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## Design and Development of Solar Based Pesticide Sprayer

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**Abstract:** “Energy –demand” is one of the major threads for our country. finding solutions, to meet the “energy demand” is the great challenge for social scientist, Engineers, Entrepreneurs and Industrialist of our country. According to them, Applications of Non conventional energy is the only alternate solution for conventional energy demand. Now –a-days the concept and Technology employing this Non-conventional energy becomes very popular for all kinds of development activities. one of the major area, which finds number applications are agriculture sectors. solar energy plays an important role in drying agriculture products and for irrigation purpose for pumping the well water in remote villages without electricity. This technology on solar energy can be extended for spraying pesticides, Fungicides and Fertilizers etc., using solar sprayers, this paper deals how a ‘power sprayer’ which is already in use and works with fossil fuel can be converted into solar sprayer’s works any fossil fuel.

**Keywords:** Spray pump, agricultural spraying equipment

### INTRODUCTION

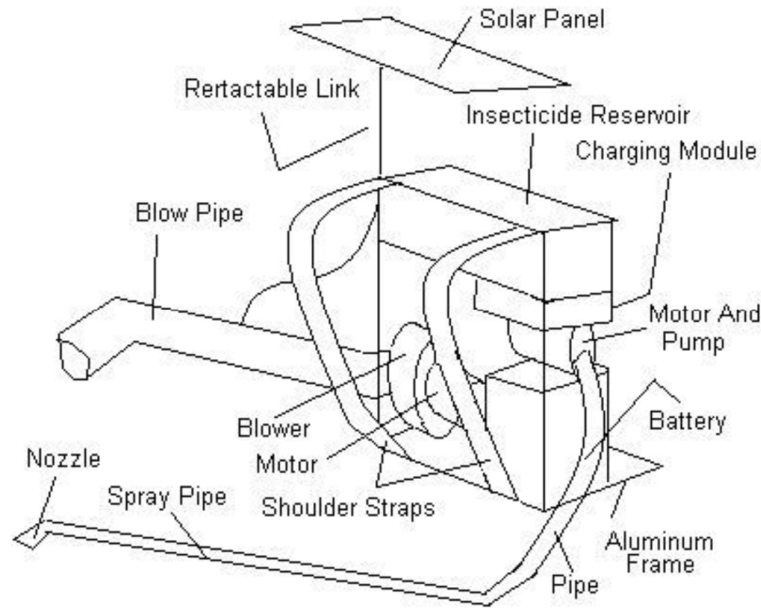
In this project an aluminum frame is constructed using aluminum bars to keep the weight of the frame low. In this frame a retractable links is fixed to the top end of which a solar photovoltaic panel is fixed that that converts solar power into electricity. This electricity is then provided to battery via a charging circuit and is used for charging circuit and is used for charging the battery. Electric power from this battery is given to an electric motor via control switches. By controlling which entire device can be operated. to the shaft of this electric motor a blower fan is connected. This blower fan is connected. This blower blowers high speed air into the blower pipe.

This blower pipe is held with hand by the device operator and is directed onto the area where he wishes to spray the pesticides / insecticides. The insecticide reservoir is connected to the blower pipe. By continuously feeding this insecticide to the blower pipe the same is spread or sprinkled where wished. Liquid insecticide is sprayed on the crops using Spray pipe, which receives liquid from a reservoir with the help of a pump. This pump is driven by another DC motor that receives power from the same battery. Thus insecticide in liquid where wished. The project can also run emergency lamp using battery power thus this project can be of very much use and can be very beneficial for farmers. The running cost of project is nil.

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## 2. Equipment Uses

- Spraying fluid tank
- Spraying pipe.
- Solar panel.
- Battery.
- Charger.
- Pump.
- Motor, Etc.....

## 3. Specification

### 3.1 According to Spraying Capacity & Discharge Capacity of Spray Motor Is Selected

- Weight of the motor : 1kg (approx)
- Current : 7Amp
- Operating power required : 84 watt
- Operating Voltage : 12V
- Motor Speed : 1,600 rpm.
- Discharge Capacity : 0-12 Lit/min
- Flow rate : >560ml / 10 seconds
- Fluid pressure : 1.6kgf/cm<sup>2</sup>

### 3.2 According To Motor Operating Power Battery Is Selected

- Weight of the battery : 2 kg.
- Cost of the battery : Rs.1200
- Output power : 144 watt.
- Operating voltage : 12v

### 3.3 According to Battery Output Power Solar Panel Is Selected

- Power : 10 watt

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- Dimension : 397\*278\*25 mm
- Weight : 1.6 kg
- Open Circuit Voltage : 21.5 volt
- Short Circuit Current : 0.65Amp
- Operating Current: 12 Amp.

