

Review on Solar Pump

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Abstract— Renewable vitality sources all in all, and Solar Energy source specifically, can possibly give vitality administrations zero or just about zero outflow. The sun based vitality is inexhaustible and no other sources in renewable vitality resemble sunlight based vitality. The sun powered fuelled pumping framework can be utilized anyplace however it is suitable for rustic regions which is confronting vitality emergency. Because of topographical position, sultanate of Oman and bay locale has adequate daylight during the time which makes it perfect area for usage of sun powered vitality. Little homesteads, towns, and creature groups in creating nations require water powered yield force of not exactly a kilowatt. A large number of these potential clients are too a long way from an electrical network to monetarily draw from that wellspring of force, and motor driven pumping has a tendency to be restrictively costly and additionally problematic because of the high cost of acquired fuel and deficient support and repair abilities.

A sun oriented controlled pump is an ordinary pump with an electric engine. Power for the engine is created nearby through a sun oriented board which changes over sunlight based vitality to direct-current (DC) power. Since the way of the electrical yield from a sunlight based board is DC, a sun based controlled pump requires a DC engine in the event that it is to work without extra electrical parts. In the event that a pump has an alternating-current (AC) engine, an inverter would be required to change over the DC power delivered by the sun oriented boards to AC power. Because of the expanded multifaceted nature and cost, and the decreased effectiveness of an AC framework, most sun based fuelled pumps have DC engines. DC engine has been utilized to drive sun powered vitality water pump framework. This paper comprises of edge of sun oriented water pump, DC engine, pump, sun powered board, suction funnel, conveyance channel, ON/OFF control switch and water tanks.

Keywords- DC motor, solar energy, Solar panel, Pump.

I. INTRODUCTION

World populace is relied upon to twofold by the center of the 21st century (Global Energy, 1998). This will thusly bring about a 3-5 fold increment in world financial yield by the year 2050, and a 10-15 fold increment by the year 2100. Thus, Primary vitality necessities are relied upon to increment by around three folds by the year 2050 and five folds by the year 2100. This is relied upon to apply colossal weight on essential vitality supplier. Vitality has a built up positive connection with financial development. Giving satisfactory, moderate and clean vitality is an essential for killing neediness and enhancing efficiency. The unavoidable increment in the utilization of fossil powers close by a nation's financial development presents related symptoms of risk to the country's vitality security, and ecological debasement through environmental change. A practical different option for the unpredictable blazing of fossil fills lies in the quickened utilization of renewable vitality. In tropical nations, which have daylight just about during the time in many parts, sun powered vitality is a standout amongst the most feasible alternatives.

Water pumping is vitality escalated movement and devours a vast sum diesel and power. Sun oriented vitality,

which is richly accessible in India, can be utilized for pumping water through Solar-PV innovation. Not at all like customary diesel or electrical pumps, sun oriented photovoltaic (PV) pumps are fuelled by a variety of sun powered boards. Sun powered PV pumps are intended to work on DC power created by sun based boards. These pumps are picking up notoriety everywhere throughout the world, particularly in the ranges where power is either distracted or temperamental. Sun powered PV pumps are turning into a favoured decision in remote areas to supplant hand-pumps, framework associated electrical pumps and diesel pumps. In such places, sun based PV pumps are even suitable financially in contrast with expectedly run pumps. Not at all like ordinary diesel or electrical pumps, sun powered photovoltaic (PV) pumps are fuelled by a variety of sun oriented boards. Sun oriented PV pumps are intended to work on DC power delivered by sunlight based boards. These pumps are picking up prevalence everywhere throughout the world, particularly in the territories where power is either distracted or temperamental. Sun powered PV pumps are turning into a favored decision in remote areas to supplant hand-pumps, network associated electrical pumps and diesel pumps. In such places, sunlight based PV pumps are even suitable financially in contrast with customarily run pumps. These water pumping frameworks are controlled by sun based vitality. It is a stand-alone framework.

The force created by sunlight based module is utilized for working DC surface divergent mono-piece pump set for lifting water from bore/open well or water repository for minor watering system and drinking water reason. The framework schematic is appeared in the framework requires a without shadow region for establishment of the Solar Panel.

II. LITERATURE REVIEW

In 2010, Teresa D. Spirits, Portland Oregon [1] give general direction on the outline of little sun oriented controlled water pump frameworks for use with domesticated animals operations or watering system frameworks likewise depict a survey of the essential components of power, a portrayal of the distinctive segments of sunlight based fuelled water pump frameworks, vital arranging contemplations, and general direction on planning a sun oriented fuelled water pump framework. It additionally gives plan samples to run of the mill outline situations and standard drawings for use by the peruser. In any case, this specialized note is not expected to be utilized as a standalone report. Rather, clients are urged to counsel the NRCS National Engineering Manual (NEH 210) on power through pressure and watering system building for extra help with the configuration of water conveyance frameworks.

