Automatic Solar Agric Sprayer System

Shubham Dayalapwar[1], Harish Dendage[2], Prakash Chaudhari[3], Akash Dhonde[4], Prof.Pravin Ingle[5]
[1, 2] Dept of Mechanical Engineering
[1, 2] Dr.D.Y.Patil Institute of Technology,pimpri,pune-411018

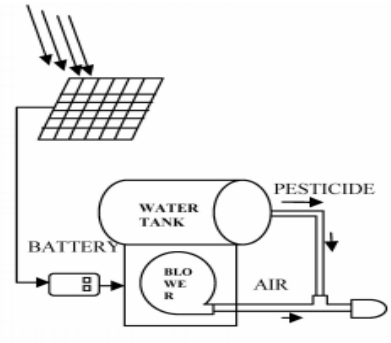
Abstract- *Sprayers are mechanical devices that are specifically designed to spray liquids quickly and easily. They come in a number of different varieties. In this project we'll take a look at solar operated mechanical boom sprayers. A sprayer of this type is a great way to cover large areas such as lawns quickly and easily.*

A sprayer typically consists of a tank for carrying the liquid to be sprayed, a solar panel, a motor for pumping out this liquid, spray nozzles on a boom that automatically disperse the liquid in a downward direction over an appreciable area (say 5 or 6 feet), ball valves, a chassis with wheels on which the sprayer is mounted, and a hose attachment for spraying. The device is mechanically pushed from behind and as the supply to the pump is switched on, the liquid is sprayed. This type of sprayers is typically used for spraying lawn chemicals such as pesticides including herbicides, insecticides and fungicides.

Keywords- Solar Panels, Solar Pump, Sprayer, Photovoltaic Cell (PV), Electricity.

I. INTRODUCTION

The sun has been the prime source of energy for life on earth. The solar energy was being used directly for purposes like drying clothes, curing agricultural produce, preserving food articles, etc. Even today, the energy we derive from fuel-wood, petroleum, paraffin, hydroelectricity and
Well-maintained lawns and gardens can create a beautiful, functional landscape around your home and provide shelter for a variety of wildlife. Through good cultural and integrated pest management (IPM) practices, the outdoor greens cape in the urban environment can remain healthy and thriving.



Pesticide should be limited where possible, but when necessary, use them responsibly. Always read and follow the pesticide label instructions before applying, such as with insecticides or herbicides, to reduce the risk of exposing humans or non-target animals. Take care to protect the environment, which includes the proper use of pesticides to prevent contamination of water resources.

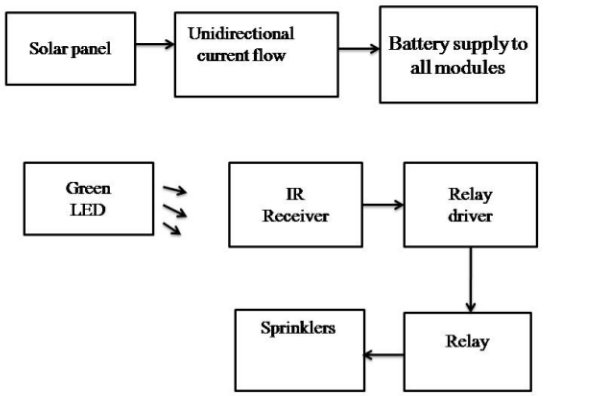
II. LITERARURE SURVEY

Philip J. Sammons [1]: 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 [2]: 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 input through the precision in the metering ensuring the better distribution, reducing the quantity needed for batterer sponse and prevention of losses or wastage of inputs applied.

III. SYSTEM DESCRIPTION

SOLAR BASED PESTICIDE PUMP USING GREEN LIGHT DETECTOR



WORKING PRINCLPLE:

The basic diagram of the solar based pesticide sprayer is as shown in the figure. It consists of solar panel, wire and boost converter, battery charging kit, limit switches, dual battery, DC motor, pesticide tank, spray nozzles, etc.

Here wire and boost converter is used to supply a required voltage from solar panel to the battery. Charging of the both batteries are controlled by the microcontroller. When the battery1 is fully charged and battery 2 is partially charged or may be empty, at that time microcontroller switches to battery2 to be fully charged. Motor uses energy from battery1 to run. When the battery1 will be fully discharged by the motor, microcontroller automatically switches to battery 2 to run the motor. And battery 1 will start charging. This process repeats continuously as we use the sprayer.

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.

IV.CALCULATION

According to spraying capacity & discharge capacity of spray pump is selected.

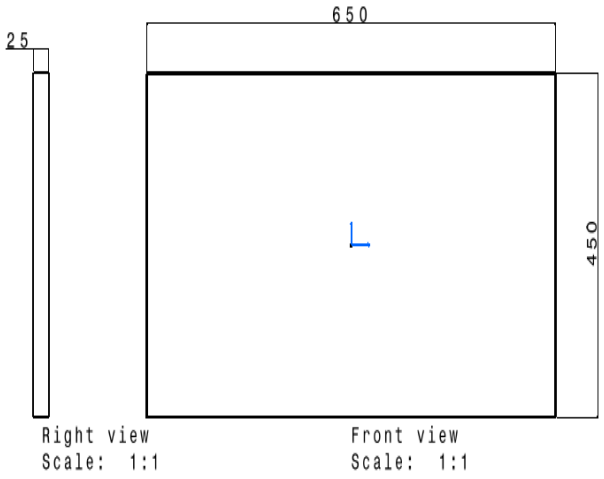
From submersible motor Specifications,

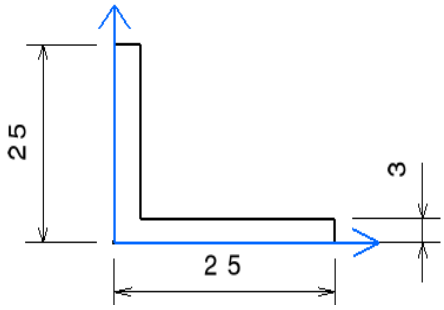
DC Voltage: 12V
Maximum lift: 40-110cm / 15.75"-43.4"
Flow rate: 80-120L/H
Outside diameter of water outlet: 7.5mm / 0.3"
Inside diameter of water outlet: 5mm / 0.2"

