

# Design & Fabrication Of Remote Controlled Solar Powered Pesticide Drizzle

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**Abstract:**The Design and Fabrication of Remote Controlled Solar Powered Pesticide drizzle is a inflates running on electricity propagate by photoflood or the thermal energy feasible from flocked sunlight as opposed to grid electricity or diesel run water inflates. The operation of solar mechanized inflates is more methodical mainly due to the lower operation and maintenance costs and has less environmental percussion than pumps mechanized by an Internal Combustion Engine (ICE).Solar inflates are favorable where grid electricity is unaccessible substitute sources (in particular wind) do not provide tolerable energy .The solar panels fabricate most (up to 80%) of the systems cost. The size of photoflood system is directly reliant on the size of the inflates ,the quantity of water that is required (m<sup>3</sup>/d) and the solar irradiance feasible .The solar drizzle has many advantages .Besides shortening the cost of drizzling ,there is saving on fuel or petrol .Also, the conveying cost for buying petrol is saved. The solar drizzle maintenance is smooth .There is less fluctuation as compared to the petrol drizzle .The farmer can do the drizzle operation by himself without fascinating labour, thus increases the drizzle efficiency.

**Keywords:** Electricity, solar panel, photoflood cells, solar inflates, drizzle

## 1. INTRODUCTION

Drizzling of Pesticides is an Crucial task in Agriculture for care of the crops from insects. Farmers mainly use hand operated or fuel operated drizzle inflates for this task. This traditional drizzle causes user fatigue due to excessive enormous and heavy construction. This inspire us to design and fabricate a model that is trolley based solar drizzle .In our design ,here we can eliminate the commenting of drizzle organically it is not good for Farmers health point of view During Drizzling in this way here we can shortened the users fatigue level. There will be eradication of engine of fuel operated drizzle Inlates by which there will be reduction in fluctuations and noise. The elimination of fuel will make our drizzling system eco-friendly. So with this background, we are trying to design and construct a solar powered drizzle inflates system.

Now a days there are renewable Energy sources are widely used. The energy which is feasible from the sun is in nature at free of cost. In India solar energy is feasible around 9 Months in a Year. So it can be used in drizzling operation. Solar pesticide Drizzle can give less tariff or price in Adequate drizzling. Solar energy is absorbed by the solar panels which contains photoflood cells. The conversion of the solar energy into electrical energy is done by these cells. This converted energy utilizes to store the voltage in DC battery and that battery further used for driving the drizzling inflates. A drizzle is a device which is used to spray a liquid. In agriculture a drizzle is a piece of equipment that is used to apply herbicides, pesticides and fertilizers on agricultural crops. Drizzle range in size from man portable units(frequently back packs with spray guns)detailed drizzles that are connected to a tractor to self propelled units similar to tractors ,with boom mounts of 60-151 feet in length .Timely application of pesticides

,herbicides and fungicides at peak periods play a vital role in securing better yields from a crop. The scope of the project is to develop a new mechanism for drizzling of pesticides.

The mechanism is designed such that potential energy of the pesticide is stored in the tank and additional spring force is used for generating the required velocity during drizzling so that to remove the pest and get a improved yield. Most of the increase in the area of irrigated land in the world has been through the increasing use of engine-driven inflates. By using this oil based inflates the pollution is increasing more inorder to control it we are going for solar based inflates which doesn't effects on pollution . However the increasing price of oil based fuel has reduced the margin to be gained by framers from irrigation ,since food prices have generally been prevented from rising in line with energy costs .Despite present short term fluctuations in oil prices, traditional oil-based engine –driven power sources and mains electricity are expected to continue to increase in the longer time .If we are to decrease our dependence on imported oil, we have to find ways to energizing irrigation inflates that are independent of imported oil or centralized electricity .Solar radiation is a source of energy is of course the essence of the clean. Sustainable energy technology except for residues possibly arising out of the manufacture of solar components (semiconductors),solar technology have very low environmental impacts .The environmental impacts of solar system in operation are very low and the source is inexhaustible. A remote control is primarily a convenience feature i.e., RF(Radio Frequency) and means the remote is multi-directional technique for the user and can allow the operation of devices that are out of convenient reach for direct operation of control. In some cases, remote control allows a person to operate a device that they otherwise could not be able to reach.

