

## Battery Operated Automated Spray by Using Sensors

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**Abstract**— Insects are largely responsible for the crop destruction. Insecticides or pesticides, a man made or natural preparation are used to kill insects or otherwise control their reproduction. These herbicides, pesticides, and fertilizers are applied to agricultural crops with the help of a special device known as a "Sprayer," sprayer provides optimum performance with minimum efforts. The invention of a sprayer, pesticides, fertilizers, bring revolution in the agriculture or horticulture sector especially by the invention of sprayers, enable farmers to obtain maximum agricultural output. They are used for garden spraying, weed and pest control, liquid fertilizing and plant leaf polishing.

**Keywords**— farmer friendly devices, Sprayer, ultrasonic sensor.

### Introduction

The farmers have been using the same methods and equipments for ages for example the seed sowing, spraying weeding etc. operations are carried out by same techniques. There is need to develop effective spraying machines. Science and Engineering is making use of knowledge to meet human needs by creating machine, systems, process and technologies that have not previously existed. Design and manufacturing are the synthetic part of engineering practice. Manufacturer has received a lot of attention recently for very good economic reasons. Present pumps may work for people having small crop area. But those having large farm sector find trouble using backsprayer.

These pumps having few limitations so our main aim is to reduce these limitations by increasing tank capacity.

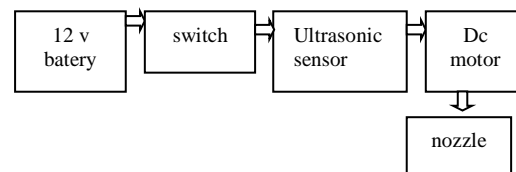
And also with the help of sensors we can minimize wastage.

In Indian farms generally two types of spray pumps are used for spraying; hand operated spray pump and fuel operated spray pump of which hand operated spray pump is most popular. The main drawback of hand operated spray pump is that the user can't use it for more than 5-6 hours continuously as he gets tired after some hours where as fuel

operated spray pump requires fuel which is expensive and availability of fuel is not easy at rural places. At the same time it exhausts carbon dioxide as pollutant which is harmful to our environment. Also use of other pesticide pumps causes fatigue.

We know 70% of population of our country lives in villages and their main occupation is agriculture. Our prominent aim of this project is to fulfil the tasks like hand spraying, IC engine spraying, and leg pump spraying etc. using non-conventional energy sources.

Here we prepared a low cost battery operated pesticide pump with devices such as emergency LED, dc motor, battery, ultrasonic sensor, which can work without any fuel. This pesticide pump can be used at various places such as farm, garden also in municipality to kill mosquitoes. We hope our new invention makes the farmer modern and smarter. In this project, we emphasized on the spraying of pesticides using sensors.



**Fig1- Block Diagram Of Battery Operated Fertilizer Sprayer**

### Working

The block diagram is as shown in figure. The pump system consists of DC motor, Battery, micro control sensor, DC Motor, Ultrasonic Sensor, spray nozzle, pesticide tank etc. It uses electrical energy to operate. Battery uses this electricity to charge itself. The stored electricity is used to run the motor and other portable devices. When the switch is turned on, in working condition the ultrasonic sensor detects the presence of any obstacle coming in influence in this way the nozzle control discharge.

#### A. Technical specification of components:

The equipment details are mentioned in this section and the equipments are pesticide tank, DC motor, DC battery, nozzle type, sensors and controller.

#### **Liquid Storage Tank:**

capacity = 50-100 ltrs. Material = PVC 240

#### **DC Motor:**

DC motor is used to lift the pesticide from tank and delivers to spray gun. DC motors has following specifications. Voltage = 12 volts DC Maximum current = 1.8 A Maximum Pressure = 0.45 MPa Liquid discharge = 2.9 lit/min Speed = 0-6,000 rpm

#### **DC Battery:**

Model name: Sealed lead acid battery. Weight = 2.5 kg  
Capacity = 12 volts, 8 Ah Charging current = 2.4 A  
(Max) Standby use: 13.5 V - 13.8 V Cyclic use: 14.5 V - 14.9 V

#### **Nozzle:**

Nozzle discharge rate is 2.9 lit/min, spray nozzles are have flexible movement.