Specifications

Diameter: Approx. 24mm / 0.95"
Length: Approx. 45mm / 1.8"
Height: Approx. 30mm / 1.2"
Material: engineering plastic
Driving mode: brush-less dc design, magnetic driving
We have V=12v ,I=1ampere
Motor Power =V*I
=12*1
P=12 watt

Front and rear wheel load calculation:





Specification:

- Frame:
  Dimensions: 650mm*450mm*25
- Handle:

  Total length: 900mm
  Thickness: 25mm
  Density of wood=$7.75*10^3$

Calculation:

1. Find mass of frame(at 650 length):

Volume of frame=length*breadth*thickness
$=650*25*3*10^{-9}$

Volume of frame=$48750*10^{-9}$m^3

Density (ρ) $=\frac{m}{v}$

$7.85*10^3 = \frac{m}{48750*10^{\wedge}(-9)}$

m = 0.383

2. Find mass of frame(at 450 length):

Volume of frame=length*breadth*thickness
=450*25*3*10^{-9}

3. Density (ρ) = $\frac{m}{v}$

7.85*10^3 = $\frac{m}{33750*10^{(-9)}}$

m = 0.265kg

4. Volume of wood: (density of wooden=0.6*10^3)

Density= $\frac{m}{v}$

0.6*10^3=$\frac{m}{(650*450*10*10^{(-9}}$

m=1.755kg

5. Front axle weight:

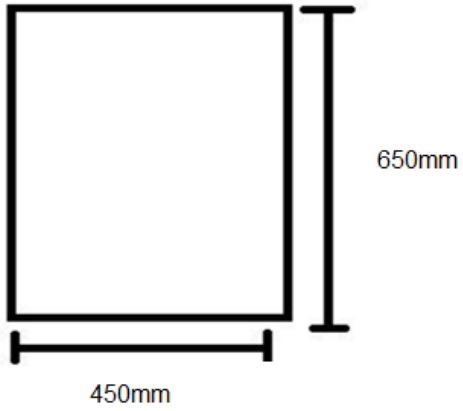
Front axle = angle+ electronic circuit + weight of water +wooden frame
= 0.383 + 0.265 + 3/2 +1+1.755/2
= 4.025kg

6. Back axle weight:

Back axle = angle+ electronic circuit + weight of water +wooden frame+handle
= 0.383 + 0.265 + 3/2 +1+1.755/2+.353
=4.378kg

Total Weight= 4.025+4.378
=8.4035kg

7. Design of Frame



Frame design for safety FOR 25*25*3 L angle mild steel channel

b = 25 mm, d= 25 mm, t = 3 mm.

Consider the maximum load on the frame to be 50 kg.
Max. Bending moment = force*perpendicular distance
= 15*9.81*325
M = 26781.3Nmm

We know,
M / I = σb / y
M = Bending moment
I = Moment of Inertia about axis of bending that is; *Ixx*
y = Distance of the layer at which the bending stress is consider

(We take always the maximum value of *y*, that is, distance of extreme fiber from N.A.)

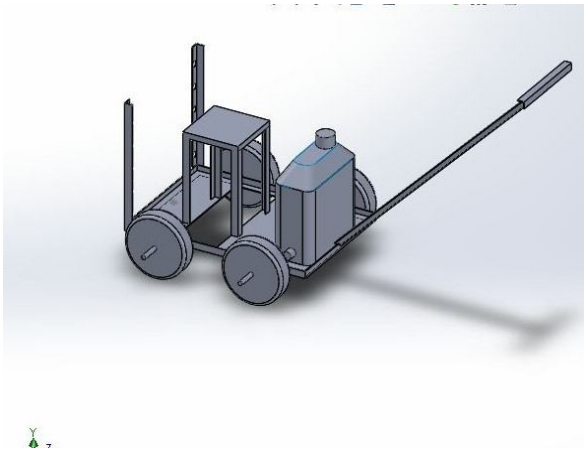
E = Modulus of elasticity of beam material.

I = bd3 /12
= 25*25^3 / 12
I = 32552.08 mm4
σb = My / Issssssss
= 26781.3*12.5 / 32552.08
σb = 10.22 N /mm2

The allowable shear stress for material is σallow = Syt / fos

Where Syt = yield stress = 210 MPa = 210 N/mm2
And fos is factor of safety = 2
So σallow= 210/2 = 105 MPa = 105 N/mm2
Comparing above we get,
σb < σallow i.e 10.22 < 105 N/mm 2
Design is Safe .

V.CAD MODEL



VI. CONCLUSION

The robot for farming reason and Agri robot is an idea for the close to the execution and cost of the item once upgraded, will turn out to be work through in the horticultural splashing operations. We have been fruitful in building up a robot whose development is sufficient to withstand the difficulties of the field. We are certain that once this idea is displayed in a way appropriate to Indian market, it will help in cutting down the 15% methodology rate found in the Indian farmers related with the agrarian splashing operation.

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