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Solar-Based Pesticide Sprayer

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Abstract: The aim is to build a solar-based pesticide sprayer used to spray the pesticide in the field and can also be used as a multipurpose sprayer. Solar energy is converted to electrical energy by the photovoltaic effect and stored in batteries for various uses. The sprayer's actual field capacity was determined to be 0.14 hectares per hour, giving an average coverage of 1 hectare per day when operating for 8 hours. Other than solar energy, the machine doesn't use any other external sources of power. This model increase spraying capacity by semi-automation process and becomes more economical and eco-friendly.

Keywords: Solar Energy, Agricultural pesticide sprayer, Eco-friendly technology, Multi-purpose system, Charging battery, solar panel, photovoltaic effect.

I. INTRODUCTION

India is fortunate to have an abundance of solar energy because, with the exception of a brief monsoon season, much of the country enjoys strong sunshine all year round. India has created equipment to use solar energy for several purposes, including crop drying, space heating, water heating, water purification, and cooking. The most popular pesticide sprayer on the market is a petrol-powered sprayer, which is heavy to transport, requires a lot of maintenance (to the engine and carburetor), and costs a lot of money to maintain. The electronic pesticide sprayer is a different kind that gave us the idea for this project. Its battery is charged using regular electricity, but it only runs for four hours after that. Therefore, the project's motivation is to increase running time and solar energy collection.

Sprayers are mechanical tools made primarily for fast and conveniently dispensing fluids [1]. There are numerous varieties of them. The focus of this project will be a pesticide sprayer powered by solar energy. This kind of sprayer is a fantastic method to harness solar power. The most cutting-edge kind of gasoline engine pump is a pesticide pump powered by solar energy. It serves a variety of functions and is frequently utilized in the agricultural sector. Compared to a petrol engine pump, this has numerous benefits. The motor is driven by solar energy. In comparison to a petrol engine spray pump, it is therefore less polluting. For domestic equipment like CFL lights and phone chargers, a rechargeable battery can be employed in this design. The solar-powered pesticide sprayer is one of the improved pesticide sprayer pump. Sun is the source of energy on the earth. It is abundant, inexhaustible source of energy.

II. RELATED WORK

Literature survey includes the papers which we have referred for our project. This particular chapter contain about the authors and their contribution on the several concepts. The papers which we have utilized in our project are explained below.

1]. Akashdeep and Shekhar developed a solar pesticide sprayer using technology to address the low flow rate and fast draining issues with the current system of pesticide sprayers. Additionally, the farmer can get a jolt if the system is connected. Our solution protects farmers against all of these issues, whether they are caused by battery drainage, the chemical reaction of pesticides, a low flow rate, or shock. The method prevents battery discharge issues by using solar technology.

2]. A solar-powered pesticide sprayer with a mobile charger and an LED light was proposed by S. Senthilkumar, T. Senthilkumar, L. Ramachandran, D. Devarajaan, V. Mohan, and G. Chitrakal. The solar-powered sprayer is discussed in this article along with some other applications. One of the most advanced and contemporary types is the pesticide sprayer powered by solar energy. The majority of applications for this kind of sprayer are farms, gardens, and pastoral areas. Use of it is thought to be more trustworthy.
Compared to two-stroke engine pumps, it employs solar energy to operate, making it a pesticide pump that requires no maintenance and produces no pollution.

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3]. Joshua et al. converted an existing fossil fuel-powered power sprayer into a solar sprayer. A redesigned solar sprayer model was created and launched for efficient operation without the use of fossil fuels in order to address the issues with the current model and lower the running cost of the power sprayer. The two-stroke gasoline engine was swapped out for a single motor in this updated variant. The 12V battery that was linked to the unit served as the source of power for this. The solar panels can be used to recharge the 12V battery.

III. PROBLEM IDENTIFICATION

Previous models were having low flow rates, fast battery drainage systems and were low efficiency. To rectify these problems, a model is built which solves these problems and is more efficient compared to other motor-operated models.

