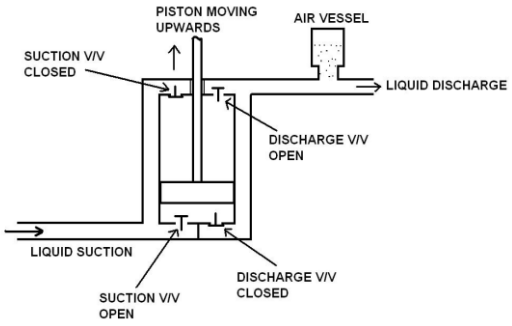

Fig. 2.Double Action Plunger Pump

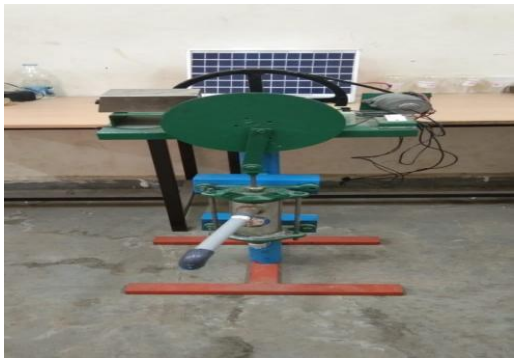

Fig. 3.PV with pump setup

Fig. 4.solar panel

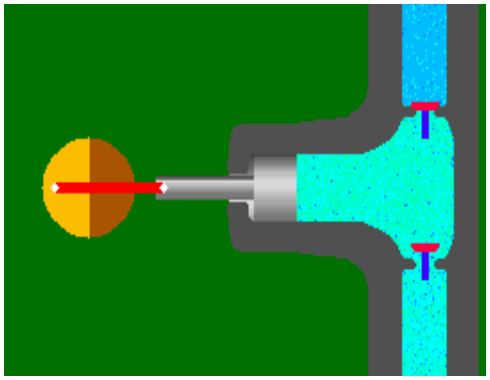

Fig. 5. Disc Rotating reciprocating pump

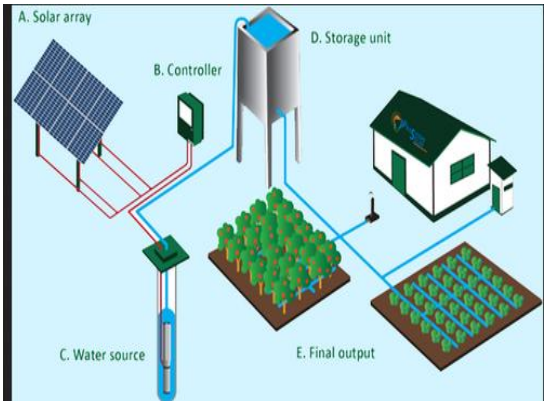

Fig. 6.Configurations of water pumping using solar

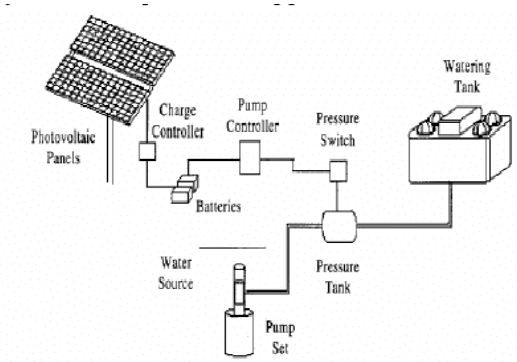

Fig. 7.Solar water pump combined with batteries

It consists of two common types of water pumping system using Solar systems with direct coupling and battery coupling. In deciding the optimal device for a particular application, a number of variables must be considered. Water pumping systems combined with batteries shown in Fig.7 Composed of photovoltaic plates (PV), charging controller, pump controller, batteries, tank and pressure switch and DC water pump. During daylight hours, Power units are charged with the electric current generated by board, and batteries provide energy to the pump when water is required. Through delivering a continual working voltage to the pump's DC motor, It runs over a long period time by using backup units.

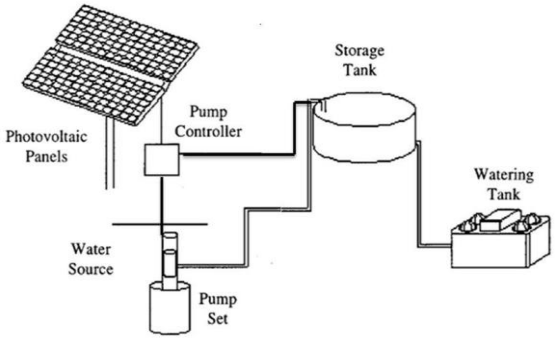

Fig. 8.Solar pump system directly coupled

In the direct connection pumping systems shown in Figure 8, electricity is pumped directly from the PV module, which, in turn, pumps water through a pipe, where it is needed. The volume of moisten pumped depends entirely on the daylight entering the solar panels and the size of the pump. Since the strength of the sun and the angle of effect on the photovoltaic panel differ all day, this system constantly varies the quantity of water pumped throughout the day. Nevertheless, in these low light conditions pump efficiency can decrease by as much as 25 percent or more in the early morning and late afternoon. Pumping output can fall even during cloudy days. To carry out productive system operation in such a way that the variable stream levels are balanced correctly between the siphon and the PV unit. Here, the range and limitations of the PV pumping system are analyzed. In general, in areas without a power supply, photovoltaic systems are designed to provide the water and irrigation. The main advantages over pumps for hands and internal combustion engines are almost zero maintenance, long service life, oil-free and easy to mount. One important element is that demand for peak water coincides with the maximum sun radiation times when the sun is used as its source of energy. Solar PV water pumping systems cost 64 percent of the price of a diesel pump with no subsidy for a life span of 10 years. Solar pumps up to 200m head and pumping up to 250m3 / day from everywhere. This means that diesel savings of at least 250 billion liters / year. The fact that water demand is variable during the year for the irrigation system must be taken into account in a solar irrigation pump system method.