In 2011, Shiv Lal, Pawan Kumar, Rajeev Rajora [2] considered the execution of a photovoltaic (PV) exhibit based water pumping framework arranged at Kota Rajasthan (25.18 N and 75.83 E), India has been concentrated on. A 2hp DC engine with 2200W (10 boards of each 225W) have been utilized for release 30 m water head. The most extreme release logged 163litre/minute between 11AM to 2PM at PV power yield between 75 to 85W/m² and the framework is working roughly 8 hours in the of November of the winter season. The entire day release has discovered 70995litre and it is more than the normal release given by the maker at 50m profundity. It is uncovered that PV exhibit based water pumping framework is reasonable and achievable choice for off-lattice and dribble watering system framework like the inside region of Kota, where clear sky days are more than 250 in a year.

In 2011, M. Abu-Aligah [3] contemplated on preferences of PV pumping frameworks, for example, low working cost, unattended operation, low upkeep, simple establishment, and long life. These are immensely vital in remote areas where power might be inaccessible. As such, in the improvement of this exploration, the center has been to appraise the accessible radiation at a specific area on the world's surface and afterward broke down the attributes of a photovoltaic generator and a photovoltaic system. The motivation behind this examination is to look at all the fundamental steps and key

segments expected to plan and fabricate a pump utilizing photovoltaic framework.

In 2012, Brian D. Vick and R. Nolan Clark [4], worked out a few stages are given to choose a sun based PV water pumping framework. The progressions for choice of stand-alone water pumping framework were: choosing whether a wind or sun based water pumping framework would be ideal, deciding the sort of PV module, how controller can influence the choice, selecting pump sort (stomach, cylinder, helical, or divergent), and breaking down the month to month water request necessity. Three contextual analyses are additionally included to show how to decide PV cluster size, engine/pump appraised power, and kind of pump.

In 2013, K. Pawan Kumar [5] examined the restricted assets and high cost of traditional vitality sources like oil, gas, coal, and additionally the proceeded with ecological contamination are a portion of the fundamental explanations behind their boundless presentation in electrical force frameworks. The improvement and use of these option vitality advancements are still limited. Sunlight based vitality has the best capability of all the wellsprings of renewable vitality. Keeping in mind the end goal to make sun based vitality aggressive with alternate types of renewable energies, a superior misuse of its favorable circumstances particularly ecological side, this will be conceivable just with the advancement of the less costly and high yield productivity frameworks. The target of this work is to convey a commitment to the investigation of the practices of the photovoltaic generators and converters used to nourish an all-around characterized load. For this situation a no concurrent machine impelling a divergent pump is considered. This can be accomplished through demonstrating and re-enactment of the different stages that constitute the general framework.

In 2013, Er. P.D.Narale, Dr. N.S.Rathore, Dr. S.Kothari [6] this paper presents plan and monetary examination of effective sun oriented PV water pumping framework for watering system of banana. The framework was planned and introduced in sun powered ranch of Jain Irrigation System Limited (JISL), at Jalgaon (Maharashtra). The study range falls at 21° 05' N – latitude, 75° 40'E–longitude and at a height of 209 m above mean ocean level. The PV framework estimating was made in a manner that it was equipped for flooding 0.165 ha of banana plot with an everyday water necessity of 9.72m³/day and aggregate head of 26m. Likewise, the life cycle cost (LCC) examination was directed to evaluate the financial reasonability of the framework. The aftereffects of the study supported the utilization of the PV frameworks for water pumping application to flood plantations.

In 2014, M. Ayub Hossaina,, M. Shoeb Hassana, M. Abdul Mottalibb, Sultan Ahmmcdc [7] worked out the specialized and financial appropriateness of sun based pump watering systems of rice and no-rice crops. Four submersible sunlight based pumps (1050 Wp) were introduced in various areas of Bangladesh for watering rice, wheat and vegetables. The sun oriented pump was utilized for trickle watering system and wrinkle watering system for development of brinjal and tomato amid 2010-13. Water investment funds by trickle watering system over wrinkle watering system for brinjal and tomato were 53.25% and 56.16%, separately. For development of wheat around 430 mm water was required and the yield was 3.00 t/ha. Water required for bororice development in Magura was 1024 mm and in Barisal it was 1481 mm. Developments of sun powered inundated wheat (BCR 2.31), tomato (BCR 2.22) and brinjal (BCR 2.34) were financially productive yet bororice was not monetarily gainful (BCR 0.31). Diesel motor worked watering system pump emanates carbon dioxide however sunlight based pump is a domain agreeable watering system innovation.

