

Agricultural Electric Backpack Sprayer Using Solar Panel

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Abstract

Sprayers are commonly used on farms to spray pesticides, herbicides and as a means of crop quality, maintenance and control. There are many kinds of machine operated sprayers, the most common of which used in India is a low pressure hand operated Sprayer. Electrical Assistance could be employed to work automatically without using any human effort. Electric Sprayer has various components which are dependent on each other starting from the first component i.e. the backpack the fluid enters the pump which is a positive displacement pump i.e. Diaphragm pump this pump pushes the fluid further towards the nozzle by means of electric motor. This electric motor acts as a pump to suck the fluid and send it to the nozzle and the electric motor is connected to battery which provide it electricity. The battery is further charged by solar panel. Between solar panel and battery there is a voltage rectifier which reduces high volt coming from the solar panel to a smaller voltage. Nano coating is done on solar panel to increase its capacity to absorb light and refract the infrared rays which contribute to unwanted heating effect and thus increasing its efficiency and life.

Keywords— valves, diaphragm, nozzle, Nano Coating, Voltage Generation.

I. INTRODUCTION

An agricultural Sprayer is an important device which is used to spray liquid pesticides, water, weed killers, crop performance chemicals, pest maintenance chemicals as well as manufacturing and production line ingredients. These sprayers are primarily used for the projection of liquids on the crop according to its requirements. In the field of Agriculture, a sprayer is a piece of equipment that is used to apply herbicides, pesticides and fertilizers on the crops. Sprayers range from man portable units (typically backpacks with spray guns) to the trailed sprayers that are connected to some tractors, with boom mounts of 4-30 feet up to 60-151 feet in length depending on engineering design for tractor and land size.

II. RELEVANCE

Sprayers are fully integrated, mechanical systems composed of various parts and components that work together to achieve a desired effect, in this case the production of the spray fluid. This can be as simple as a hand sprayer attached to a bottle that is pumped and primed by a spring-lever, tube ad vacuum-pressure or as complex as a 150-foot reach boom sprayer with a list of system components that work together to deliver the spray fluid. By employing this kind of system it would provide a high deal of ease for rural farmers and agricultural workers to work with greater efficiency.

III. MOTIVE

Agricultural sprayers are often used for applying water chemical solutions containing acids or caustic materials, often as crop-performance or pest-maintenance chemicals; i.e. fertilizer, pesticides, etc. Thus motive of this paper is to design an Agricultural sprayer having pressure up to 6 bar using free energy and pollution free. To make a product having: - ONE TIME INVESTMENT LONG TERM USE.

IV. OBJECTIVE STATEMENT

To Select a type of pump and design the same for agricultural sprayer acting on D.C Motor and to obtain the pump up to 6 BAR using 12Volt D.C Motor which will receive the Electrical energy from Solar Panel to run the Motor directly or indirectly and further provide Nano coating on the Solar Panel to enhance its efficiency. Another alternative Electric supply route is also provided to light a 5Watt Bulb for Emergency Conditions.

V. FIGURES

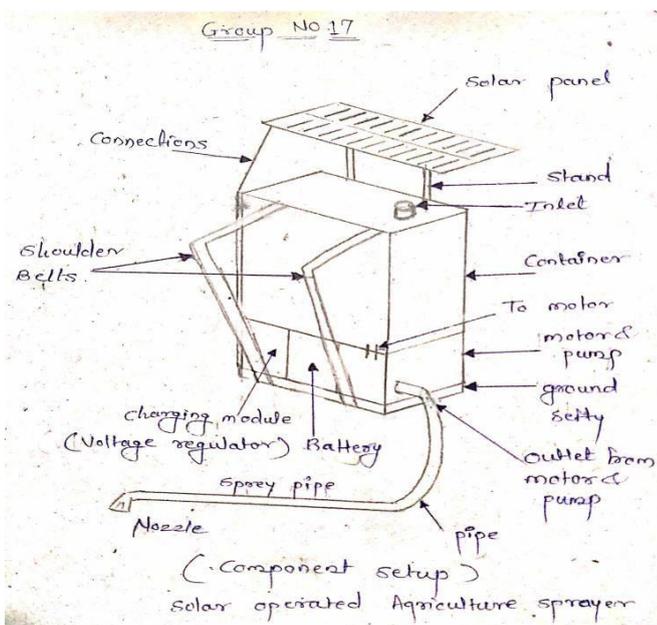


Fig. 1 Solar Agricultural sprayer (Sketch)

