Manufacturing of Drone For Spraying of Pesticides

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Abstract- *India is agriculture based country and 70% people do farming and related work.Agriculture is required to be boomed to enhance the Gross Domestic Product (GDP)of the country by improving the productivity. The productivity of the crops can be increased with the help of pest control. Pesticide sprayingis the necessary procedure in cultivation of the crops. The WHO (World Health Organization) estimates there are near about 3 million pesticide affective cases in every year. In that around one lakh deaths in each year,especially due to the pesticides sprayed by human being. The pesticide affects the nervous system and also leads to disorders. This paper describes the development of quad copter UAV and the sprayer module which is remedy to the problems caused in rainy season, to move the pipe required for spraying of pesticides due to soilslurry. Because of the usage of drone with HTP for spraying pesticides we overcome health problem which are caused due to the direct exposure of pesticides on human body as well as pesticide storage capacity.*

Keywords- GDP, WHO, Quadcopter, HTP (Horizontal Triplex Power) Pump.

I. INTRODUCTION

Agriculture in India constitutes more than 60% of the occupation. It serves to be the backbone of Indian economy. It is very important to improve the efficiency and productivity of agriculture by simultaneously providing safe cultivation of the farmers. Operations like spraying of pesticides, sprinkling fertilizers are very tedious. Though spraying of pesticides has become mandatory it also proves to be a harmful procedure for the farmers.[1]

Farmers, especially when they spray pesticides, take too many precautions like wearing appropriate outfits, masks, gloves etc so that, it does not cause any harmful effects on them. Avoiding the pesticides is also not completely possible as the required outcome has to be met. So, use of quad copter in such cases gives the best of the solutions for these problems, along with the required productivity and efficiency.[1]

Organophosphates and carbonates presents in pesticides affect the nervous system. Others may irritate the skin or eyes. Some pesticides maybe carcinogens Others may affect the hormone or endocrine system in the body. Children, and indeed any young and developing organisms, are particularly vulnerable to the harmful effects of pesticides.

This project (Quad copter) is to mainly overcome the ill-effects of pesticides on human beings (manual pesticide sprayers) and also to cover larger areas of fields while spraying pesticides in a short span of time

when compared to a manual sprayer. This paper is based on the spraying system of agriculture. The basic theme of project is related to problem which are generate in agriculture, like the farmers are not able to spray insecticides or pesticide when soil is wet or high height of crop. This project is on agriculture problems, like reduces the labour cost & reduce the time, and also increase working efficiency by drone. So our project is UAV cum RPA agriculture sprayer drone.[1]

II. PROBLEM STATEMENT

1. Pesticide pumps already in market having limited capacity. So user need to refill the pesticide for many times. It will cause of wasting time to user.
2. For the back-pack type pesticide sprayer, user needs to carry the heavy tank at the back. As we know, this is the most type of pesticide pump sprayer that user use in farming.
3. User need to hold the nozzle when spraying out the pesticide.
4. Some of pesticide sprayer, user need to pump in the mixture of pesticide before spraying out the pesticide manually. So, huge force is needed to pump the pesticide.
5. In rainy season, due to rain the soil slurry causes a major problem to move the pipe required for spraying of pesticides.
6. Due to high pressure intensity of spray the chemicals from nozzle may effect the person who is spraying the pesticides causing severe health problem which may also be fatal.
7. Nowadays the drones available in the market have low pressure intensity to spray the pesticides from the air which causes the pesticides sprayed to fly off along the air, reducing the efficiency of spraying.

8. During spraying after sometime hand muscles starts to pain and thus proper pressure is not maintained.So, it affects the droplet pressure.
9. When using fuel operated vehicles the exhaust gases liberated from the Silencer or muffler produces a harmful effort over the crops.

