

# DESIGN AND FABRICATION OF SINGLE BARREL SOLAR PUMP

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## ABSTRACT

*The objective of project is to study, fabricate and experience the working of solar operated barrel pump. The basic principle behind the working of this machine is "scotch yoke mechanism"*

*"Scotch yoke mechanism" is a reciprocating motion mechanism, converting the linear motion of a slider into a rotational motion or vice versa.*

*The mechanism consist of two link from which one is connected to the motor and another one is connected to the piston of barrel pump.*

*When the motor rotates the link connected to the motor shaft rotates along the circumference of circle, the final link generate the reciprocating motion of the piston of barrel pump for suction and discharge of water.*

*Running the motor with the help of solar energy the reciprocating action of piston moves to and fro, this suction and discharge of water. Thus the tank can be filled with full of water without using any conventional energy like fuel or electricity. As this whole setup does not consume either electric power or fuel and contribute in the effort to save the conventional energy sources. The solar operated pump gives better results when compared with the nominal submersible pump.*

**Keyword:** - barrel, battery, charge controller, motor, solar panel.

## 1. INTRODUCTION

Agriculture is the back bone of the rural India. Despite the agriculture contribution to the country's GDP, agriculture is the biggest industry in the country and plays a key role in the socioeconomic growth of the country.

Due to India's geographical location, certain parts experience different climates, thus affecting each region's agricultural productivity differently. India is very dependent on its monsoon cycle for large crop yield. In some region there is no need to worry about water availability. But in today's condition there is an enormous change has done in the climate. This results in affecting the water level on the earth surface. In the summer lots of farmers have to suffer from scarcity of water. Even the have water available in their wells, they sometimes does not have source to lift that water up to supply to the crops.

By a small study we have found that in summer season the availability of electricity is very much less. Due to this the farmers cannot supply the water to the crops at specific duration and thus it affects growth of the crops. For irrigation many farmers install submersible pump in their well. Which may cost them at high range sometime. And due to this reason many farmers cannot afford this setup.

By considering above mentioned observation we went through a study whether any alternative machine can perform the same kind of duty and save conventional energy or sources. Instead of submersible pump we designed a cylindrical shaped barrel which has multifunction of suction and delivery at same time, this barrel will exactly work like submersible pump but it has a different power source. This barrel is connected to a 50 W motor which works on a 12 V battery. The battery is rechargeable and is very much effective in terms of water availability, in terms of electricity present. Through this barrel we can lift from ground surface. It has simple scotch yoke mechanism which controls all over the operation.

### 1.1 Objectives

Our main concentration to present high efficient solar water pump at low cost

- The main object of our project is to design and fabrication a solar water pump so that our Indian farmers can utilize it at affordable cost.
- Helps in providing the critical protective irrigation in water scarce areas.
- Improves agricultural productivity.
- No fuel costs and minimal maintenance cost.
- Move economical that diesel pump sets in the long run.
- Solar pump are useful where grid electricity is unavailable and alternative source do not provide sufficient energy.

## 2. CONSTRUCTION AND WORKING PRINCIPLE

It consists of following components:

- Solar panel
- Charge controller
- Battery
- Motor
- Barrel

We used polycrystalline solar panel of 120W, which is used to charge the battery. The type of battery used is Lithium ion of 12V, 9 AH. A charge controller, charge regulate or battery regulator limits the rate at which electric current is added to or drawn from the electric batteries. It prevents overcharging which can reduce battery performance or life span and may pose a safety risk. It may also prevent completely draining (“deep discharge”) a battery, or perform controlled discharges depending on the battery technology, to protect battery life. The motor is of 84W and its torque is 45kg- cm. It has planetary gear box which helps to adjust the speed by adjusting the gear ratio. The barrel has two valves inside the barrel which works during suction and discharge. The piston inside the barrel moves from BDC to TDC and TDC to BDC.

