

Development of Solar Operated Hybrid Spray Pump

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Abstract - In this product we have used non conventional energy to run the sprayer. Non conventional energy means the energy is renewable, unlimited and pollution free. A solar operated hybrid spray pump runs on the electricity generated by the photovoltaic cell as well as electrically charged by the grid. The operation of solar powered pumps is more economical mainly due to the lower operation and maintenance costs and has less environmental impact. When the electricity is not available on the grid, in this condition the solar energy is used to charge the battery. The design of this product is done by considering parameters like low weight, low cost, user-friendly nature, and high operating time for faster coverage of area. the product includes 12V 12W solar panel, 12V 12ah DC battery, 200 psi water pump, flow control valve, a chassis with 3 wheels on which the sprayer is mounted, and a hose attachment for spraying.

A sprayer consists of a 50 liter tank for carrying the mixture of liquids to be sprayed. The solar sprayer has many advantages, besides reducing the cost of spraying; there is a saving on fuel/petrol. The solar panel converts the UV rays into the electricity. By using the curve shape for spraying it finds to be effective. The spraying time is reduced than the hand operated spray pump. The farmer can do the spraying operation by himself without engaging labor, thus increasing spraying efficiency.

Keywords: Solar Panels, Solar Pump, Sprayer, Photovoltaic Cell (PV).

1. Introduction:

In India about 73% of population is directly or indirectly depends upon the farming. Hence it is said that India is an agricultural based country. [2] Renewable energy resources are the most preferable resources for generation of electrical energy because they are environment friendly. Solar energy is one of them. The total energy we receive from the sun far exceeds our energy demands.[8] It is most important renewable energy sources that have been gaining enlarged attention in recent years. The energy which is available from the sun is in nature at free of cost. In India solar Energy is available around 8 months in year. We have designed the Solar operated Hybrid spray pump as a multisource pump.

This product is solar operated as well as charged grid operated, it is use for agriculture purpose. It is a mechanical device which is designed for the farmers' help to reduce the effort of the farmers as well as reduce the maintenance cost

and operating cost. In this project we have used solar panel. The photovoltaic cell converts the solar UV rays in electricity. This converted energy is utilized to store the voltage in the DC battery and that battery is further used for driving the water pump.

There will be elimination of engine of fuel operated spray pump by which there will be reduction in vibrations and noise. High pressure water pump is used to increase the pressure of water during spraying. The water pump is connected to the battery by using wires. The clearance of the chassis from the bottom is 1feet -1.5feet. Because of this clearance the trolley can be pushed easily with fewer efforts. The whole spraying components are mounted on the trolley. In this design, we can eliminate the back mounting of Sprayer ergonomically it is not good for farmer's health point of view during spraying.

There are 3 wheels used for the making of trolley front wheel size is greater than the back wheels to maintain the balance. In this system we are remove the solar panel in working condition. By this the solar will be not damage by the crops or liquid.

2. Problem Definition:

A backpack sprayer consists of tank 10 -20 liter capacity carried by two adjustable straps. Constant pumping is required to operate this which results in muscular disorder. Also the backpack sprayer can't maintain pressure, results in drifts/dribbling. Developing adequate pressure is laborious and time consuming. Pumping to operating pressure is also time consuming. Moreover, very small area is covered while spraying. So, more time are required to spray the entire land Back pain problems may arise during middle age due to carrying of 10-20 liter tank on back.

3. Objectives:

This research study intends the utilization the inherently available solar energy in spraying operations:

1. To reduce the maintenance cost.
2. To increase the efficiency of the spray pump.
3. To develop a spraying method.
4. To reduce the weight of spray pump on the back of human body.

5. To reduce the charging cost using solar energy.

4. Proposed Methodology:

In this project we have added the trolley at the base, to reduce the weight of backpack. By adding the trolley the back pain will be reduced. By using the four wheels it will be easy to push the trolley. Also by adding the DC water pump to maintain the pressure for constant pumping of fluid. Creating constant pressure for spraying will be easy. Using the mechanical equipment for spraying would require more time. By using solar energy there is no need of electricity to charge the battery.

Using the curve shaped sprayer proper spraying can be done. The spray pump operated by using electricity and solar energy it will be eco-friendly. The maintenance cost is less. By using the flow regulator the flow will be regulate as per requirement or need.

5. Components:

1. Solar Panel:

The way the solar power is collected is from the radiant heat of the sun. The function of solar panels is to gather that energy and convert it to electricity to bring power to industry, homes and small businesses. The function of solar panels occurs because of the components of what makes up a solar power system.

Specification of solar panel:

- Size:
- Cost: 1600
- Rated voltage: 12V
- Rated power: 12 W
- No of solar panel: 1

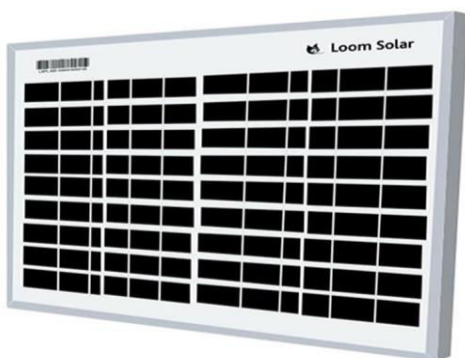


Figure 1 Solar Panel

2. Battery:

To store the energy and provide whenever needed is the function of battery. Usually this type of batteries is used for small applications. The battery life is good for use and they are rechargeable.

Specification of battery:

- Type of battery: leads acid battery
- Rated voltage: 12V
- Rated current: 12Ah.
- Number of batteries: 1



Figure 2 Battery

3. DC Motor: (Water Pump)

DC motor is used to lift the pesticide from tank and delivers to sprayer. It runs on the electricity.

Specification of DC motor: (Water Pump)

- Flow: 8 LPM
- Required Voltage: 12 V
- Pressure: 200 psi
- Power Supply: DC



Figure 3 DC Motor

4. Sprayer:

A sprayer of this type is a great way to use Hybrid energy. Solar based pesticides sprayer pump is one of the improved versions of petrol engine pesticide sprayer pump. It uses the solar power to run the motor. So it is a pollution free pump compared to petrol engine sprayer pumps.



Figure 5 Nozzle

5. Tank

Storage tanks are containers that hold liquids for long. This is mainly used to reserve the fluids. Storage tanks are available in many shapes: vertical and horizontal cylindrical open top and closed top flat bottom, cone bottom, slope bottom and dish bottom.

Specification of tank:

- Capacity: 50 liters
- Price: 300
- Material: PVC



Figure 6 Tank

6. Pipes:

It is a connection between tanks to spray gun that helps to regulate required pressure from tank to sprayers.



Figure 6 Pipes

Trolley:

The trolley are generally used to the transport a material one place to the another place.



Figure 7 trolley

6. Conclusion:

The aim of the paper is to utilize the solar energy and use it to operate the spray pump. The output of a solar pumping system is very dependent on good system design

derived from accurate site and demand data. This model of hybrid solar sprayer pump for agriculture is more cost effective and gives the effective results in spraying operation. As it runs on the non conventional energy source i.e. solar energy, it is widely available at free of cost. This model is designed to be eco friendly and lower cost, and thus will prove to be more efficient when compared to the other spray pumps.

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