#### **Ultrasonic Sensor:**

This sensor is used to detect the plants. Systems typically use a transducer which generates sound waves in the ultrasonic range, above 20000 hertz, by turning electrical energy into sound, then upon receiving the echo turn the sound waves into electrical energy which can be given to microcontroller.

The HC-SR04 ultrasonic sensor uses sonar to measure distance to an object. It offers excellent range accuracy and stable readings in an easy-to-use package. Its operation is not affected by sunlight or black material like Sharp rangefinders are (soft materials like cloth can be difficult to detect). Module main technical parameters: 1. Working Voltage : 5V(DC) 2. Static current: Less than 2mA. 3. Output signal: Electric frequency signal, high level 5V, low level 0V. 4. Sensor angle: Not more than 15 degrees. 5. Detection distance: 2cm-450cm.

6. High precision: Up to 0.3cm 7. Input trigger signal: 10us TTL impulse 8. Echo signal : output TTL PWL signal Mode of connection: 1.VCC 2.trig(T) 3.echo(R) 4.GND The basic operation principle is below : use IO port TRIG to trigger ranging. It needs 10 us high level signal at least Module will send eight 40kHz square wave automatically, and will test if there is any signal returned. If there is signal returned, output will be high level signal via IO port ECHO. The duration of the high level signal is the time from transmitter to receiving with the ultrasonic. Testing distance = duration of high level sound velocity(340m/s) / 2 You can use the above calculation to find the distance between the obstacle and the ultrasonic module.

#### **Controller:**

It is used for switching circuit by receiving signals from sensors. It consists of an amplifier and relay References

#### **Solenoid valve :**

While there are multiple design variants, the following is a detailed breakdown of a typical solenoid valve design.

A solenoid valve has two main parts: the solenoid and the valve. The solenoid converts electrical energy into mechanical energy which, in turn, opens or closes the valve mechanically. A direct acting valve has only a small flow circuit, shown within section E of this diagram (this section is mentioned below as a pilot valve). In this example, a diaphragm piloted valve multiplies this small pilot flow, by using it to control the flow through a much larger orifice.

Solenoid valves may use metal seals or rubber seals, and may also have electrical interfaces to allow for easy control. A spring may be used to hold the valve opened (normally open) or closed (normally closed) while the valve is not activated.



A- Input side

B- Diaphragm

C- Pressure chamber

D- Pressure relief passage

E- Electro Mechanical Solenoid

F- Output side

The diagram to the right shows the design of a basic valve, controlling the flow of water in this example. At the top figure is the valve in its closed state. The water under pressure enters at A. B is an elastic diaphragm and above it is a weak spring

pushing it down. The diaphragm has a pinhole through its center which allows a very small amount of water to flow through it. This water fills the cavity C on the other side of the diaphragm so that pressure is equal on both sides of the diaphragm, however the compressed spring supplies a net downward force. The spring is weak and is only able to close the inlet because water pressure is equalized on both sides of the diaphragm.



#### Conclusions :

1. The Suggested Model Has Removed The Problem Of Backpain ,Since There Is No Need To Carry The Tank (Pesticides Tank) On The Back.
2. As The Suggested Model Has More Number Of Nozzles Which Will Cover Maximum Area Of Spraying In Minimum Time And At Maximum Rate.
3. Muscular Problems Are Removed An There Is No Need To Operate The Lever.
4. It Does Not Create Air Pollution And Noise.

#### B. SCOPE FOR THE FUTURE WORK:

The total model weight is 21 kg with fully pesticide tank. The weight can be reduced 2-3 kg by using plastic molding for mechanical structure. Further energy can be saved by using PWM Scheme for driving pump.

#### C. ACKNOWLEDGEMENT

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