In 2014, Pietro Elia Campana Ye Zhub, Elena Brugiatie, Hailong Lia, Jinyue Yana [8] Typically, PV water pumping (PVWP) frameworks for watering system are regularly composed in light of the most exceedingly bad conditions, for example, high water request and low sun oriented illumination. In this way, the introduced PVWP frameworks get to be larger than usual in a large portion of time. Since the ordinary control frameworks don't streamline the water supply, the water misfortunes are expanded. To cure the issues identified with the operation of the larger than usual frameworks, a novel control framework is proposed. The control unit collaborates between water request and water supply keeping in mind the end goal to pump just the sum required by yields. In addition, the novel control framework substitutes the ordinary assurance approach with a technique in light of the ground water assets accessibility and reaction. The novel control framework speaks to a creative answer for water funds in PV watering applications.

In 2014, Chi Zhang , Jinyue Yanab [9], examined entrance of the renewable business sector of Photovoltaic PV advancements requires the expansion of the extra values created from the innovation including atmosphere and social co-advantages as radical developments in another plan of action. Contrasted and existing PV plans of action, this paper develops the worth suggestion into operation framework and client division, examined by a pilot exhibit of PV water pumping (PVWP) frameworks for the preservation of prairie and farmland in China. The paper recommends that the coordinated PVWP frameworks can join the usage of innovation with ecological co-advantages, farming items by building up an intuitive interface to connect an informal

community. This can promote spread advantages to empower the dynamic interests of speculations from people and organizations. Discounted cash flow (DCF) model and net present value (NPV) assessments have been directed on the customary PV rooftop, PVWP pilot and PVWP scale up situations. The outcomes demonstrate that the situation of coordinated PVWP framework with interpersonal organization items can fundamentally enhance the payback period (PP) and increase internal rate of return (IRR). Taking into account the PVWP pilots and applicable modern situations, the outcomes in this paper give how the imaginative PV plan of action advancement can enhance the present practices and strategies on PV innovations execution.

In 2015, Balkeshwar Singh and Anil Kumar Mishra [10] considered the renewable vitality sources when all is said in done, and Solar Energy source specifically, and it's capability to give vitality administrations zero or very nearly zero outflow. The sunlight based vitality is bounteous and no other sources in renewable vitality resemble sun powered vitality. The sun based fuelled pumping framework can be utilized anyplace however it is fitting for provincial territories which is confronting vitality emergency. Because of geological position, sultanate of Oman and inlet locale has plentiful daylight during the time which makes it perfect area for usage of sun powered vitality. Little homesteads, towns, and creature crowds' in creating nations require water driven yield force of not exactly a kilowatt. A hefty portion of these potential clients are too a long way from an electrical matrix to monetarily draw from that wellspring of force, and motor driven pumping has a tendency to be restrictively costly and additionally inconsistent because of the high cost of bought fuel and inadequate support and repair abilities.

III. METHODOLOGY

A. Making Water Tank

Two piece of blank of G.I. sheet have been cut from G.I. sheet having length 1000 mm and width 1000 mm by using shear cutting machine. Bending operation has done on bending machine and making required shape and size on hydraulic press. Welding operation has done by using oxy-acetylene gas welding machine with the help of filler material. A source tank and discharge tank has been made of size 400 mm x 400 mm x 300 mm.

B. Frame of Solar Water Pump

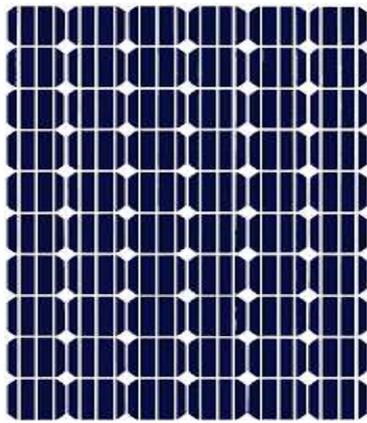
Frame of solar water pump has been made by using mild steel square pipe and angle bar of different size. Frame of solar water pump has been made by joining all mild steel square pipe and angle bar with the help of arc welding machine .G.I. sheet has been fixed on the table using rivets by riveting machine.

C. Pump with Shaft Coupling

Shaft coupling has been made from mild steel of length 105 mm having different in diameter of 25 mm, 15 mm and 11 mm using lathe machine. A hole of diameter 4 mm has been made by drilling machine Pump has been used for pumping water. A shaft coupling is used for fixing impeller on one end of shaft then placed in the pump. The other end of shaft is connected to DC motor shaft with the help of tapping screw.

