

## Solar Powered Pesticide Agriculture Sprayer

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### **Abstract:**

*Sprayers are mechanical gadgets that are particularly intended to shower fluids rapidly and effectively. They arrive in various diverse assortments. In this venture we'll investigate sun powered worked mechanical blast sprayers. A sprayer of this sort is an extraordinary approach to cover extensive regions, for example, yards rapidly and effectively. A sprayer ordinarily comprises of a tank for conveying the fluid to be showered, a sun powered board, an 12 volt DC pump for pumping out this fluid, splash spouts on a blast that consequently scatter the fluid in a descending course over a calculable zone (say 5 or 6 feet), ball valves, a case with wheels on which the sprayer is mounted, and a hose connection for showering. The gadget is mechanically pushed from behind and as the supply to the pump is exchanged on, the fluid is splashed. This sort of sprayers is commonly utilized for splashing yard chemicals, for example, pesticides including herbicides, bug sprays and fungicides.*

**Keywords:** Solar sprayer, photovoltaic cells, non-conventional energy etc.

### **INTRODUCTION:**

From time immemorial, the sun has been the prime wellspring of vitality for life on earth. The sunlight based vitality was being utilized straightforwardly for purposes like drying garments, curing farming produce,

safeguarding sustenance articles, and so forth. Indeed, Even today, the vitality we get from fuel-wood, petroleum, paraffin, hydroelectricity and even our nourishment begins in a roundabout way from sun. Sun based vitality is for all intents and purposes boundless. The aggregate vitality we get from the sun far surpasses our vitality requests. It is presumably the most solid type of vitality accessible all around and to everybody, not at all like different sources. With decreasing supplies of petroleum, gas and coal, tapping sun oriented vitality is a consistent and fundamental game-plan. As far back as the modern upheavals human have been reliant on fills, power and wind vitality. For human advancement in numerous nations there is research and trials are going on the Solar vitality and the wind vitality, yet in our nation, labor is accessible in vast extent, So we make our new idea sun powered worked mechanical blast sprayer in these idea we lifts water in tank for showering on the rural items or on little plants in yards and greenhouses.

Very much kept up yards and greenery enclosures can make a delightful, practical scene around your home and give asylum to an assortment of natural life. Through great social and incorporated nuisance administration (IPM) hones, the open air greens cape in the urban condition can stay sound and flourishing. Alongside appropriate plant determination and care, controlling bugs in your grass or garden is a critical piece of

upkeep. Numerous social practices supplement IPM control techniques, for example, productive and suitable watering holes and prudent utilization of pesticides.

Pesticide ought to be constrained where conceivable, however when essential, utilize them capably. Continuously read and take after the pesticide mark directions before applying, for example, with bug sprays or herbicides, to decrease the danger of uncovering people or non-target creatures. Take care to ensure the earth, which incorporates the best possible utilization of pesticides to avoid defilement of water assets.

### Objectives

- Design and build up a sun powered agri sprayer framework which depends on sun oriented vitality.
- Also create the model of a similar which would have the capacity to give same outcomes as necessity of plan idea.
- To Test the model with its capacity to Work dependably under various working conditions.
- The extend work subject is one, in which really we are inclining the hypothetical ideas in pragmatic way. Likewise the viable experience is one of the points of this subject. For a creating industry these working performed and the parts or segments delivered ought to have its base conceivable generation cost, then just the business runs productively. There are various units having utilized as a part of enterprises for different purposes.

### LITERATUREREVIEW:

R. Joshua et.al. Says in the paper [1] “Solar Sprayer - An Agriculture Implement” that “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 villages without electricity.

Philip J. Sammons et.al. Says in the paper [2] “AUTONOMOUS PESTICIDE SPRAYING ROBOT FOR USE IN A GREENHOUSE” that an engineering solution to the current human health hazards involved in spraying potentially toxic chemicals in the confined space of a hot and steamy glasshouse. This is achieved by the design and construction of an autonomous mobile robot for use in pest control and disease prevention applications in commercial greenhouses. The effectiveness of this platform is shown by the platforms ability to successfully navigate itself down rows of a green house, while the pesticide spraying system efficiently covers the plants evenly with spray in the set dosages.

