

Agriculture Multisprayer Machine

Tarun Kumar, Vipul Chaudhary , Varun Kumar

Department Of Mechanical Engineering, IMS Engineering College, Ghaziabad U.P

Abstract

Majority of the Indian population is solely depends on agriculture, where 60% to 70 % of total population's family income depends on agriculture, in this majority of them are small scale producers.

In agriculture, main problem faced is spraying pesticides. Due to advancement in technology many companies have come up with electrical and solar type of pesticide sprayers. But the medium scale farmers cannot afford this type of sprayers, because of its price when compared to manual type.

Due to this reason, present project comes up with a new idea which uses slotted lever mechanism for pumping of pesticide. The study comprises on Design, Analysis and Fabrication of pesticide sprayer. Analysis is been carried out for pesticide sprayers components using ANSYS Workbench and also cost estimation analysis for pesticide sprayers is provided considering farmers economy.

Project ensures that the Mechanism provided gives better efficiency when compared to other type of sprayers. Results obtained from ANSYS can be used for better improvements in design as future scope and Cost estimation analysis helps in knowing the market for farmers.

Keywords: *agriculture, pesticide sprayer, slotted lever mechanism, ANSYS Workbench*

Introduction

India stands second in worldwide in farming sector. Agriculture products plays very important role, which is the source of survival for the man kind. Not only human beings are dependent directly, most of the living creatures are also directly or indirectly dependent on agriculture products. Approximately 36% of the world's population are engaged in agriculture with India's 65% of the population being directly and indirectly dependent on this sector.

On survey agriculture and other sectors like forestry, logging and fishing accounted for 17% of the GDP and employed 49% of the total workforce in 2014. As compared to past decades the overall population which depends on agriculture has been decreased due to various reasons like, climatic changes, draughts etc. This data reveals the agriculture's contribution to GDP has steadily declined from 1951 to 2011, but still it is the largest employment source and a significant piece of the overall socio-economic development of India. The yield in agricultural crops has been increased compared to past decades due to major improvement steps by the government and researches have been conducted to improve the soil fertility as well as for minimum usage of water for better yield and in turn. This gives better profit for the farmers for their products

When it comes to the increase in yield of the agro products, the main reasons which directly increase the yield of crops are water, soil fertility, and pesticides. Due to advance developments and researches in agriculture sector many new methods have evolved to increase the production in the agriculture sector.

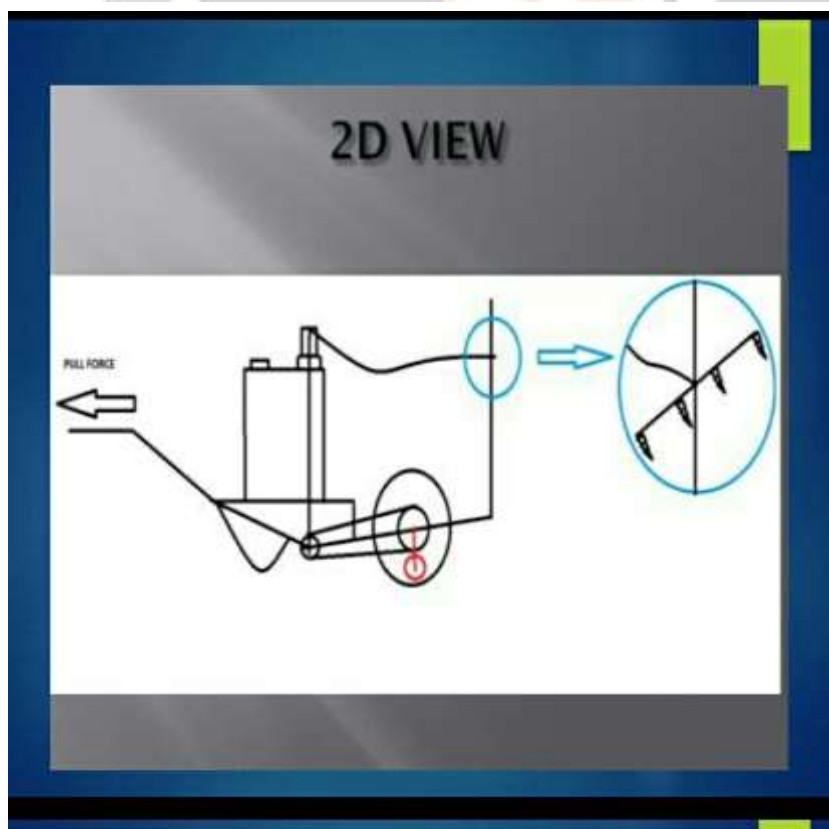
Chemicals are widely used for controlling disease, insects and weeds in the crops.