III. LITERATURE SURVEY

DESIGN AND DEVELOPMENT OF MULTIPURPOSE, PESTICIDES SPRAYING MACHINE By Shailesh Malonde1 , Shubham Kathwate2 ,Pratik Kolhe3Roadney Jacob4 ,Nishat Ingole5 ,Rupesh D. Khorgade6 (May 2016)

This paper presented as India is agriculture based country and 70% people do farming and related work. Agriculture is required to be boomed to enhance the Gross Domestic Product (GDP) of the country by improving the productivity. The productivity of the crops can be increased with the help of pest control. Pesticide spraying is the necessary procedure in cultivation of the crops. The present idea deals with the designing and fabricating a pesticide sprayer which will be useful and affordable to the farmers which will assist to increase the productivity of crops. Though this project an attempt has been done to improve the method of spraying the pesticide that will enhance the productivity and increase the farmer's income. So we have designed a pesticide spraying machine which will not only increase productivity but also will reduce the effort of the farmers. The machine will save the time of the farmer as well as efficiency in spraying. One of the most common forms of pesticides application, especially in conventional agriculture, is the use of mechanical sprayers. Hydraulic sprayers consist of a tank, a pump, a lance (for single nozzles) or boom, and a nozzle (or multiple nozzles). Sprayers convert a pesticide formulation, of one containing a mixture of water (or another liquid chemical carrier, such as fertilizer) and chemical, into droplets, which can be large rain-type drops or tiny almost-invisible particles.This conversion is accomplished by forcing the spray mixture through a spray nozzle under pressure. The size of droplets can be altered through the use of different nozzle sizes, or by altering the pressure under which it is forced, or a combination of both. Large droplets have the advantage of being less susceptible to spray drift, but require more water per unit of land covered.Due to static electricity, small droplets are able to maximize contact with a target organism, but very still conditions are required. [1]

AGRICULTURAL DRONE By MD. Alimuzzaman (Jan 2014)

He had focused on Quad copter and wing aircraft drone which are best suited for the agriculture industry. Drone are well equipped with an autopilot using GPS and a point to shoot camera that is also controlled by GPS. Importance of Drone can be understood from the fact that it can provide farmers with three detailed views. First, keeping eye on crop from the air can help reveal patterns that show a problem related to irrigation, soil variation and fungal infestations. Secondly, drone uses Satellite remote sensing method which is used to identify the crop growth by comparing multiple images taken by the satellite. Third, airborne cameras can take multispectral images, capturing data using visual spectrum as well as infrared, which shows the difference between the distressed and healthy plants which can't be viewed with naked eyes. From the future perspective, agriculture drone can assist farmers to reduce excessive use of water and will contribute to reducing the chemical load on the environment by spraying on the plant that require attention. Therefore, it future this can be called as the green-tech tool. Drones are not only confined to the agriculture sector but can successfully be used across several industries such as Military and for delivering pizza. Government of developed countries are focusing on setting out the favourable strategy for enhancing the use of such drones by increasing the funding and commercialising agriculture technologies.[2]

QUADCOPTER UAV BASED FERTILIZER AND PESTICIDE SPRAYING SYSTEM By S. Meivel, Dr. R. Maguteeswaran , N. Gandhiraj , G. Srinivasan (Feb 2016)

This paper presented that the Indian agriculture needed production and protection materials to achieve high productivity. Agriculture fertilizer and chemical frequently needed to kill insects and growth of crops. The WHO (World Health Organization) estimates there are more than 3 million pesticide cases in every year. In that more than one lakh deaths in each year, especially in developing countries due to the pesticides sprayed by human being. The pesticide affects the nervous system of humans and also leads to disorders in body. The health effects of pesticides include asthma, allergies and hypersensitivity, and pesticide exposure to cancer, hormone disruption and problems with reproduction and fatal development. A remote controlled UAV (Unmanned Aerial Vehicle) is used to spray the Pesticide as well as fertilizer to avoid the humans from pesticide poison. [3]

The quad copter is cost effective alternate to high cost standard rotorcrafts. UAVs are rapidly upcoming method for cultivation, production and protection processes. The quadcopter was chosen for this project because of high stability and more lifting power. The control of quadcopter is easier than the helicopter model of vehicles. Some

applications of quadcopter are Search and Rescue, Police, Code Enforcement/Inspections, Emergency Management, Fire, Surveillance, Border Security, Defence, etc.

