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# Design and Analysis of Solar Power based Reciprocating Water Pump

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**ABSTRACT:** Improvement in irrigation field needs to be implemented for better economic background of our country. In present days, people need more and more power for driving instrument. The most efficient solar renewable energy should be used in a better way to obtain the expected outcome. Which is eco-friendly and run with low power consumption compared to centrifugal pump, submersible pump and other fuel based pump. The ultimate aim is to lift the water from the lower surface and below the surface of water resources. So the electrically charged PV panel by solar rays is directly connected to electrical component as a Battery. Charged battery provides electrical power to run the DC Gear motor which provides crank shaft mechanical power. Consequently it provides the power to drive the reciprocating pump.

**KEYWORDS:** Solar, PV Panel, Battery, DC Motor & Reciprocating Pump

## I.INTRODUCTION

Conventional energy and Non-conventional energy are the two types of resources. In which conventional energy resources are mostly preferred and conventional energy sources can also be obtained easily. Conventional energy resources such as natural gas, oil, coal and uranium etc. Due to this reason its uses more than the non-conventional energy sources. Now a days innovation and development in technologies are developing fastly with higher accuracy. Which is required more demand of conventional energy as much as possible. Due to this reason in future there will be no availability of conventional energy resources.Then non-conventional energy resources are replaced by conventional energy resources. Such as last many years farmers has been using diesel pump for the irrigation purpose for agriculture. Diesel pump is to be run by diesel as fuel which is conventional energy source. Today the demand and cost of the diesel is increasing and very expensive day by day. Due to this reason the running cost of the diesel pump is very higher.
In this project we propose an automatic irrigation system using solar power which drives reciprocating pump to pump water from lake, river, bore wells, and canals to the outlet is automatically regulated using controller.

## II.LITERATURE REVIEW

One major issue engineers come across working with pneumatic cylinders has to do with the compressibility of a gas. Many studies have been completed on how the precision of a pneumatic cylinder can be affected as the load acting on the cylinder tries to further compress the gas used. Under a vertical load, a case where the cylinder takes on the full load, the precision of the cylinder is affected the most.

**Dhimant L. Panchal, Kamlesh H. Makwana, Sugam V. Panchal , Mayur R. Panchal proposed SOLAR POWERED RECIPROCATING PUMP[1].** Irrigation technology changing rapidly for application of agriculture or cultivation. The solar operated reciprocating pump is most suitable due to availability of plenty of solar energy. Which is eco-friendly and run with low power consumption compared to centrifugal pump, submersible pump and other fuel based pump. In additionally there is no time consumption for users. Our objective is to provide the water from the level of surface and below the surface of water resources. So the electrically charged PV panel by solar rays is directly connected to electrical component as a Battery. Charged battery provide electrical power to run the DC Gear-motor

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which provide mechanically power to the mechanism of chain drive. Consequently it provide the power to drive the reciprocating pump.

**Relevance to current Research**

**Suhagiya Falcon proposed Development of Solar Powered Water Pumping System [2].** Providing clean, environmentally safe water for livestock in sufficient quantities continues to be a major concern for farmers and ranchers. Abundant water in remote locations in needed to insure that grasslands are grazed evenly. A solar powered water pumping system designed for remote locations was operated to determine the performance and reliability of the system and determine the performance and reliability of the system and components. The system began pumping water when the solar radiation intensity exceeded. Flow increased linearly with radiation intensity and reached a maximum flow of intensity. Maximum flow was dependent on using the correct controller adjustment as well as the radiation intensity. Solar water pumping system operates on direct current. The output of solar power system varies throughout the day and with changes in weather conditions. Photovoltaic module, the power source for solar pumping, have no moving parts, requires no maintenance and last for decades. A properly designed solar pumping system will be efficient, simple and reliable. Solar powered pumping systems are used principally for three applications town and city water supply, livestock watering and irrigation.

**Relevance to current Research**

**Sapna Wagh, Prasad Wagh, Amit Mawale, Akshay Agarkar, Sateesha Patil proposed A Review Solar Tracking System with Reciprocating Pump [3].**In present days, people need more and more power for driving instrument. A solar based reciprocating pump is a pump, running on electricity generated by solar cell, available from collected sunlight as opposed to greed electricity or diesel run water pump. Nowadays many types of pump are available such as, positive displacement pump, impulse pump, velocity pump, gravity pump, steam pump, valve less pump.

A reciprocating pump is class of positive displacement pump, is used for variety of purpose such as, car washing, irrigation, color spraying, extraction of oil from bottom of the earth, large fountain, garden water pump, etc. A solar reciprocating pumping systems is believed to be applicable to many remote and domestic irrigations applications without access to electricity relaying diesel power and having insufficient wind for pumping and to be cost competitive, locally manufacturable alternative to photovoltaic. This system consists of solar collector, battery, motor, crankshaft, reciprocating pump, valve, and tank. In this project work, we are planning for design and developing a solar tracking system which will utilize mechanical energies for the tracking operation.

**Relevance to current Research**

**M.Bala Raghav, K.Naga Bhavya, Y.Suchitra proposedDesign of Solar Power Based Water Pumping System[4]**Day by day the use of non-renewable energies havebeen increased a lot and now they are becomingextinct.The raw materials used to generate poweri.e. coal,fossil fuels have been depleting veryrapidly.People have been suffering a lot due toimmense power cuts. To get out of these problemswe are going for the renewable energies likesolar,wind,biomass etc. As agriculture is heart of a country and every individual depend on agriculturefor food.

