

Design and Development of Remote Controlled Agriculture Pesticide Sprayer Vehicle

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Abstract: — Spraying is traditionally done by labor carrying backpack type sprayer which requires more human effort. The farmer who is spraying pesticide is affected by it which is harmful to human health. Also the lumber pain and shoulder disorder due to the weight of the equipment and the pesticide in it. Mechanization for spraying operation is costlier for specialized operations like High Pressure Sprayer, Engine Operated Sprayer. We have designed an Agricultural Pesticide Sprayer Vehicle which does not need fossil fuel for required operation, which is easy to move and sprays the pesticide without the farmer being in direct contact with the pesticide. In this project we have used Wiper Motor which drives the sprayer vehicle. The rotation of the wheel rotates the chain sprocket which is connected to give motion to pesticide drum lever, the lever operates the piston of the drum and hence it sprays the pesticide. The sprayer motion is given by linkage through motor that is powered by battery and it is operated by a remote control.

Index Terms - Wiper Motor, Battery, Pesticide Sprayer, Remote Control.

I. INTRODUCTION

India is an agriculture based country. In India 73% of population indirectly depends on farming. Farmers have been using the same methods for seed sowing, spraying, weeding etc. There is need of improving method of farming. India is facing the problem of low agricultural productivity. This is because of low level farming, insufficient power supply to farms and poor level machinery are the main reason for agricultural productivity of India being low as compared to other countries that have been agricultural rich countries for a very long time. Spraying is an important method in farming. Most common type of sprayer used in India are backpack (hand operated sprayer) its main component are hand operated lever, pesticides tank nozzle. In backpack sprayer hand lever is continuously operated to maintain pressure in pesticide tank. Nozzle converts the water and pesticide mixture in small droplets. This type of sprayer can generate pressures up to 100 pounds per square inch.

II. LITERATURE SURVEY

Nitin Das (Agricultural fertilizers and Pesticides Sprayers) April 2015

The development of an attachment for a motorbike for getting a multi-purpose tool bar was given by Mansukhbhai Jagani. From this development they tried to solve the twin problems of farmers, the paucity of laborers and shortage of bullocks. This motorbike can be used to carry out various farming operations like inter-culturing, sowing, spraying operation and furrow opening. This technology is proved efficient. And the cost is low for small size farm

Siddharth Kshirsagar (Design and Development of Agriculture Sprayer Vehicle) March 2016

The engine operated sprayers produce more consistent sprays; the sprays cover the area more uniformly when operated at constant speed. Results are more uniform coverage than the hand spraying. Motorized sprayers are also capable of higher pressure spray that is required to provide a better coverage. There is many other type of hand operated sprayer that are not widely used throughout the agriculture. Used wide extensively for the productions of specific commodities.

Pavan B. Wayzode (Design and Fabrication of Agricultural Sprayer, Weeder with Cutter) April 2016

Experiments with rotary blades were performed in the early years; Power Specialties Ltd. introduced a gasoline powered rotary mover. One of the experiments in the design of rotary moving equipment was made by C Stacy, a farmer in the Midwest region of the United States. The concept was the use of a toothed circular saw blade mounted horizontally on a vertical shaft, which would be suspended at a height of approximately 2 inches. The movement was across a lawn to cut grass and other lawn vegetation at a uniform height. The power for his experimental mover was an electric motor. The common disadvantage was that the engine runs down easily. The cost of production was high for an average individual to purchase. Rotary movers were not developed until engines were small enough and powerful enough to run the blades at a high speed

III. PROBLEM DEFINATION

Vehicle should be able to work with the help of appropriate controls in order to spray effectively along the path as required to perform the required functions. Based on this factor, the basic mechanical designs of agricultural sprayers vehicle will be designed and implemented for 15 liters of payloads by combining the entire factor that are stated above with goal of achieving a better functionality. Mechanization for spraying operation is costlier for specialized operations such as high pressure sprayer, engine operated sprayer. Skills of labor required depend upon the complexity of the equipment or machinery used. All the pre-

existing methods have concentrated on providing less feasible and uneasy solutions. Now here we require a machine that is cost efficient for the farmers and also machine which would keep the farmer away from the spray so that the harmful pesticide may not enter his body by any means. A machine that does not require any means of fossil fuel will be an ideal solution that we are going to provide.

IV. PROPOSED METHODOLOGY

The vehicle is design to perform the operation namely spraying with the help of remote control. It is used for spraying pesticides. The reserve tank contains pesticides, which is attached to the reciprocating pump. The reciprocating pump is connected to the spraying nozzle through flexible pipe. Following are the component used:

1. Supporting wheels
2. Nozzles.
3. Pump System.
4. Base Frame.
5. Pesticide Storage (Tank).
6. Remote Control system.
7. Flexible Pipe.
8. Connecting Rod.
9. Wiper Motor
10. Battery

1. Supporting wheels:

Supporting wheels are used to give motion to the vehicle and also these wheels have the ability to take the whole weight of the assembly.