First one is Plus (+) configuration and another one is Cross (X) configuration. In this project we used X (Cross) configuration. Both the models are same, but the control of these models slightly different. The cross configuration is easier than plus configuration model.This method can be used in all situations, especially in the places where labours are hard to find. It has many advantages that include hastening the spraying process of pesticide thereby reducing the causalities due to pesticide exposures and hence prevents the encounters with the poisonous snakes like viper and cobra which are regularly found in our agricultural fields. Environmental pollution can be reduced when it sprayed from lower altitude.[3]

DEVELOPMENT OF QUAD COPTER BASED PESTICIDE SPRAYING MECHANISM FOR AGRICULTURAL APPLICATION By Sadhana B1, Gourav Naik2, Mythri R J3, Puneeth G Hedge4, Shyama Kirana Sharma B5 (2 April 2017)

This paper investigate potential health effects of pesticides may include asthma, allergies, and hypersensitivity, cancer, hormone disruption and problems with reproduction and fatal development and many more health issues. The quadcopter was chosen for this project because of two benefits like its high stability and more lifting power. The control of quadcopter is easier while compared with the helicopter model or vehicles. Remote sensing by Unmanned Aerial Vehicles (UAVs) is changing the way agriculture operates by increasing the spatial-temporal resolution of data collection. Micro UAVs have the potential to further improve and enrich the data collected by operating close to the crops, enabling the collection of higher spatial-temporal resolution data. In that paper, they presented a UAV-mounted measurement system that utilizes a laser scanner to compute crop heights, a critical indicator of crop health. The system filters, transforms, and analyses the cluttered range data in real-time to determine the distance to the ground and to the top of the crops. [4]

IV. HARDWARE DISCRIPTION

DJI NAZA M-LITE:- The Main Controller (MC) is the brain of the system, it communicates with all ESCs and RC transmitter to carry out the autopilot functionality. It has a built in Inertial Measurement Unit (IMU) consists of one 3-axis accelerometer, one 3-axis gyroscope and a barometer for sensing the attitude and altitude.

BLDC:- Brushless DC electric motor also known as electronically commutated motors are synchronous motors that are powered by a DC electric source via integrated inverter/switching power supply, which produces an AC electric signal to drive the motor: The brushless motors are multi-phased, normally 3 phases, so direct supply of DC power will not turn the motors on. A BLDC motors for quad copter is constructed with a permanent magnet rotor and wire wound stator poles.

ESC :- ESC is used to control BLDC motor. It takes signal from microcontroller and breaks into 3 parts and sends it to the BLDC motor. We would require 4 ESCs as we are using 4 BLDC motor. Each ESC is controlled independently by a PPM signal (similar to PWM). The frequency of the signals vary, but for a Quad copter it is recommended the controller should support high enough frequency signal, so the motor speeds can be adjusted quick enough for optimal stability. The ESC generates three high frequency signals with different but controllable phases continually to keep the motor turning. The ESC is also able to source a lot of current as the motors can draw a lot of power.

Accelerometer Sensor:- The accelerometer measures acceleration and also force, so the downwards gravity will also be sensed. As the accelerometer has three axis sensors, we can work out the orientation of the device.

Gyroscope Sensor:- A gyroscope measure angular velocity, in other words the rotational speed around the three axis. A gyroscope is a device that uses Earth's gravity to help determine orientation. Its design consists of a freely rotating disk called a rotor, mounted onto a spinning axis in the centre of a larger and more stable.

Radio Receiver:- This receives 2.4GHz signals coming from the transmitter side. It has got 6 independent channels to receive the signal from the transmitter and then send the signal to the microcontroller for further processing. Its current consumption is less than 40 mA and works on 5 volt power supply.

Lipo Battery:- Lithium batteries are the preferred power sources for most electric modelers today. They offer high discharge rates and a high energy storage/weight ratio. However, using them properly and charging them correctly is no trivial task. LiPo battery can be found in a single cell (3.7V) to in a pack of over 3 cells connected in series (11.1 V). A popular choice of battery for a QuadCopter is the 3SP1 batteries which means three cells connected in series as one parallel, which should give us 11.1V.

