

Review on Non Conventional Energy Source Operated Agricultural Pesticide Compact Spray Pump

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ABSTRACT: “Energy - demand” is one of the major threats 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 areas, which finds applications are in 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 uses and works with fossil fuel can be converted into solar sprayer that works without any fossil fuel.

KEYWORDS: Spray Pump, Agriculture Spraying Equipment.

I. INTRODUCTION

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

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.

II. RELATED WORK

“Energy - demand” is one the major thread 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 in Agriculture Sectors. Solar energy plays an important role in drying agriculture products and for irrigation purpose for pumping the well water in remote

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This paper illustrates invention and operation of multiple granulated pesticides duster with the use of solar energy. The concoction is accomplished by the use of solar panel, impeller type centrifugal blower, gear reduction mechanism, dispensers, D.C motors and batteries. In addition, the duster has been equipped with a facility to operate on an electric supply, which serves beneficial in the absence of sunlight. The device essentially works for disbursing solid granulated (powder) form of pesticide. The operator controls the rate and discharge of different pesticides by means of push buttons and toggle switches. The technical specifications of the device are worked and examined in a way to minimize the weight of the device and deplete the feeder unit dispenser in a span of three hours. The duster is portable, low cost device and emerges a boon for small scale agriculture, nursery, horticulture, and community services including farms.

Engineering is making use of that knowledge to meet human needs by creating machine, systems, process and technologies that have not previously existed. Design and manufacturing are the synthetic part of engineering practice. Manufacturer has received a lot of attention recently for very good economic reasons. In Indian farms generally two types of spray pumps are used for spraying; hand operated spray pump and fuel operated spray pump. Of which hand operated spray pump is most popular. The main drawback of hand operated spray pump is that the user can't use it for more than 5-6 hours continuously as he gets tired after some hours where as fuel operated spray pump requires fuel which is expensive and availability of fuel is not easy at rural places. At the same time it exhausts carbon dioxide as pollutant which is harmful to our environment. In such situation we should think to move towards some non-conventional energy. Considering it, solar energy would be one of the solutions. This paper emphasis on the spraying of pesticides using solar power as energy. It can be most often used at various locations such as farms, gardens although it can become more popular in rural areas as well. The additional advantage of this project is it can be used as home lighting system as its battery can be used at night too.

III. CONSTRUCTION DETAILS & SPECIFICATION

In this project an aluminium frame is constructed using aluminium bars to keep the weight of the frame low. In this frame a retractable link is fixed to the top end of which a solar photovoltaic panel is fixed that converts solar power into electricity. This electricity is then provided to battery via a 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 pump is connected spray pipe.

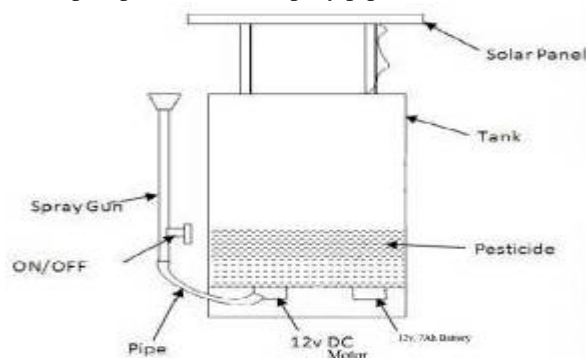


Fig. 1 Conceptual solar agro sprayer Unit

This spray pipe is held with hand by the device operator and is directed onto the area where he wishes to spray the

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pesticides / insecticides. 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 form is sprayed.

Components of Pump

- Spraying fluid tank
- Spraying pipe.
- Solar panel.
- Battery.
- Pump.
- Motor.
- Switch & Pressure Control Knob.

IV. 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 1m² 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 15. The solar panel arrangement was made at an angle of 45° to the vertical so that it should not create any trouble to the 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 enclose of base of the pump. The operation of the motor is controlled by a press type switch attached on the assembly. Energy received from the solar cell is 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 Actual solar agro sprayer Unit

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 system. Motor attached at the

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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 switch is pushed which supplies the current to motor. Thus motor sucks liquid and deliver it through delivery pipe.

V. RESULT & DISCUSSION

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, 7Ah by practically is 8.43 hours and hours. The fully charged battery can be used to spray 580 liters of fertilizer, which 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.

- 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

VI. CONCLUSION

As we know that 70% of population of our country lives in rural area & their main earning source is farming. The main aim of this paper is to fill the tasks like hand spraying, IC engine spraying etc. using non-conventional energy sources. Thus Non conventional energy source operated spray pump will help the farmers of those rural areas of country where fuel is not available easily. They can perform their regular work easily as well as saves fuel up to large extent. Also reduce the human effort by reducing the weight of system.

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