Mahesh M. Bhalerao et.al. Says in the paper [3] “DEVELOPMENT AND FABRICATION OF SMART SPRAY PUMP” that in order to meet the food requirements of the growing population and rapid industrialization, modernization development of agriculture is inescapable. Mechanization that enables the conservation of inputs through the precision in the metering ensuring the better distribution, reducing the quantity needed for better response and prevention of losses or wastage of inputs applied. Mechanization reduces unit cost of production through higher productivity and input conservation. Farmers are using the same methods and equipment for the ages.

Ritesh Chavan et.al. Says in the paper [4] “Design and Construction of Solar Powered Agricultural Pesticide Sprayer” that Today’s world faces a huge “energy crisis” problem. To meet the future “energy demands”, the use of non-conventional energy as an alternate solution is inescapable. In order to meet the food

requirements of growing population, modernization of agriculture has become a necessity. In agriculture, spraying of pesticides is an important task to protect the crops from insects for obtaining high yield. However, farmers have been mainly using traditional conventional techniques like hand operated and fuel operated spray pump system for spraying pesticides. Now-a-days, the concept and technology employing non-conventional energy has become very popular for all the developing activities.

### SYSTEM ARCHITECTURE:

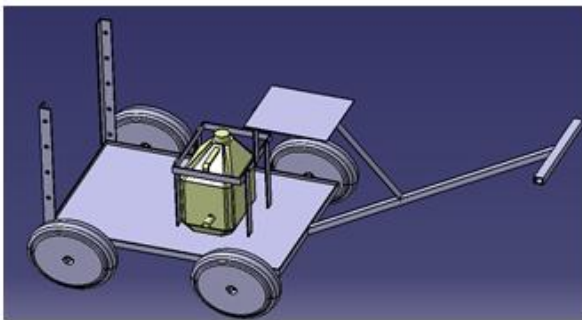


Fig. Proposed model using CATIA v5 cr21

The basic block diagram of the solar based pesticide sprayer is as shown in the figure. It consists of solar panel, 12 volt battery, spray pump, IR sensor, green LED part, water/ liquid containing plastic can, chassis, and wheels. Etc.

It uses solar energy to operate. First the solar energy is absorbed by the solar panel. This solar energy is then converted into electrical energy by the photovoltaic cell. This produced electrical energy is stored in 12 volt battery. Which is used to drive 12 volt water cooler pump to spray liquid.

To spray the pesticides a 12v, 2.1amp DC motor is required. DC motor is driven by the 12v battery. Motor consists of one inlet & one outlet. Inlet opening is connected to pesticide tank and outlet is connected by the sprayer nozzle.

Motor creates the suction & helps to spray the pesticides to the crops, Pesticide tank is having capacity of 5 litre.

The IR green sensor is used to detect the green light emitted from green LED part, which shows the presence of plants. Thus if green light is detected by sensor, it starts the pump otherwise not. So liquid that may be water or pesticides will be only sprayed to plants which will reduce the consumption of liquid i.e. water and pesticides. Also eliminates the wastage of it due to continuous and careless spraying all over.

List of standard parts and components used are,

1. Chassis
2. Wheels
3. Handle
4. Water containing plastic can
5. 12 volt solar panel
6. 12 volt battery for storage and to drive pump
7. 12 volt water cooler pump to spray
8. Green sensor
9. Electrical wires and connections Etc.

SOLAR BASED PESTICIDE PUMP USING GREEN LIGHT DETECTOR

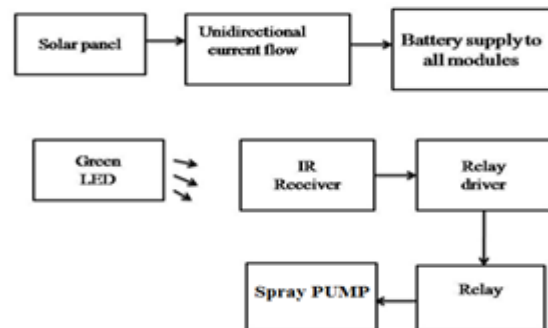


Fig. Block diagram of the system



Fig. Project final model testing

## SYSTEM DESIGN:

### Design of Frame:

#### Specification:

Mass=6kg (here total 6kg weight acted on frame)  
 Here weight acting on middle side of frame therefore here consider perpendicular distance=325mm

