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Fabrication of Automatic Pesticides Spraying Machine

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Abstract – There are many types of pesticides sprayer are available in India. But mostly used sprayer is backpack type sprayer which is used by farmers because it is cheaper, easy to use and main thing about it is less costly. With the help of this machine farmer spray pesticides in their farm, but it requires lot of time and thus high operational cost. Also, the farmer which is spraying pesticides is affected by it as it is harmful to human health and human also affect by the lumbar pain due to weight of equipment.

This method used lots of time and affects human health adversely. This paper suggests machines which will save time and operational cost. Also saves human from affecting adversely.

Key Words : DC Pump, Nozzle, Battery, Remote Control, DC Motor.

I. INTRODUCTION

India is a country where nearly 70% of people lives in rural area and main source of their income is farming, directly or indirectly. 70% of people in India are connected with farming directly or indirectly, instead of that we are not producing the crop of which we having capacity to produce. Reason behind this is we farmers of our country are not using technology very well. So we have to make machines that can help then to save their time and money and to increase the production rate and their profit. We have to make economic machineries so farmers can purchase it as per capita income of our country's farmers are low and our country per capita income is low that of compared to other country as our country is developing country.

Present scenario in agricultural field in India related to sprayer is that farmers are using hand operated sprayer or motorized sprayer. According to idea in our project we are making a small 4 wheel kart or vehicle which is electronically operated by a wireless remote which runs on power source as a DC battery. One vertical arm is attached at centre of vehicle and one horizontal arm at top of the vertical arm. Nozzle is fitted to these arms so that it can spray pesticides both the sides. As more no of nozzle are there hence spraying is done rapidly and time and money is saved.

II. LITERATURE REVIEW

Literature review is nothing but the work done before the present time on the same topic. So, we know that people doing farming from ancient time for food and other purpose. For better grown of crop they spray pesticides on them. There are many types of pesticides spraying technique available now that we can find as we move from east to west and also from north to south. It is difficult to mention all those techniques here. But we tried to mention main techniques used and best known to us. People in India use backpack type sprayer which is carry on back of the person with 15 lit maximum capacities and one nozzle in one hand while other hand is used to pump the machine

to create pressure. Another machine which is developed and supplied in England was manufactured and patented by Holme Farm Supplies Ltd. This machine is consisting of water tank on tractor. This water tank contains liquid pesticides. On back side of it a long rod is attached on which nozzles are attached. This is used to spray pesticides. Also many such machines are manufactured by this company for large scale farming and large size crops.

One another machine is made in India by Mansukhbhai Jagani. He attached spraying and cultivating equipment to his bike. So his bike was able to furrow opening, sowing, cultivate and spray pesticides on plants. This was proved as cost effective for small size farms.

III. CONSTRUCTION AND WORKING PRINCIPLE

The machine consists of the main body frame, battery, DC Motor, Nozzles, Pipes, Wheels, Tank and DC Pump. This is the four wheel drive machine. All the four wheels are individually driven by 30 RPM DC Motor. Frame is made up of mild steel. Its width 35 cm, length 50 cm and height is 30 cm. The main frame is covered from all the sides with plywood sheets. Vertical arm is attached at centre of back side of main frame, carrying horizontal arm. The nozzles are fitted to the pipes which are attached with the vertical and horizontal arm. The horizontal arm is movable on vertical arm. The tank is kept at the centre of the body. The DC Pump is kept at the back side of the tank while the battery is kept at the front side of same. The Remote is used to operate the vehicle. Rang of the remote is 50m.

Image 1 : Actual Photo of Automatic Pesticides Spraying Machine

The power source to run this machine is DC Battery. Battery is of 12V 9A. 30 RPM DC Motors which are directly attached to the wheels is run on the battery. Also the DC Pump is run on the battery. When vehicle moves forward then at the same time pump discharges liquid from tank towards the nozzle fitted to pipe. As 4 nozzles are attached therefore pressure reduces at each nozzle. There are 2 nozzles at each side through which mixture of water and pesticides comes out and form solid spray patter as our nozzle is of solid spray patter and liquid falls on plants. Nozzle angle for spraying is 90 degree so we can cover large area with a single nozzle.