## **2. LITERATURE SURVEY**

J.V.Bhanutej et al “Design and Modeling of agriculture sprayers “, IJART 2015

In India ,agriculture has a predominant role in our day to day life .The crops that come as yield decides the total production ,adds to the economy of our country. The yield decreases due to the presence of pests, insects in the farms. To kill the pests, insect’s pesticides ,fertilizers are spread either manually or by using sprayers .Earlier ,the pesticides and fertilizers were drizzled manually ,but they will result in harmful effects on farmers. In order to overcome this problem, different drizzling techniques have been developed. These drizzles consists of different mechanisms and the cost of the equipment is generally high .We developed a mechanism in which we tried to minimize the equipment cost by removing the pump to spray. This sprayer works on Bernoulli’s principle, in which the spraying action of the sprayer is due to the head developed and mechanical linkage. The model is developed mathematically for the major components like tank, required head and spraying mechanism

Shailesh Malonde et al “Design and Development of multipurpose pesticides spraying machine” IJAEGT Volume 04

As India is agriculture based country and 70% people do farming and related work .Agriculture is required to boomed to enhance the Gross Domestic Product(GDP) of the country by improving the productivity. The productivity of the crops can be increased with the help of pest control .Pesticides spraying is necessary procedure in cultivation of the crops. The present idea deals with the designing and fabricating a pesticide sprayer which will be useful and affordable to the farmers which will assist to increase the productivity of crops .Though this project an attempt has been done to improve the method of spraying the pesticide that will enhance the productivity and increase the farmers income. So we have designed a pesticide spraying machine will not only increase productivity but also reduce the efforts of the farmers .This machines will save the time of the farmer as well as efficiency in spraying . This model carries multi nozzle pesticide sprayer pump which will perform spraying at maximum rate in minimum time .Constant flow valves can be applied at nozzle to have uniform nozzle pressure.

Kumawat mukesh M, “solar operated pesticide sprayer for agriculture purpose” IRJET volume 05

Sprayers are mechanical devices that are specifically designed to spray liquids quickly and easily. They come in number of different varieties .In this project we will take a solar operated mechanical sprayers. A sprayer of this type is a great way to use solar energy. Solar based pesticides sprayer pump is one of the improved versions of petrol engine pesticide sprayer pump. It is vastly used in the agriculture filed and also used for many purposes. This is having more advantages over petrol engine sprayer pump it uses the solar power to run the

motor. So it is a pollution free pump compared to petrol engine sprayer pump. In this charged battery can also use for home appliances. The solar panels make up to most 80% of the systems cost .The size of the pv system directly dependent on the size of the pump ,the amount of water is required ( $m^3/d$ ) and the solar irradiance .The farmer can do spraying operation by himself without engaging labour ,thus increasing the spraying efficiency.

Prof. Gopal Waghmare”Design and fabrication of solar operated sprayer for agricultural purpose” NC-ITSE Volume 04

Today’s energy demand is the great challenge for our society. Conventional energy (fossil fuel, coal, nuclear energy etc) can be widely used in India such as textile industry, power plant etc. using conventional energy there are many exhaust that can be come not after pollutant which is harmful to our environments, in such situation we should move towards some non conventional energy (solar energy, wind energy ,tidal energy) non conventional becomes very popular for all kinds of developments activities such as drying agriculture product. Irrigation purpose and for spraying purpose, in this paper we are trying to make unique equipment for cultivation users. My while spraying. Farmers mainly use hand operated or fuel operated spray pump for this task. This Conventional sprayer causes user fatigue due to excessive bulky and heavy construction. This motivated us to designing and fabricated a model that is basically trolley based solar sprayer in our project here we can eliminating the back mounting of sprayer because Ergonomically it is not good for farmer health point of view during spraying in this here we can reduce the users fatigue level.

