

Development of Solar Operated Fertilizer Sprayer by Using Advanced Product Development Techniques Working operation

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ABSTRACT : Today's world is of new technology and developments. Hence the rapid growing industry in agriculture sector as well as continuous increasing demand by the society. New machines and techniques are being developed continuously to manufacture various products at cheaper rate and higher quality. Therefore "**Product Development of Solar Operated Spraying Machines**" is an innovative idea, hence it will be helpful and will overcome the difficulties faced by our farmers.

The investigation on the existing fertilizer sprayer reviews the following drawbacks such as completely manual operated, to run the machine it required manual effort, the adjustment of spraying nozzle is manual operated, the power capacity of previous product was low. The proposed work is benefited by the automatic movement of the nozzle, automatic height adjuster and automatic driving mechanism. This all work parameter will be helpful for farmers.

Index Terms – product development, automation, solar operated

I. INTRODUCTION

Today's world is of new technology and developments. Hence rapid working machine and equipment's are going to be manufactured. New machines and techniques are being developed continuously to manufacture various products at cheaper rate and higher quality. In agriculture fertilizer spraying is one of the basic and most important step. Therefore "**Product Development Of Solar Operated Spraying Machine**" is an innovative idea, hence it will be helpful and will overcome the difficulties faced by our farmer. The product development process typically consists of several activities that firms employ in the complex process of delivering new products to the market. In engineering, new product development covers the complete process of bringing a new product to market. The whole process of fertilizer spraying is mostly carried with the help of hand pump sprayer which is time consuming and cause fatigue to the operator that even with compromising the health issues. To provide automatic motion to the set up to reduce human efforts by providing chain drive arrangement, To attain various angles of nozzle with remote controller to cover larger area for spraying.

II. METHODOLOGY

In this project, we used the following component like booster pump, solar panel, automotive battery, nozzle, high torque motor, stepper motor,

As our whole machine is automatic we are perform some operation step by step

- 1) Continuous charging of battery with the help of solar panel
- 2) With help of control panel we can control the respective operation
- 3) Machine is driven by the high torque motor
- 4) Booster pump will suck the fertilizer and will spray by the nozzle
- 5) The movement of the nozzle is control by stepper motor
- 6) With the help gear motor the height of the nozzle can be adjusted up to 4.52 feet's

III. FABRICATION

Machines used:

1. Welding machine (Arc welding setup)
2. Grinding machine
3. Power hacksaw

After completing the design of model, we started with fabrication of model according to the process generalised by product development techniques:

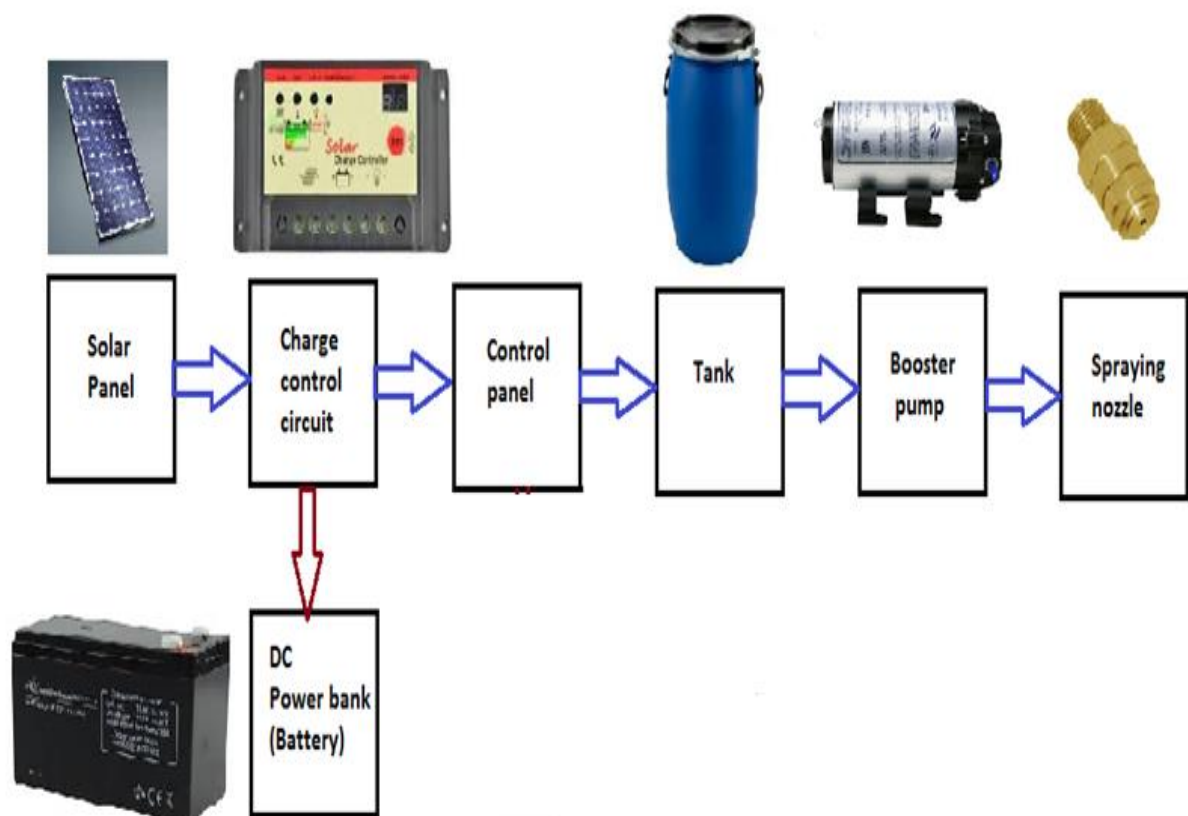
- Making of driving wheels which suits the farm environment
- Mounting of driving wheels on shaft and idler wheel
- Welding of chassis and frame
- Welding of nozzle guide channel
- Mounting of high torque motor and chain drive assembly
- Nozzle guide assembly
- Mounting of two stepper motors
- Controller and circuit installation
- Battery charging system with solar panel

IV. LIST OF COMPONENTS

It consists of following components:

1. Solar panel
2. Booster pump
3. High torque motor
4. Stepper motor
5. Gear motor
6. Charging unit
7. Operation control unit
8. Body frame
9. Fertilizer pipes

V. WORKING



- The entire working of the machine is dependent on the solar panel and battery. the solar panel is used of 5 watt.
- As the panel observe the heat and due to help of charge controller the battery is charged.
- Tank which carry fertilizer solution is placed in centre which is attach to booster pump with the help of pipes.
- The booster pump is further connected to nozzle and pump follows the instruction of operation control unit .
- The height adjustment of the nozzle is done with the help of gear motor.
- Angular movement of the nozzle is done with the help of steeper motor.

VI. OBSERVATION & EXPERIMENTATION

PARTS	OBSERVATION
SOLAR PANEL	It takes 3 hours to fully charge a battery ,and the machine Almost work for 3 hrs. on full load
NOZZLE	The spraying radius of the : <ul style="list-style-type: none"> ➤ Horizontally : 2500 to 3000 (mm) ➤ Vertically : 1000 (mm)
AUTO MOTIVE BATTERY	Capacity: 12 v Output :13.5 to 14.5 Running time: 4 hrs.

PROJECT PHOTO



VII. RESULT AND DISCUSSION

- Hence, we successfully fabricated a **Solar Operated Spraying Machines** which is fully automatic. In which all the manual operation are reduced and previous manual operations has converted into fully automatic.
- In manual operation it required human effort to run the machine but after atomization this is automatically operated. And all the respective operations are performed automatically like spraying, height adjustment, machine driven.
- Automatic machining takes less time than manual operation and power source of machine is solar power .

REFERENCES:

- “Modelling of algorithms for solar panels control systems” T.A. Demenkova , O.A. Korzhovaa,b , A.A. Phinenkoa
- Performance Assessment of Solar Agricultural Water Pumping System” V.S.Korpalea , D.H.Kokatea , S.P.Deshmukha
- Thin PDMS nozzle/diffuser micropump for biomedical applications” Paul Kawun , Stephane Leahy , Yongjun Lai