D. D C Motor

A D C motor of model – MY1016, voltage- 24v, speed – 2500 rpm, current – 14 Amp and output – 250 watt has been used for driving water pump. It has been purchased from market. An electric motor is a machine which converts electrical energy to mechanical energy. Its action is based on the principle that when a current-carrying conductor is placed in a magnetic field, it experiences a magnetic force whose direction is given by Fleming's left hand rule. When a motor is in operation, it develops torque. This torque can produce mechanical rotation.



E. Solar Panel

A solar panel is a packaged, connected assembly of photovoltaic cells. Solar panel is rated by its DC output power. It has crystalline silicon cell and 8 A/21.6 V; 150 watt. It has a size of 1480 mm x 660 mm. The efficiency of a panel is determined by the area of a panel. Solar panels use light energy from the sun to generate electricity through the photovoltaic effect. Electrical connections are made in series to achieve a desired output voltage.

F. Pipe and Elbow

A mild steel pipe of diameter 1/2" has been used as a suction pipe and PVC hose pipe of diameter 1/4" has been used as delivery pipe. An elbow of diameter 1/2" has been used for connecting two mild steel suction pipes. A delivery pipe of small diameter has been used to increase the pressure inside pump.

G. Motor pump fixture

A motor pump fixture of G.I. sheet has been made for fixing motor pump assembly system on table. It has been fixed on the table with the help of nut and bolt. It has been used for arresting vibration during running motor pump.

Assembly of Solar Water Pump System a different part of solar water pump system has been made and then assembled together. An assembly of solar water pump system is

H .Pump controller

The primary function of a pump controller in a battery-coupled pumping system is to boost the voltage of the battery bank to match the desired input voltage of the pump. Without a pump controller, the PV panels' operating voltage is dictated by the battery bank and is reduced from levels, which are achieved by operating the pump directly off the solar panels. For example, under load, two PV panels wired in series produce between 30 to 34 volts, while two fully charged batteries wired in series produce just over 26 volts. A pump with an optimum operating voltage of 30 volts would pump more water tied directly to the PV panels than if connected to the batteries. In the case of this particular pump, a pump controller with a 24-volt input would step the voltage up to 30 volts, which would increase the amount of water pumped by the system.

IV. Applications

- i. Drinking water supply
- ii. Village water supply
- iii. Livestock watering
- iv. Irrigation
- v. Process industry

V. Analysis of Solar Power System

A. Specification of site conditions.

Define the site and weather station location (latitude, longitude) and the monthly average values of the global irradiance on the horizontal surface (kWh/m²) and the annual Main factors affecting the solar availability are the orientation (tilt and azimuth angel) and the possible shading caused by the surrounding. By multiplying the horizontal radiation values with monthly tilt azimuth angle factor, the monthly radiation values on the module surface can be estimated. This monthly factor is presented for different location for horizon shadowing levels of 0, 20 and 45 degrees Shadow: 0, 20° horizon shading, Tilted: 45° angle due south.

The second reason also leads to the important issue of minimizing loads without decreasing the user's comfort.

Solar pump sizing:

Solar pump sizing: $HE = V \times H \times \rho_w \times g / (3.6 \times 10^6)$

Where: HE : hydraulic energy (kWh/day)

V : volume (m³/day)

ρ_w : water density ≈ 1000 (Kg/ m³)

g : gravity ≈ 9.82 m/s² $P_{pv} = HE / ((S / \text{days of operation}) \times F_x$

Where: Ppv : is the nominal power of PV at standard test condition (STC) in (kW)

B. Estimation of the electricity demand.

The very first step in designing a PV system must be careful examination of the electrical loads. The reasons are twofold:

I. Obviously, the sizing of the system components is dependent on the electricity and power demand. For stand-alone systems, this is crucial.

II. Oversized systems resulting from a poor load analysis and the idea of staying on the 'safe side' increase the system costs. This is particularly demanding in a field where poor economics are a major drawback, which still is the case for PV.

S: the annual solar radiation of the PV array (kWh/m²)

F: array mismatch factor = 0.85 on average.

E: daily subsystem efficiency = 0.25 - 0.40 typically

: Solar panel tilt angle (Summer Use: tilt angle = 25 degrees, Winter Use: tilt angle = 45 degrees). Worksheet

#1: Define site condition and solar availability.

VI. RESULT

From Literature study & Solar Energy concepts, we have prepared the layout of solar pump system which is Eco-friendly system and No conventional Power is required for its working.

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