IV. METHODOLOGY

"Figure 4.1 displays the basic block diagram of the solar-powered pesticide sprayer. Solar panel, buck and boost converter, battery charging kit, limit switches, dual battery, DC motor, pesticide tank, and spray nozzles are included. It is powered by solar energy. The solar panel first absorbs the solar energy. [2] The photovoltaic cell then transforms this solar energy into electrical energy. In this case, a buck-boost converter is employed to supply the battery with the necessary voltage from the solar panel. The micro-controller regulates the charging of the two batteries. The micro-controller shifts to battery 2 to be fully charged when battery 1 is entirely charged and battery 2 is only partially charged or maybe empty. Battery power is used by the motor.

Depending on how the sprayer is being used, this operation will continue to be repeated. A DC motor rated at 12V, 2.1Amp is needed to spray the insecticides. The 12v 8Ah battery powers the DC motor. [4] One inlet and one outlet make up a motor. The sprayer nozzle connects the outlet to the hole that connects to the pesticide tank. The motor generates the suction and aids in applying pesticides to the crops; the pesticide tank has a 12-litre capacity. For different types of spray, such as F, taper, and sector nozzles, multiple nozzle types are utilized. Any necessary nozzle from the F nozzle, taper nozzle, or sector nozzle can be used, depending on the distance. [5]

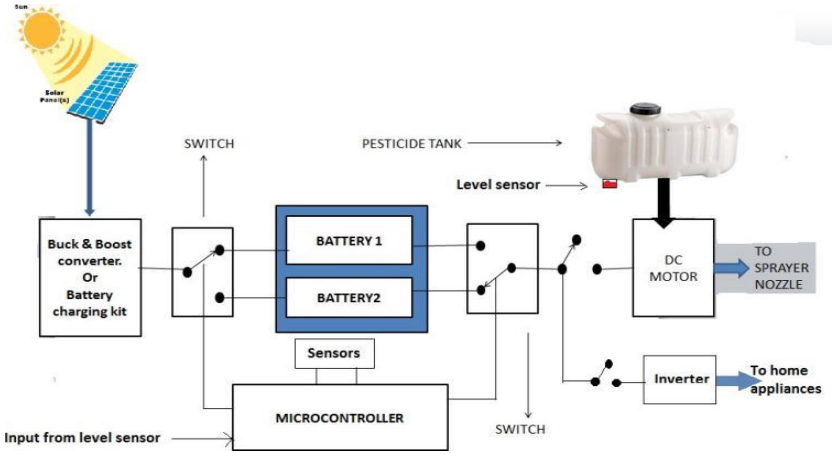

Fig4.1 Block diagram of solar based pesticide sprayer

V. RESULT

According to the experiments, the solar panel produces 17 Volts (V), 1 Ampere (A), between 9.30 AM and 4.30 PM during the day. Testing takes place during this period since pesticide sprayers are being deployed. In this time at 1.3A, the 12V, 8Ah battery can be fully charged in 7 hours. Therefore, unlike an electronic pesticide sprayer, this module can be operated to spray continuously for 7 to 8 hours. The model won't cost more than Rs. 7000. The suggested model is therefore affordable and compatible with other models that are offered commercially. [6]

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Fig. 5.1 Top view of solar operated sprayer

Fig 5.2 Front view of Solar operated sprayer

VI. CONCLUSION

It doesn't affect how well a pesticide sprayer powered by gasoline performs. Additionally, the model is made to be economical and environmentally benign, making it more effective than a pesticide sprayer powered by gasoline. The module can be released as a commercial product with a small form factor alteration. A solar panel is installed on the frame and tested in order to confirm the performance. One completely charged battery may be used to spray 2 Acres of land, while one liter of gasoline can cover 1 Acre. It has been reported that an 8Ah battery can power the pump for three hours. Therefore, the price of 1 liter of gasoline is significantly more than the price of battery charging, with no operational expenses.

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