2. Nozzles:

The nozzle is a critical part of any sprayer Nozzles performs three functions:

- Regulate flow
- Atomize the mixture into droplets
- Disperse the spray in a desirable pattern

3. Pump System:

The pump system comprises of sprayer mechanism of 15 liter capacity integrated with inbuilt pump and sprayer.

4. Base frame:

The base frame is a steel fabricated structure that holds the entire assembly of the sprayer and supports the weight of whole structure.

5. Pesticide storage Tank:

Pesticide storage tank is used to store the pesticide. It has 15 liter capacity and is lighter in weight.



Fig.1. Pesticide storage tank

6. Remote access:

It is used for performing to and fro motion of sprayer and adjustment of nozzle

7. Flexible pipe:

It can be mounted in any orientation

8. Connecting Rod:

Connecting rod connects sprocket to storage tank



Fig.2. Connecting Rod

9. Wiper Motor:

Wiper motor is used to drive the wheels of the Agriculture pesticide sprayer vehicle.

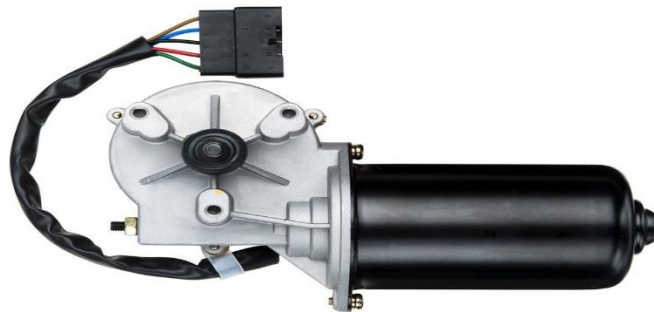


Fig.3. Wiper Motor

V. CALCULATIONS

- Discharge of pesticides through the nozzle = 8.9 ml/stroke
- Discharge in minute = 1.8 lit/min
- Amount of pesticide required = 9.5 lit/acre
- For Swept length

Angle of dispersion from nozzle = 110 degree

So now,

Consider that the plant is at a distance of 1.5 feet that is 0.47 m therefore, the radius required to be covered by the spray will be

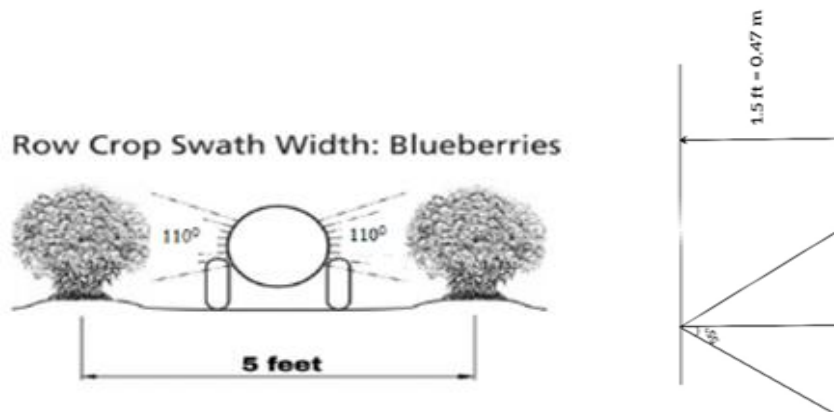


Fig.4. Spraying angle and the distance covered by the spray

$$\tan 55 = r/0.47$$

$$r = 0.47 * \tan 55$$

$$= 0.671$$

$$\text{Diameter} = 0.671 * 2 = 1.34$$

Therefore, 1.34 m would be covered in a stroke of the pump.

VI. RESULT

The machine we are making is a real model of a cost effective machine .This machine would surely reduce the effort of farmer. Also the machine will not have any kind of maintenance. The farmer is saved from the ill effects of the pesticide. Fatigue of the farmer will also be reduced to very low level. A green and eco-friendly environment product is provided for the future. The flexible hose helps the farmer to reach the heightened plants as well.

VII. FUTURE SCOPE

Technology is ever growing and there is always scope for improvement and advancement in every field of work. In future we can accommodate the charging of the battery by use of a solar panel so that the farmer would not need to worry about the charging of battery. By use of more powerful motor this type of instrument can be used for very rough terrains like hilly slopes etc. Further this type of technology can be modified and used for spraying in very narrow areas.

VIII. Acknowledgment

The authors are thankful to assistant prof. Md Sami Malik, Automobile Engineering Department, Theem College of Engineering for the preparation of the paper.

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