## **3. WORKING PRINCIPLE AND FABRICATION DETAILS**

This works on solar energy. The mixture is accomplished by the use of solar panel, a centrifugal pump which runs on dc supply is attached to the solar panel the solar panel generates the power that power is dc power its positive and negative charges are connected to a better in order to save the power and use it when the sun arise are not present by using this device we can drizzle pesticides to the herbs and plants and any agriculture drizzling it is economical as compared to the other means used like petrol/diesel pesticides sprayers. there is no much maintenance cost and no operating cost as it is using solar energy it is free of cost and there is no pollution its working principal is very simple and it is economical of the farmers which has one more advantage that it can also generate power that power is saved in the battery and it can be used for both for drizzling and well as to light in the house when there is no current supply. and where as in rainy season when the sunrays are not there that time we can charge the battery and use it to spray pesticides to the herbs and plants as compared to petrol/diesel It is economical no efforts to human just he has to carry the device is light in weight so it is much feasible.

The main components used to fabricate the model are:

- Solar panel(Concentrated Photovoltaic Technology)
- Pump
- Dc motor
- Battery
- Tank
- Nozzle
- Bevel gear
- RF type remote controller

Solar panel:

Concentrated Photovoltaic Technology (CPV) is using in this project due to the usage of this technology such as mirrors and lens to focus sunlight on solar cells for the sake of generating power. This method is the best compared with non-concentrated photovoltaic technology. We need to need to protect our panels from Effect of Irradiance, temperature effect, cooling. Based on the knowledge under concentrated solar radiation the characteristics of solar cells decreases 50% when its sun light rises from 46<sup>0</sup>c to 84<sup>0</sup>c , so a efficient cooling system is needed to increase solar cells power generation. A solar panel (Concentrated photovoltaic module (or) non concentrated photovoltaic panel) is a packed, connected assembly of photoflood cells. The solar panel can be used as component of a larger concentrated photoflood system to generate and supply the electricity. Each panel is rated by its dc output power under standard test conditions, and typically ranges from 50to100 watts the efficiency of the panel determines the area of the panel given as the same rated output. Solar powered photoflood panel's converts sun rise into electricity by exciting electrons in silicon cells by using photons of light from the sun. The electricity can be used to supply renewable energy to battery by lowering utility bills; these panels not only pay for themselves over time, they help in reducing air pollution.

Pump:

For people living in remote areas, solar water inflates is usually the only solution as there is no access to diesel. A solar powered water inflate differs from a regular water pump only in that it uses the sun energy to supply electricity for the inflate. All the pumped water stored in the tank so that there is constant supply even in bad weather conditions and during night time where there is in sufficient power to generate the solar water inflates. Solar powered water inflates represent a higher initial investment, however, over a period of five years they represent a cost benefit due to minimum maintenance cost compared to ac pumps run with a generator

Dc motor:

A dc motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy nearly all types of dc motors have some internal mechanism, either electro mechanical or electronic, to periodically change the direction of current flow in the part of the motor

Battery:

Electric battery is a device consisting of one or more electro-chemical cells with external connections provided to power electrical devices such as flash lights, smart phones and electric cars. When a battery supplying a electrical power, its positive terminal is cathode and its negative terminal is anode. The terminal mark negative is the source of electrons that when connected to an external circuit will flow and deliver energy to an external device. When a battery is connected an external circuit, electrolytes are able to move as ions within, allowing the chemical reactions to be completed at separate terminals and so delivered energy to the external circuit. It is the movement of those ions within the battery which allows current to flow out of the battery to perform work.

Tank:

Storage tanks are containers that hold liquids, compressed gases or mediums used for short or long term shortage of fluids or gases. The term can be used for reservoirs .Storage tanks are available in many shapes: vertical and horizontal cylindrical open top and closed top flat bottom cone, slope bottom and dish bottom. Large tanks tend to be vertical cylindrical, or to have rounded corners transition from vertical side wall to bottom profile, to easier withstand hydraulic hydrostatically induced pressure of contained liquid. Most container tanks for handling liquids during transportation are designed to handle varying degrees of pressure.