## 4. Working of Solar Sprayer

### 4.1 Working Principle and Operation

Solar radiation can be converted directly into electricity using semiconductor devices, which are known as Photovoltaic (PV) cells. When Sunlight falls upon the Solar cell a part of the light is absorbed and it is converted into Electrical Energy by means acid battery for storing the electrical energy. A 12V DC motor is connected to these lead acid battery to convert the electrical energy into mechanical energy.

### 4.2 Operating System of Solar Panel

Charging can be done using a solar Panel. Battery can be charged continuously during discharge itself, by attaching the Panel on the sprayers. Without Panel on the sprayers, discharge can be done for a minimum period of 4 to 5 hours. By changing the battery, discharge can be continued for further more hours. Charging can be done by separate Solar Panel attachment.

### 4.3 Working of Solar Sprayer

The solar agro sprayer consist of three main parts namely,

- Solar panel unit
- Storage battery unit and
- Rotating motor.

In the solar agro sprayer the two stroke petrol engine component of the power sprayer has been replaced with a combination of storage battery and rotating motor. The action of the rotating motor could be controlled by a switch attached with it in the assembly. Solar panel arrangement has been provided at the top of the unit to charge the storage battery. The units of solar panel, storage battery and a rotating DC motor were mutually attached with one another. A solar panel of size of 1 area with an output power of 75 watt has been mounted on a circular metal frame which is enclosed over the cylindrical chemical tank of capacity of 10 L. The solar panel arrangement was made at an angle of  $45^\circ$  to the vertical so that it should not create any person who is loading the unit on his back. Moreover it is able to receive maximum solar radiations continuously from the sun during the operation of the unit in the field. The output of the panel is connected in parallel with the 12 V storage battery to store the electrical energy from the panel. The 12 V battery is properly connected with a 12 V DC motor attachment on the frame. The operation of the motor is controlled by a press type switch attached on the assembly energy received from the solar cell stored in a storage battery unit for application. This stored electrical energy can be converted in to mechanical energy by rotating the motor. For this mechanical operation there is no need of conventional fuel like petrol and oil.



Fig.2: Solar Panel Unit

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Working of this pump is simple. Solar panel collects the solar energy into electricity and supplies it to battery. Battery uses this electricity to charge itself. This battery next is used to operate motor and lighting system. Motor attached at the bottom of tank sucks the liquid from tank and deliver it. The 'ON' and 'OFF' of motor is controlled with handle attached to spray gun. A switch is given there to operate its function. As the handle is pushed, the valve of gun is released and at the same time the current to motor. Thus motor sucks liquid and deliver it through delivery pipe.

## 5. Calculation

### 5.1 Analytical Calculation of Current & Charging Time of the Battery

- The current produced by the solar panel (I) was calculated by knowing the maximum power (P) of the solar panel and the voltage rating (V) of the battery that is given by  $I=P/V$  Therefore,  $I=10/12 = 0.83$  Ampere
- Charging time (T) was computed by taking the ratio rating current consumed by the solar panel.
- $T=$  (battery rating in ampere hour)/(total current consumed by the solar panel) Therefore,  $T=12/0.83=14.45$  hours

## 6. Advantage

- Easy in construction
- More economical
- Easy to clean and maintain
- It is a renewable energy source
- It does not create air pollutant & noise
- Easy to handle
- Do not required fuel hence cost reduce for spraying

## 7. Result

The proposed system was tested with AC charging as well as solar charging. From the results it was found that the current and time required for charging the full battery capacity of 12V, 12Ah by practically is 14.45 hours and hours. The fully charged battery approximately spray 5-6 acres of land. It was also found that, if we charge the battery in a day it can be used to spray 200 liters of fertilizer. The initial cost of the proposed system is little more as compared to conventional sprayer but the running cost of the system is very less. The developed system used for spraying the fertilizer, pesticides, fungicides and painting.

## 8. Conclusion

As we know 70% of population of our country lives in villages & their main occupation is agriculture. The prominent aim of this project is to fulfill the tasks like hand spraying, IC engine spraying, and leg pump spraying etc. using non-conventional energy sources. Thus solar operated spray pump will help the farmers of those remote areas of country where fuel is not available easily. They can perform their regular work as well as saves fuel up to large extent. At the same time they reduces environment pollution. Thus saving revenue of government & also most demanded fuel.

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