

Fabrication of Sprayer For Coconut Tree

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Abstract- Coconut is one of the most valuable gifts of nature to mankind. The every part of a coconut tree has its own use or applications. It is generally called “Tree of Heaven”, “Tree” of Abundance”, “Tree of Life” and kalpavriksha”. A variable rate chemical sprayer for disease and pest-infested coconut plantations was designed and evaluated. The manual application of chemicals is considered risky and hazardous to workers, and provides low precision. The designed sprayer consisted of a sprayer frame, a power system, a chemical tank and pump, a nozzle. As the target was confirmed, the nozzle was moved towards the target area (tree canopy) using the pulley and rope controlling system. The pump then sprayed chemicals to the target at a specified rate. The sprayer reduced labour requirements, prevented chemical hazards to workers, and increased coconut pest controlling efficiency.

I. INTRODUCTION

Coconut is one of the cash crops in India. India is one among the top players of coconut producers in the world. But the coconut farmers and home grown coconut tree growers face lot of difficulties in getting manual coconut tree climbers to harvest the coconut. There is acute shortage of human coconut tree climbers not only in India but all over the world. Traditionally this job is taken up by the socially and economically backward people in India. As the literacy rate increases and India is growing economically, there are several high paid jobs which people move to. It also a risky job in which an accident might be fatal in some cases. Without proper insurance coverage, this could be a blow to the entire family if the climber is the lone person to earn and take care of the family. It is also found that people engage in this job for several years develop issues related to their skin. So better solutions has to come to harvest coconuts since it is very risky job. The purpose of this paper is to discuss about various existing solutions available, their limitations and suggest solutions that could possibly be a complete one. The conventional way of harvesting is by climbing the coconut tree and cutting it. Because of the difficulties in climbing and harvesting process different methods have been developed.

II. LITRTURE REVIEW

Coconut is one of the highest economic value agricultural products in Thailand. Coconut is used to cook main dishes, as well as various kinds of dessert in Thai cooking. These problems result in the decrease in coconut production quantity and severe economic damage to coconut plantations. Some farmers use parasitic wasps to control coconut pests naturally. However, this method did not work well in pest control, and was also labour intensive. Some farmers drill holes on coconut trees and fill chemicals inside, which may leave chemical residue in coconuts. On the other hand, the limitations of chemical sprayers include their reach to the full height of coconut trees and the heavy weight of bamboo stick (sprayer boom). Many researchers have integrated a real-time machine vision sensing system and an individual nozzle-controlling device with a commercial map-driven-ready herbicide sprayer to create a spraying system. The smart sprayer was tested to determine its effectiveness and performance under varying commercial field conditions. Using the on-board differential GPS, geo-referenced chemical input maps (equivalent to weed maps) were also recorded in real-time. The performance accuracy of the spot-applicable fertilizer spreader was evaluated both in laboratory simulation and real-time field tests.

III. CONSTRUCTION

The following are the main component of the project:

1) Main body (base):

It is the main body of the machine. It consist all element of machine. It works as pillar for other parts. Base is made by mild steel which can take all compressive loads. It is also movable where we required by the manual force. Sizes of base: 3 feet x 3 feet x 3 feet (Mild steel angle)

2) Pump:

A diaphragm pump (also known as a Membrane pump) is a positive displacement pump that uses a combination of the reciprocating action of a rubber, thermoplastic or Teflon diaphragm and suitable valves on

either side of the diaphragm (check valve, butterfly valves, flap valves, or any other form of shut-off valves)

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There are three main types of diaphragm pumps:

- Those in which the diaphragm is sealed with one side in the fluid to be pumped, and the other in air or hydraulic fluid. The diaphragm is flexed, causing the volume of the pump chamber to increase and decrease. A pair of non-return check valves prevent reverse flow of the fluid.
- Those employing volumetric positive displacement where the prime mover of the diaphragm is electro-mechanical, working through a crank or geared motor drive, or purely mechanical, such as with a lever or handle. This method flexes the diaphragm through simple mechanical action, and one side of the diaphragm is open to air.
- Those employing one or more unsealed diaphragms with the fluid to be pumped on both sides. The diaphragm(s) again are flexed, causing the volume to change.