Nozzle:

A nozzle is a device designed to control the direction or characteristics of fluid flow(specially used to increase flow velocity) as it exits or enters an enclosed chamber or pipe .A nozzle is often a pipe or tube of varying cross sectional area and it can be used to direct or modify the flow of a fluid .Nozzles are used to control the rate of flow,speed,direction,mass ,shape,and pressure of stream that emerges from them. In a nozzle, the velocity of fluid increases at the expense of its pressure energy

Bevel Gear:

These are the gears where the axes of the two shafts intersect and the tooth bearing faces of the gears themselves are conically shaped. Bevel gears are most often mounted on shafts that are 90 degrees apart ,but can be designed to work as other angles as well. The pitch surface of bevel gears is a cone. Two important concepts in gearing are pitch surface and pitch angle. The pitch surface of the gear is the imaginary toothless surface that you would have by averaging in out the

peaks and valleys of the individual teeth. The most familiar kinds of bevel gears have pitch angles of less than 90 degrees and therefore are cone shaped. This type of bevel gear is called external because the gear teeth point is upward.

RF type remote controller:

RF stands for radio frequency and means the remote is multi directional .Both receiver and the remote control can be put in to either IR or RF mode .Here we are using RF type control. Instead of sending out light signals, an RF remote transmits radio waves that correspond to the binary command for the button that we are pushing .A radio receiver on the controlled device receives the signal and decodes it.

#### 4. ASSEMBLY PROCESS

In the assembly process the base structure is made from the cast iron and the required parts are fixed in the predetermined positions and the connections .Solar panel is placed in such a way(inclined) that it can absorb the sunlight and this solar panel is connected to the controller and to battery .so that we can charge the battery and from battery is connected to the dc motor .With the help of the dc motor the inflate is working and converts the mechanical energy into hydraulic energy and this energy pulls the pesticides which is mixed with water and throw the piping it comes out of the nozzle and pesticide is applied this is the assembling process



#### 5. DESIGN CALCULATION

##### 5.1 Calculation For Chassis Frame

- Side bar of the chassis are made from “box section” with 121.2mm \* 763.77 mm
- Material of the chassis is ASTM A710 Steel
  - Front overhang (a) = 50.8mm
  - Rear overhang(c) = 50.8mm
- Wheelbase(b) = 1168.8mm
- Modulus of elasticity, E =  $2.10 \times 10^5 \text{ N/mm}^2$
- Poisson ratio = 0.28
- Capacity of frame = up to 2500kg
- Weight of the body and engine = 200kg

- Total load acting on chassis = capacity of the chassis + weight of body and engine
- Chassis has two beams so load acting on the chassis.
- Load acting on the single frame =  $122625/2 = 110362.5 \text{ N/beam}$

##### 5.2 Calculations Of Shear Force And Bending Moment

- Shear force calculations
- $F_a = 0 \text{ N}$
  - $F_c = (-9.260 \times 935) + 24119065 = 15461.55 \text{ N}$

- $F_d = (-9.26 \times 4735) + 34727.65 + 24119.65 = 15001.2$   
N
- $F_b = 0$ N
- Bending moment calculation
- $M_a = 0$  N-mm
- $M_c = (-9.26 \times 935 \times 935) / 2 = -4047661.75$  N-mm
- $M_d = [(-9.26 \times 4735 \times 4735) / 2] + (24119.65 \times 3800)$   
 $= -12150971.75$  N-mm
- $M_b = 0$ N-mm

### 5.3 Motor Selection Calculation

- Assumed mass (M) = 30 kg
- Weight (W) = 30 \* 9.81 = 294.3 N
- Required torque (T) :  
Assumed co-efficient of friction = 0.6  
 $T = \text{co-efficient friction} * w * r$   
 $= 0.6 * 294.3 * 0.65$   
 $= 114.8$ N-m

## 6. ADVANTAGES, DISADVANTAGES AND APPLICATIONS

The advantages, disadvantages and applications of the proposed model are:

### 6.1 Advantages

The advantages are as follows :

- Solar powered pesticide systems are practical in flat terrain where the sun shines.
- Solar pesticide pumping is clean and efficient.
- Solar power is clean .It does not causes any pollution.
- It does not require fuel hence it is a zero fuel operated equipment.
- It is maintenance free device.
- It is easy to operate and portable
- The prepared solar pesticide drizzle can be used largely in agriculture field effectively.
- It causes less fluctuations and it is cost efficient.

### 6.2 Disadvantages:

The disadvantages are as follows:

- Relatively high initial cost.
- Lower output in cloudy weather.

### 6.3 Applications:

- It is mainly used in agriculture sector for drizzling chemicals on plants.
- It is also used in automobile industry for drizzling plant

## REFERENCES

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