Farmers have been facing horribleproblems due to power cuts. Our paper is asolution for this problem.We are now coming upwith the design of “Solar power based waterpumping system”.

**Relevance to current Research**

**M. Abu-Aligah proposed Design of Photovoltaic Water Pumping System and Compare it with diesel powered pump[5].**In locations where electricity is unavailable, other means are necessary to pump water for consumption. One option is a photovoltaic (PV) pumping system. Advantages of PV pumping systems include low operating cost, unattended operation, low maintenance, easy installation, and long life. These are all important in remote locations where electricity may be unavailable.

So far, in the development of this research, the focus has been to estimate the available radiation at a particular location on the earth’s surface and then analyzed the characteristics of a photovoltaic generator and a photovoltaic network. The purpose of this research is to examine all the necessary steps and key components needed to design and build a pump using photovoltaic system.

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## III.METHODOLOGY OF PROPOSED SURVEY

### MANUFACTURING PROCESS

Manufacturing processes are the steps through which raw materials are transformed into a final product. The manufacturing process begins with the creation of the materials from which the design is made. These materials are then modified through manufacturing processes to become the required part. Manufacturing processes can include treating (such as heat treating or coating), machining, or reshaping the material. The manufacturing process also includes tests and checks for quality assurance during or after the manufacturing, and planning the production process prior to manufacturing.

### METAL CUTTING

Metal cutting or machining is the process of by removing unwanted material from a block of metal in the form of chips.

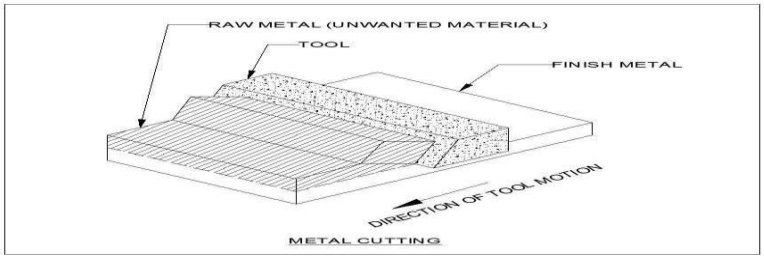


**Figure 1- METAL CUTTING**

Common cutting processes include sawing, shaping (or planning), broaching, drilling, grinding, turning and milling. Although the actual machines, tools and processes for cutting look very different from each other, the basic mechanism for causing the fracture can be understood by just a simple model called for orthogonal cutting.

### SAWING

Cold saws are saws that make use of a circular saw blade to cut through various types of metal, including sheet metal. The name of the saw has to do with the action that takes place during the cutting process, which manages to keep both the metal and the blade from becoming too hot. A cold saw is powered with electricity and is usually a stationary type of saw machine rather than a portable type of saw.

### WELDING

Welding is a process for joining similar metals. Welding joins metals by melting and fusing 1, the base metals being joined and 2, the filler metal applied. Welding employs pinpointed, localized heat input. Most welding involves ferrous-based metals such as steel and stainless steel. Weld joints are usually stronger than or as strong as the base metals being joined.

### DRILLNG:

Drilling is a cutting process that uses a drill bit to cut or enlarge a hole of circular cross-sectionin solid materials. The drill bit is a rotary cutting tool, often multipoint. The bit is pressed against the work piece and rotated at rates from hundreds to thousands of revolutions per minute. This forces the cutting edge against the work piece, cutting off chips (swarf)from the hole as it is drilled.

### INSPECTION:

Critical appraisal involving examination, measurement, testing, gauging, and comparison of materials or items. An inspection determines if the material or item is in proper quantity and condition, and if it conforms to the applicable or specified requirements. Inspection is generally divided into three categories:

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(1)Receiving inspection, (2) In-process inspection, and (3) Final inspection. In quality control (which is guided by the principle that "Quality cannot be inspected into a product") the roleof inspection is to verify and validate the variance data; it does not involve separating the good from the bad.

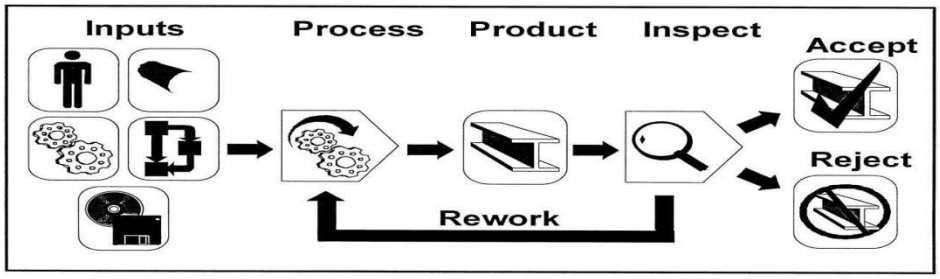


**Figure 2- INSPECTION**

## IV. CONCLUSION AND FUTURE WORK

The project carried out by us made an impressing task in the field of agriculture industries. It is very usefully for famer for supplying water on their fields. This project has also reduced the cost involved in the concern. Project has been designed to perform the entire requirement task which has also been provided.

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