IV. COMPONENTS

Wheel :- wheel is used to transfer machine from one place to another by rotary motion of it. Specifications of wheels are as follows:

Radius – 10 cm,
Wheel material - rubber and plastic

Image 2 : Wheels

Image 3 : Nozzle

Nozzle :- Nozzle is the main device in any spraying machine. It decides how much area is covered by spray. It generates spray pattern. Following are nozzle specification :

Nozzle Type – Solid Nozzle
Nozzle Angle – 90 degree
Nozzle radius – 1 mm = 0.039 inch

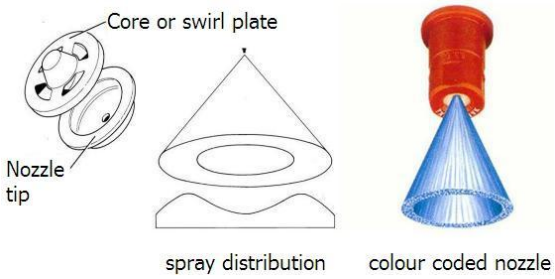

Image 4 : Spray Pattern form by nozzle

DC Motor :- DC Motor is used to rotate the wheel which is used to move the machine from one place to another. Following are the specification of DC Motor :

30 RPM DC Motor
Current :- 2.2 Ah
Voltage :- 12 V

Image 5 : DC Motor

DC Pump :- DC Pump is used to transport mixture of water and pesticides from tank to the delivery nozzle. Following are the DC Pump specification.

Pressure = 6.2 bar = 80 Psi
Current = 2.1 Ah
Voltage = 12 V

Tank :- Tank is the unit where we can store the mixture of water and pesticides. To protect it from corrosion and for log life and to reduce weight it is made up of plastic.

Tank capacity – 15 lit.

Frame :- Frame is nothing but the chassis for a machine or vehicle. It is the unit where remaining parts of the machine are fitted. To withstand in heavy weight parts it is made up of Cast Iron.

Length – 50 cm
Width – 35 cm
Height – 30 cm.

Pipe :- Pipe is the unit used to carry water from sump or tank to DC Pump and from DC Pump to nozzles. To reduce cart weight and to eliminate corrosion effect it is made up of plastic.

Plastic pipe length = 10 ft.

Metallic T & square :- T is nothing but the 3 way joint in which it accepts the liquid flow from one direction and transfers it to other 2 directions and vise versa. Also square is same to it but having 4 directions. Both are made up of metal and having internal diameter 8 mm.

V. CALCULATION

Following are the calculations:

- Power = energy per second

Battery 9 Ah current, 12 V

Power = V * I

= 12 * 9

= 108 WH

- Backup Time of Sprayer = (Power stored in battery / Power consumed by motor and pump)

= 108*2 / {(4*2*12) + (2.1*12)}
= 1.78 hrs

- Flow rate of Nozzle

$Qn = 28.9 * D^2 * \sqrt{P}$

Where,

Qn = flow rate of water from nozzle (gpm)
D = Nozzle diameter (inch)
P = Pressure at nozzle (Psi)

$Qn = 28.9 * (0.039)^2 * \sqrt{25}$
Qn = 0.21 gpm
Qn = 0.79 lit/min

Description	Conventional Method (10 Acre)	Automatic Pesticides Spraying Machine (10 Acre)
Pesticides	5Litre	4Litre
Pesticides cost	5*2000=10000 Rs	4*2000=8000 Rs
Labor Charge	Rs. 300 / Day	Rs. 300 / Day
Nos. of labors	3	1
Nos. of working days	8	2
No of cycle	5	5
Total charges of labor	300*3*8*5= 36000Rs	300*1*2*5=3000 Rs
Machine cost	3000*3=9000	35000
Working charges of battery	-	Rs. 120/day For 5 no of cycle =Rs 600
Total cost	10000+36000+9000=55000	8000+3000+35000+600 =46600
We save Rs.8400/ year		

We are using 4 nozzles. There are 2 nozzles on both sides of arm. Hence the final discharge will be 0.79*4 = 3.1 lit/min.

VI. RESULT AND CONCLUSION

As the current passes from battery to DC Motor vehicle starts moving. At the same time DC Pump run and sprays pesticides with many nozzles. This machine will be operated by remote with maintaining some distance; therefore no harm effect will occur to human health. Also it covers larger area in less time so lots of time will be saved with this and also labor cost will reduce and money saved.

Based on the present work the followings are some important conclusions have been drawn.

1. It is found that the existing pesticide spraying machine runs on human power. That portable backpack sprayer type machine may cause health problems for person as he directly comes in contact with pesticide. Also, the human who is spraying the pesticides faces the problem of lumber pain.
2. In advent of avoiding such problems enlisted in first point, an automatic pesticides pesticide spraying machine seems an alternative concept.
3. Comparison between the existing machineries and present machine shows that the tricycle operated machine can work very efficiently with respect to covering area, time and cost of spraying process. Also it seems economical.
4. During testing the speed of vehicle varies continuously; it is because of varying track resistance. Further it is assumed that the spraying would be stopped partially but the pressure generated in spraying pump continues to spray the pesticide because the pressure developed in the pump is sufficient enough to spray for few minutes.

Cost Comparison of First Year

Cost Comparison from Second Year

Conventional Method = 10000 + 36000 = 46000 Rs

Automatic Pesticides Spraying Machine = 8000 + 3000 + 600 = 11600 Rs

Therefore, automatic pesticides spraying machine will save large amount of money.

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