V. METHODOLOGY

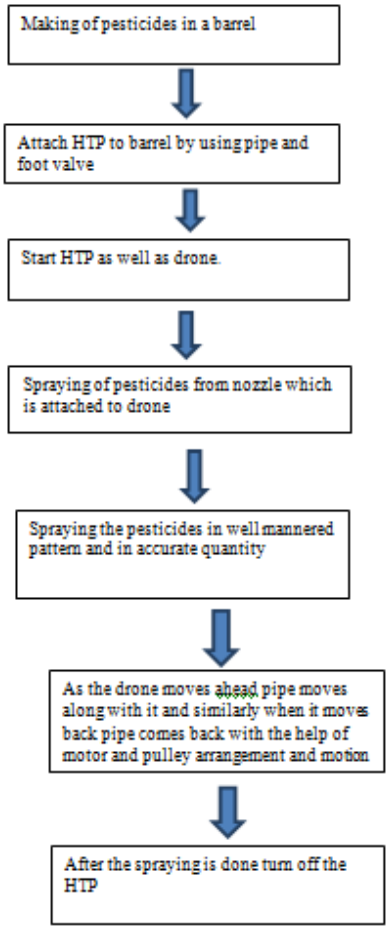
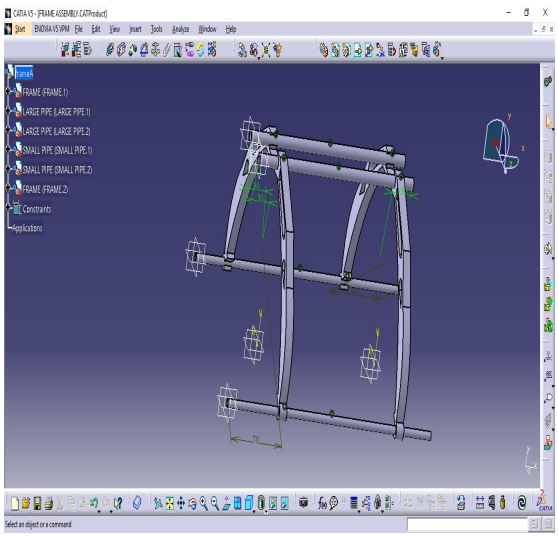
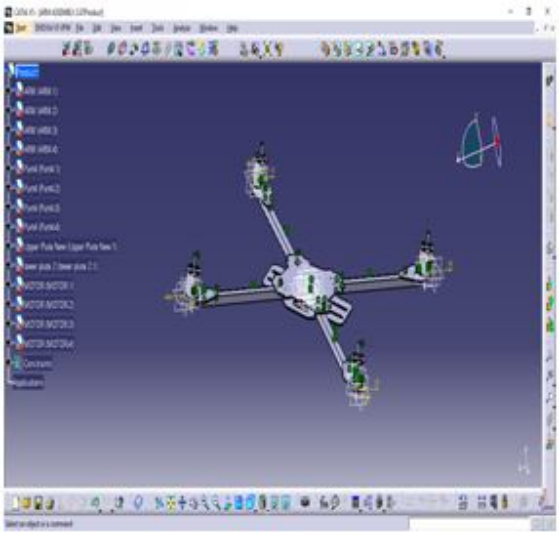
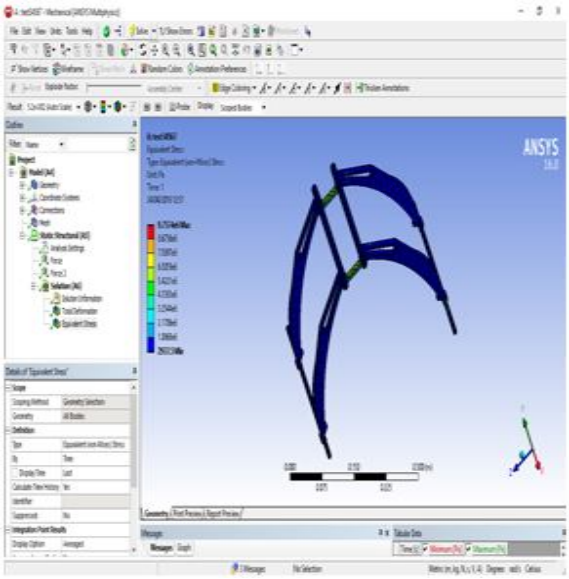