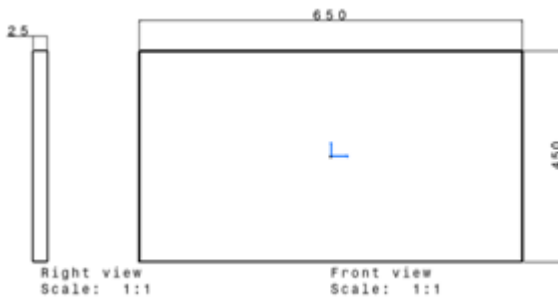


Fig. frame dimensions in mm

$$M/I = \sigma b/y$$

$$\text{Bending moment (M)} = \text{force} * \text{perpendicular distance}$$

$$= 6 * 325 * 9.81$$

$$\text{Bending moment (M)} = 19129.5 \text{ Nmm}$$

Here we are finding the value of moment of inertia:  
 Therefore taking the value of angular frame;

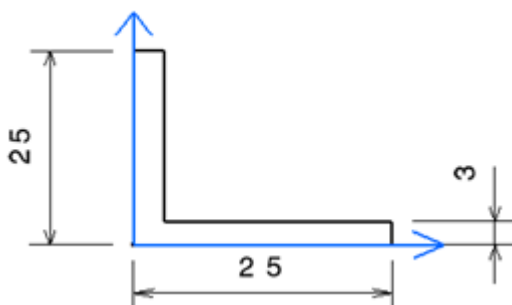


Fig.L-angle dimensions in mm

$$b = 25 \text{ mm}$$

$$h = 25 \text{ mm}$$

$$I = (b(h^3))/12 = (25(25^3))/12$$

$$I = 32552.08 \text{ mm}^4$$

$$Y = b/2 = 25/2 = 12.5$$

Therefore above value use in above equation  
 $(19129.5)/32552.08 = \sigma b/12.5$

Therefore,  
 $\sigma b = 7.34 \text{ Nmm}$   
 $7.34 < 105$

Hence design is safe.

### Design of welded joint:-

Checking the strength of the welded joints for safety the transverse fillet weld welds the entire angle and the edge, the maximum load which the weld can carry for transverse fillet weld is

$$P = 0.707 \times S \times L \times ft$$

Where, S = size of weld, L = contact length = 35mm (10 mm for starting & stopping of weld)

The load of shear along with the friction is 200 kg = 1962N

$$\text{Hence, } 1962 = 0.707 \times 5 \times 35 \times ft$$

Hence let us find the safe value of 'ft'  
 1962

$$\text{Therefore } ft = 0.707 \times 5 \times 35$$

$$ft = 15.85 \text{ N/mm}^2$$

Since the calculated value of the tensile load is very smaller than

The permissible value as  $ft = 56 \text{ N/mm}^2$ . Hence welded joint is safe.

## ADVANTAGES AND APPLICATIONS:

### ADVANTAGES

- It is multipurpose machine
- Easy to operate.
- It is pollution free
- It is portable
- Unit cost is very cheap one.

### APPLICATIONS

- It is a renewable energy source.
- Power Sprayers are used to discharge pesticides and fertilizers in the liquid form. It is Two Stroke Petrol Engine.
- Solar agro sprayer is not a new invention and this technology finds suitable application in the farming community of India.
- Solar energy plays an important role in drying agriculture products and for irrigation purpose for pumping the well water in remote villages without electricity

**FUTURE SCOPE:**

Future scope of this type of robots are very bright because it is very useful in agriculture and reduce the workload. It will reduce the time consumed in spraying the pesticide liquid and works very effectively. It will help the farmers to do work in any season and conditions. It will reduce the danger for the farmers from different breathing and physical problems. The model weighs 21Kgs with full pesticide in tank.

The weight can be reduced by 3 to 4kgs by using plastic molding for mechanical structure. Further battery energy can be saved by using PWM scheme for driving pump.

**CONCLUSION:**

The robot for agricultural purpose an Agrobot is a concept for the near the performance and cost of the product once optimized, will prove to be work through

In the agricultural spraying operations. We have been successful in developing a robot whose construction is enough to withstand the challenges of the field. We are sure that once this concept is presented in a manner suitable to Indian market, it will definitely help in bringing down the 15% modality rate found in the Indian formers associated with the agricultural spraying operation.

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