IV. ENERGY REQUIREMENT FOR PUMPING SYSTEM

The capacity of water to be lifted (hydraulic power) is directly commensurate with the volume of lifting water (V, m3) and the head (H, m).The kilowatt hour (kWh) is the most convenient unit of energy. This is the energy for 1 hour (1 kWh = 3,6x10 * N.m) equivalent to 1000 W. E = ^/^-j [Barlow et al. 1993] is calcular from water powered vitality, E in kWh. The proficiency of the siphon, rç, relies upon the proportion of capacity to include.

V. SYSTEM COMPONENTS

The entire solar pumping system includes panels, monitoring mechanism support structure, controlling electronic parts, wires, tubing and pump.

A. SOLAR PANELS

Most solar panels connected to the panels generate DC electricity; Connections of series or parallel lines are made to achieve the voltage and power required for the pump. Solar panels are the most important parts used to run the pump.

B. PUMP CONTROLLER

The pump controller protects the siphon against high or low voltage conditions and increases the amount of water in the right lamps. An electronic inverter pump requires that the DC-energy from sunlight-based panels is changed into AC-energy for the pump to operate.

C. PISTON PUMP

Piston pumps or plunger pumps are positive displacement hydraulic engines that convey information through the cylindrical tube using a piston or plunger. They are also called high-viscosity pumps, service pumps, and high pressure pumps because they can supply high-pump pressures and handle viscous and solid media. Plunger pumps and Piston pumps are positive pumps that transported liquids by using contracted cavities. There are numerous kinds of cylinder siphons and plunger pump structures; however they all utilize in any event one cylinder moving in an encased chamber. Explicit kinds of plans incorporate pivotal and outspread cylinder pumps.

Axial cylinder pump:

It's contained various cylinders appended to a round and hollow square which move a similar way as the square's centerline (pivotally). A significant part of the weight and stream control hardware can be incorporated inside, taking into account solid activity and straight forward plan of the related water driven framework.

Double-action plunger pump

A twin pump is one that discharges liquid from the other end of the cylinders as it fills one end of the liquid cylinder. Shown in Fig.7.

Support Structure

The support structure provides the installed solar panels with protection and protects them against theft or natural disasters. A manual monitoring system is mounted to the support structure to achieve optimum water production. By allowing the solar boards to face the sun as they travel across the sky, monitoring fluid production is increased.

D. FOUNDATION

Support structures and pumps are provided with foundations. Electrical connections Installation is complete with a set of cables of appropriate sizes, connectors, junction boxes and switches.

E. EARTHING KIT

In case of lightning or short circuit is given for protection. As part of the installation, plumbing pipes and fittings necessary to connect the pump are supplied.

F. CRANK SHAFT

Crankshaft is a mechanical component that can transform reciprocal movement and rotation.

VI. RESULTS AND DISCUSSIONS

There are many benefits of the PV pumping system that are summarized as

Low running costs: The pump's negligible operating costs are one of the major advantages. Since the pump does not need any fuel, such as electricity or gasoline, the running costs are minimal.

Low maintainability: A well-conceived solar system needs minimal maintenance after panel purification once a week.

Nature-harmonious: The main benefit is that it provides optimum water production, i.e. in dry months and hot, if needed.

Flexibility: The solar panels don't have to be right next to the well. These can be up to 20 meters away from the well, or wherever the water is needed. Such pumps can also be turned on and off as needed, as long as there is more than 30 seconds between two operations

Low yield: If the demand is very high, solar pumping is not suitable. The solar peak power is very small.

The solar DC pump's efficiency, however, is more than a regular pump.

Variable yield: The solar pump's liquid yield varies by sunlight. In the early morning and at night, it is most strong at midday.

Theft: Theft of solar panels may be a problem in some regions. Therefore, farmers must take the precautions necessary.

VII. CONCLUSION

Here, with its range and limitations, the PV pumping system was studied. In areas where electricity is not available, photovoltaic systems are designed to provide water and irrigation. Their main advantages compared to internal combustion pumps are virtually zero maintenance, long operating life, oil usage, pollution and finally easy installation.

One important feature is that peak water demands coincide with times when the sun is used as its source of energy, which can provide maximum solar radiation. Compared to diesel pumping systems, the value of diesel pumps in the ten-year life cycle is 64 percent of the cost of solar PV pumping systems.

Like solar pumps with outputs up to 250m3/day are available for pumping from anywhere in the range of up to 200 m face. Photovoltaic pumps in general are economical compared to diesel pumps for village water supply up to approximately 3kWp and for irrigation up to approximately 1kWp.

Solar photovoltaic are eco-friendly, low maintenance and economical alternatives to grid or diesel irrigation pumps. Indian PV Water pumping capacity is estimated at 8 to 71 million solar pump sets, which means a minimum total of 250 billion liters / year of diesel storages.

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