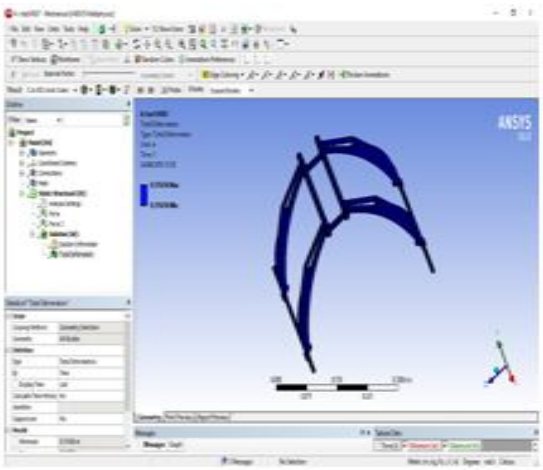
FIGURE:- METHODOLOGY

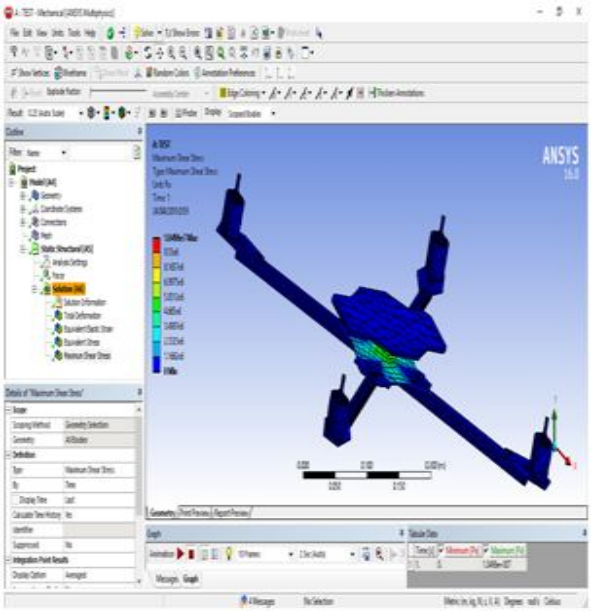
VI. CATIA MODEL AND ANSYS RESULTS

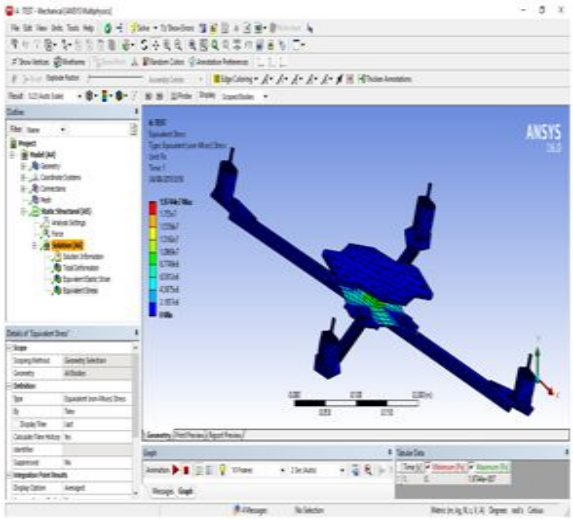












VII. CONCLUSION

- Drone (Unmanned Ariel Vehicle) can be used in all situations, especially in the places where labour hard to find.
- Due to usage of drone various health issues are tackled such as asthma, allergies and hypersensitivity, and pesticide exposure to cancer, hormone disruption and problems with reproduction and fatal development. Other pesticides may be irritated the skin and eyes.
- It helps to avoid the wastage of pesticides. Quad rotor can be used to spray on hilly landscapes.
- Reduces ill effects to humans while spraying manually.
- Increases the efficiency of spraying.
- Reduces the time for spraying when compared to manual spraying.
- By using our project we get constant flow rate with high pressure intensity of pesticides particles from nozzle because of we are connecting the HTP with the drone by pipe.
- By using this project we spray the pesticides in rainy season also without interruption of soil slurry.

REFERENCES

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[2] AGRICULTURAL DRONE By MD. Alimuzzaman (Jan 2014)

[3] QUADCOPTER UAV BASED FERTILIZER AND PESTICIDE SPRAYING SYSTEM By S. Meivel, Dr. R. Maguteeswaran , N. Gandhiraj , G. Srinivasan (Feb 2016)

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