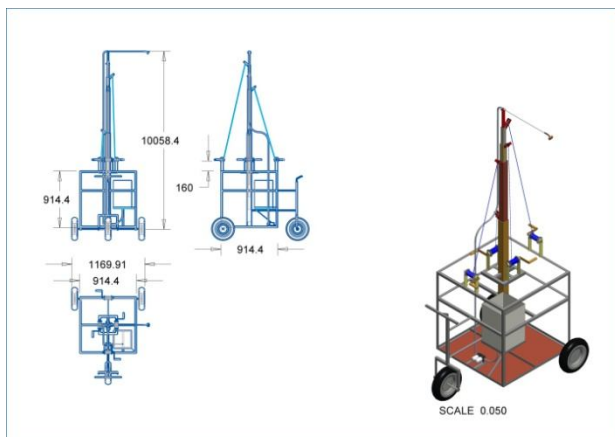


Fig: Geometric Modelling

IV. WORKING OF THE PROJECT

The electrical energy which is stored in storage battery, which is rechargeable. Battery provides smooth flow of electricity for proper working of pump. Battery is connected to the d.c. motor. When we press operating switch at the handle, the pump start working. The valve at the handle gets open and due to closing of the switch pump starts rotating. The pump suck the water from reservoir tank after

complete pump is filled with water, it will start discharging through the pump. When the volume of a chamber of either type of pump is increased (the diaphragm moving up), the pressure decreases, and fluid is drawn into the chamber. When the chamber pressure later increases from decreased volume (the diaphragm moving down), the fluid previously drawn in is forced out. Finally, the diaphragm moving up once again draws fluid into the chamber, completing the cycle. Where is high velocity its high velocity is reduced and converts into pressures. Same time operating valve is open, pressurize water supply to the nozzle and when this pressurized liquid flowing to number of holes of small diameter. Solution converted into fine particle and it is desirable for the spraying the water. Our project is working continuously without the any help of electricity.

V. CALCULATION

Technical specification

- For Flow Rate or Discharge:

$$Q = \frac{3960 \times WHP}{H}$$

Water horsepower (whp) = 5 watt

Total head (h) = 2 meter

Flow rate or discharge (q) = 4.0465609757963 gallon/minute

= 15.31 litre / hour

- Bearing Calculation:

$$P = X Fr + Yfa.$$

Where;

P=Equivalent dynamic load, (N)

X=Radial load constant

Fr= Radial load (H)

Y = Axial load contact

Fa = Axial load (N)

In our case;

Radial load $F_R = 750N$

$$F_a = 0$$

$$P = 1 \times 750 N$$

$$\Rightarrow L = (C/p)^P$$

Considering 4000 working hours

$$L = \frac{60 n L h}{10^6} = 4.8 \text{ mrev}$$

$$\Rightarrow 4.8 = \left[\frac{C}{750} \right]^P$$

$$\Rightarrow C = 12652 N$$

As required dynamic of bearing is less than the rated dynamic capacity of bearing;

⇒ Bearing is safe.

VI. OBJECTIVES OF PROJECT

- The idea is to make a device which does not use Electrical energy but a device completely depending on mechanical linkages.
- Provide an alternative to the existing methods of climbing.
- To tackle the problem of unavailability of coconut tree climbers for coconut farming and plant protection activities.

VII. ADVANTAGES

- Our project is mostly used in rural areas where the electricity problem is more.
- No requirement of any electrical device require to run the project.
- Cost of our project is very less.
- The output of our project is very large as compared to electrically run pump.

VIII. APPLICATIONS

- It is used in agricultural land to spray the pesticides on multiple trees to remove the insecticides from it.
- It is also used in domestic purposes.

IX. CONCLUSION

A chemical sprayer with a moving system was designed and fabricated, which consisted of major parts such as a sprayer frame, a power system, a chemical tank and pump and rope pulley and winch system. The spraying rate was 15.31 Litre/min. at a forward speed of 2.5 km/h, and a working capacity of 0.056 ha/h. This project is used where the electricity problem is more, mostly the pesticide sprayer is working on the electricity. Our project is working on the D.C. power i.e. on the power of battery which is chargeable. This project spray the pesticide up to the 33 foot height.

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