**Working-** The working principle of this model is the ‘scotch yoke mechanism’.

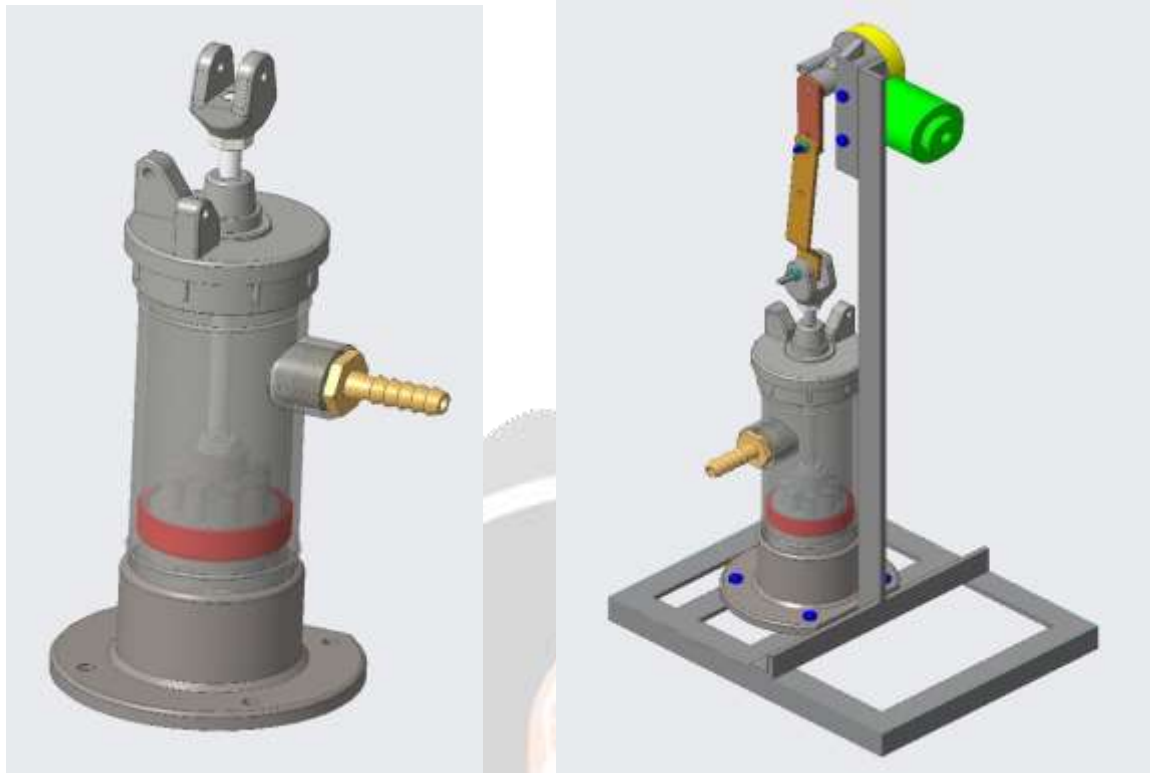
The polycrystalline solar panel converts the solar energy into electric energy. This electric energy is used to charge the battery which is converted to charge controller. As it prevents overcharging of battery and back flow of current. The motor is driven by battery.

The mechanism consist of two link from which one is connected to the motor and another one is connected to the piston of barrel pump.

When the motor rotates the link connected to the motor shaft rotates along the circumference of circle, the final link generate the reciprocating motion of the piston of barrel pump for suction and discharge of water.

Running the motor with the help of solar energy the reciprocating action of piston moves to and fro, this suction and discharge of water. Thus the tank can be filled with full of water without using any conventional energy like fuel or electricity. As this whole setup does not consume either electric power or fuel and contribute in the effort to save the conventional energy sources. The solar operated pump gives better results when compared with the nominal submersible pump.

There are two flaps inside the barrel one is placed at the bottom and another is just above if both the flaps works simultaneously at each stage. In first stage there is a suction. As the piston moves up, the bottom flap opens and the water comes inside the barrel. In the second stage the piston comes down and the water moves up as the second flap connected with piston get opens. At third stage the piston move up. At this time suction and delivery both takes place by keeping the upper flap close and bottom flap open and the cycle continuous.



**FIG. Cad Model**

### 3. FUTURE SCOPE :

- Using multi barrel will give continuous flow of water.
- By some further improvements this model can be used for domestic purpose.

### 4. CONCLUSION:

- Through this model we can provide the most necessary content requires for farming i.e. water to the farm.
- The farms where no electricity or very few electricity is available can get an advantage of solar energy. And this energy is not only can use for our model but also for other work.
- Through this model we can provide water for irrigation at night as well as it can be stored as well.
- A diesel pump gives discharge of 500 lit/hr. and our setup gives discharge of 480 lit/hr. This is less than diesel pump but this is effective and have long duration without any maintenance problem.
- If we use multi barrel then a continuous flow of water and discharge can be achieved.

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