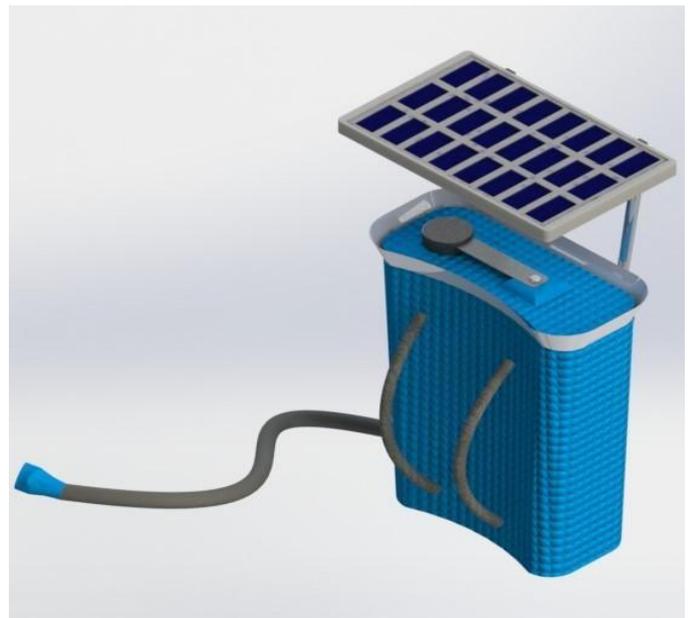


Fig. 2 CAD Model of the Assembly

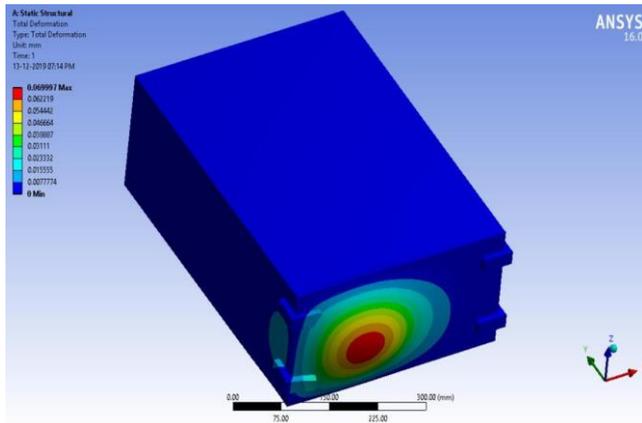


Fig. 3 Deformation of the backpack

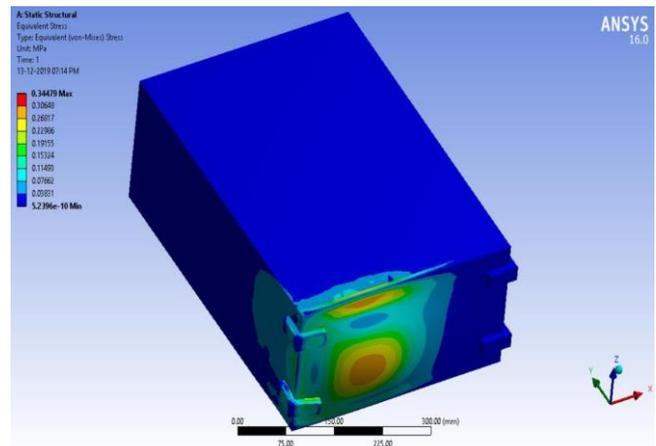


Fig. 4 Stress Analysis of the backpack

VI. SUMMARY

Agricultural Sprayer Using Solar Panel is an automatic fertilizer spraying assembly by which works on the hydraulic output pressure created by a 12V D.C motor, which draws power from battery which is connected to 40W Solar Panel placed above the assembly via fixtures. Further considering the long lasting use and high output efficiency of the solar panel a thin selective solar absorptive Nano coating layer is put on the upper surface of panels. This Nano coating layer allows light with various wavelength to strike the solar panel and make most of its use by avoiding these rays not exceeding the atmosphere. This yields high Voltage Generation than Rated Voltage and also Saves panel from excessive heating. Thus it would be a great help to the user (Farmers), as it would reduce the human labour to continuously pump the sprayer and as the energy source is green and renewable it would not affect the environment as well.

VII. RESULTS AND ADVANTAGES

- 1) Selection of Diaphragm pump helps in achieving suited pressure conditions (6bar-10bar) as pesticides to be sprayed do not come in direct contact with parts of pump thus corrosion of pump is avoided.
- 2) NanoCoatings of solar panel not only helps in absorbing the charge but also helps in self cleaning and increases the life of panel.
- 3) Nanocoating of panels do not show much positive results in increasing efficiency but have a positive impact on increasing thermal efficiency.
- 4) There must be a voltage regulator between battery and solar panel as it can regulate high voltage and avoid mechanism failure.
- 5) A 15w solar panel is used which results in utilizing approx. 360 min to charge the battery running for 240 min at absence of sunlight or during no charge condition.

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