Methodology

- Motion Transmission by Chain and Sprocket Arrangement
- Slider Crank Mechanism
- Rotary Motion Converted into Reciprocating Motion

Components

- Sprocket
- Chain
- Crank
- Connecting Rod
- Pump
- Nozzle
- Wheel
- Frame
- Tank

**Literature survey**

Literature survey is carried out to understand the state of art in different spraying mechanisms Dhiraj N. Kumbhare, [1], [2016], et.al, this paper comprises of fabrication of automatic pesticides spraying machine which gives an idea about components used in the sprayer Workbench and also based on geometry and analysis results fabrication is carried

Geometry

The complete geometry of the model consists of front wheel, trolley (chassis and small wheels) and crank and slotted lever mechanism. The enlarged view of major components of pesticide sprayer is as shown in Fig. and also analysis is been carried out for the same.

Frontwheel

Front wheel is the major part which helps in the movement of whole setup as shown in Fig. The front wheel is connected to trolley by shaft and bearings as shown in the Fig.



Fabrication

Based on the design and Ansys results, the model is fabricated as shown in Fig. The detailed list of components, materials used and cost is as shown in Table 5.

Sr No.	Name Of Component	Material Used
1	Frame	Mild Steel
2	Tank	Plastic
3	Nozzle	Plastic
4	Nozzle Bar	Steel
5	Wheel Rim	Steel
6	Tyre	Rubber
7	Sprocket	Steel
8	Free Wheel	Steel



Overview Of Model

Advantage And Disadvantage And Application Of Agriculture Multisprayer Machine

The fabricated model of Trolley type pesticide sprayer has the following advantages, disadvantages and Applications as listed below

Advantages

- Design is simple and compact
- Affordable for Middle and lower class farmers through government subsidies
- Minimum cost compared to other types
- Low Maintenance cost
- Use of Crank- Slotted lever mechanism facilitates adjustable features in spraying
- Pesticide can be sprayed for crops grown to a height of Maximum 6 feet
- Eliminates direct contact of pesticides from farmers

Disadvantages

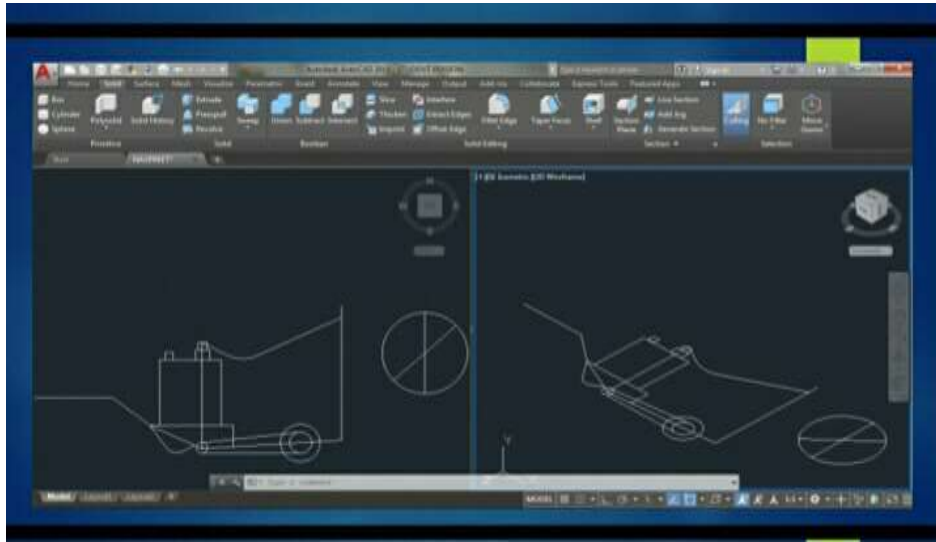
- Cannot be used for dense Farming Such as rog farming etc.
- Preferable for dry land crops.
- Requires Human effort to push the trolley

Application

- Sugarcane Farming
- Tomato Farming
- Beans Farming
- Capsicum Farming

Design And Dimension

- **Sprocket**
Teeth = 45
Diameter =200 mm
- **Freewheel**
Teeth =18
Diameter =70 mm
- **Tank**
Capacity =16 liters
Gross weight =20 kg
Box Dimensions =520*200*480 Milli Metre cube
- **Tyre Hight =20inch**
- **Rod = 8mm**
- **Total Height =113cm**
- **Nozzle Gap = 2inch**
- **Nozzle Bar Length =85cm**
- **Nozzle Head Bar Length = 84cm**
- **Frame**
Length =49inch
Breadth =42 inch



Design Model

Conclusions

From the Design, Analysis and Fabrication of Trolley type pesticide sprayer, the following conclusions are:

1. ANSYS is the very effective and powerful tool in determining the stress and strains (deformation) in the components
2. The design is simple and compact with minimum fabrication cost
3. The fabricated model is affordable for middle and lower class farmers through Government Subsidies
4. Compared to other types of spraying mechanisms, the crank- slotted lever spraying mechanism incorporated in present project is more efficient and is with low maintenance
5. Minimum travel path width required for a pesticide sprayer is just about 30 cm. Hence it can travel in narrow path without damaging the crops.
6. Project completely eliminates labour wages and carrying sprayer tank on back of farmer

And also it can be concluded that the present project work becomes a ready reckoner for engineers for future developments in pesticide spraying methods/mechanisms. Present work is no more exhaustive further work can be carried out by modifying the spraying mechanisms.

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