

# DESIGN AND FABRICATION OF BANDING AND DIRECT SEEDING MACHINE

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## Abstract

*In the present day, people especially the farmers are looking out for new and advanced farming techniques to improve the productivity of their farmland at the same time conserving the fertility of the soil. All the basic automation of the seeding machine are moving it forward and backward and also putting the plough up and down for it to seed at a certain depth. Here the designing systems like sowing the seeds and navigate the vehicle motion are preferred by this autonomous robot using microcontroller, relay switches, Hydraulic pump, and an LCD display. The direct seeding technique is now accepted as an alternative to the old conventional farming techniques and promotes soil and water conservation in developed countries. In our proposed method plough can be moved using hydraulic arrangement and movement of whole setup is being done by the microcontroller unit. Hydraulic arrangement provides the actual penetration pressure to move the plough inside the soil. Irrigation system is also mounted on the top of the structure. This has also led to a drastic reduction in input costs. The objective of our study was to determine the implementation characteristics of a similar method in Indian subcontinent conditions. In India there is acute shortage of water for agricultural purposes and over exploitation of the available land leading to famine like situations. Our aim was to find a long term solution for the same and help the agriculture industry.*

**Keywords:** Banding, Direct seeding, Hydraulic pump, irrigation system, Relay switches, Catia V5, Ansys 14.5

## 1. INTRODUCTION

India's progress in the agricultural area demonstrate the uses of innovative technologies in past few years. In India, agricultural growth was at lowest level in past year but development in technologies and system which reduces time as well as money has given a fast response to the farmers [1] [2]. In India 65-70% population depends on agriculture so it's a better time to indulge the automatic machines and robots which can reduce the human efforts, time and money. In agriculture there is a need of automatic system in ploughing, seeding, irrigation and moisturizing the soil to increase the fertility of soil. Whenever the ploughing is done by some traditional methods like bull, tractor, the fertility and moisture content of soil reduces. This causes the soil to become barren. Our project constitutes the automatic system for different agricultural processes like ploughing, seeding, irrigation and uses the non-conventional solar energy attached with battery. In this project we have used the system of hydraulic energy as well as electronic control systems. These control system reduces the human interaction during the process where as hydraulic systems are the driving unit for plough. The whole setup of 'Banding and direct seeding mechanism' is moved using wiper motor guided with microcontroller unit. An android app is used to cause the all motion which is connected with Bluetooth receiver. Microcontroller is programmed and relay switches are used to provide the forward and backward motion to the setup. In this project when vehicle moves front and hydraulic system causes the plough to move inside at a particular depth based on the microcontroller programming. At the same time plate below the both hopper moves left or right direction so that seeds can be put in the soil but during the reverse motion it is being closed so there is no seeding. This movement of plate is caused by the knuckle joint and shaft connected to it. Irrigation is done based on the relay response and required amount of water is sprinkled over the surface so that it could prevent the excessive moisture in soil. Energy for the motor is obtained by solar panel which is being stored in the battery for progressive use. These automations in the system causes to overcome with the traditional methods and causes to increase the agricultural growth.

## 2. OBJECTIVES

1. To automate the different processes used in agriculture
2. To introduce hydraulic unit for ploughing operation as it generates more power
3. Row wise seeding at a particular penetration depth

### 3. PROPOSED IDEA

Many journals related to the agriculture states that using an automation systems in the agricultural activities increases the efficiency of different processes like ploughing, seeding, irrigation. In our project we have proposed an idea which uses non-conventional energy from sun and stores it in battery for different types operations. Here we have used 8-bit PIC12F675 microcontroller which is easily programmable and have fast response to the IR signals given by the Bluetooth receiver. Bluetooth receiver is connected with an Android application which sets the signal for the microcontroller to operate for different operations. In this project our idea was to introduce the hydraulic unit for the ploughing operation which could develop more power for it. This hydraulic unit is connected with different joints and fixtures to move it up and down. Our idea was towards the hydraulic unit because ploughing operation needs more power than all the other operations which can be performed easily by the microcontroller response. Water spraying unit and seeding is being performed by the signal response sent from the microcontroller. When the moisture content is in excessive amount, spraying unit is stopped and other processes are being initiated by the android application.

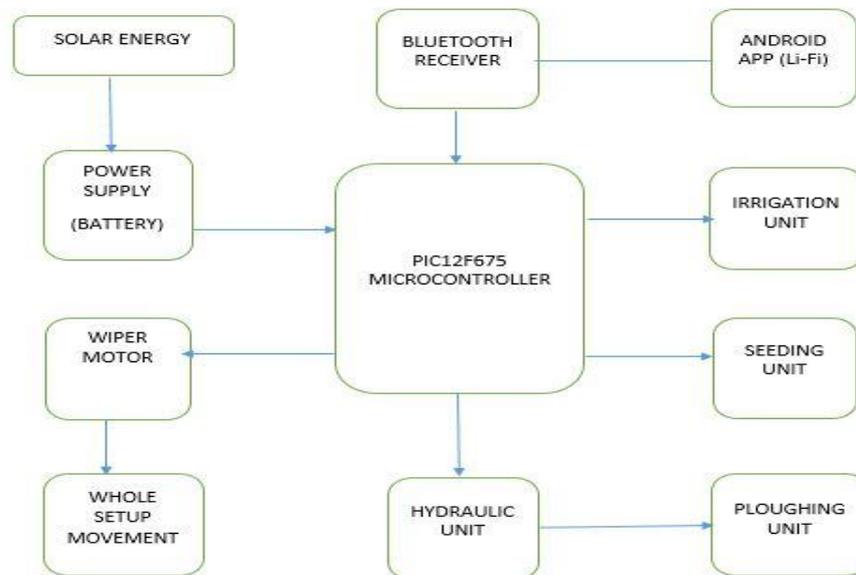


Figure 1 Block diagram

### 4. METHODOLOGY

The assembly of the proposed system constitutes wiper motor (12V), Hydraulic pump, Knuckle joint and related shafts, Water Container, Irrigation Unit, PIC12F675 Microcontroller, IC MAX 232, 4-way relay switch, LCD Display, Switch Mode Power Supply (SMPS), DPDT Switch, Plough, Chain Drive, Bluetooth Receiver, Android Application(Li-Fi). Microcontroller is programmed in Embedded C language in which all the Characters are being set based on the requirement of our system. Whenever a signal is sent from the android application to the Bluetooth receiver, it transfers it to the microcontroller which is programmed and set by the characters used in the android application. This signal causes the different automatic operations in the project

#### 4.1 Component Description

- **WIPER MOTOR**  
It is used for the front and back motion of the whole setup. A sprocket which is already connected to the wiper motor connects the wheel shaft to the motor. So whenever relay causes motion to the wiper motor, it forces the wheel to move in front direction.
- **HYDRAULIC PUMP**  
Due to the pressure produced by the hydraulic pump plough is made to penetrate at a desired depth inside the soil.
- **IRRIGATION UNIT**  
This causes the water to move from a large tank based on the response given by the microcontroller through android application.
- **PLOUGHING UNIT**  
This uses the hydraulic pressure and response given from the microcontroller to penetrate inside the soil.

- MICROCONTROLLER

In this we have used 8-bit PIC12F675 Microcontroller which has been programmed in Embedded C programming language to produce a proper response for the different part of the system.

- ANDROID APPLICATION

An app has been developed using android studio which is being connected to the Bluetooth receiver for passing the information to the microcontroller unit.

- BLUETOOTH RECEIVER

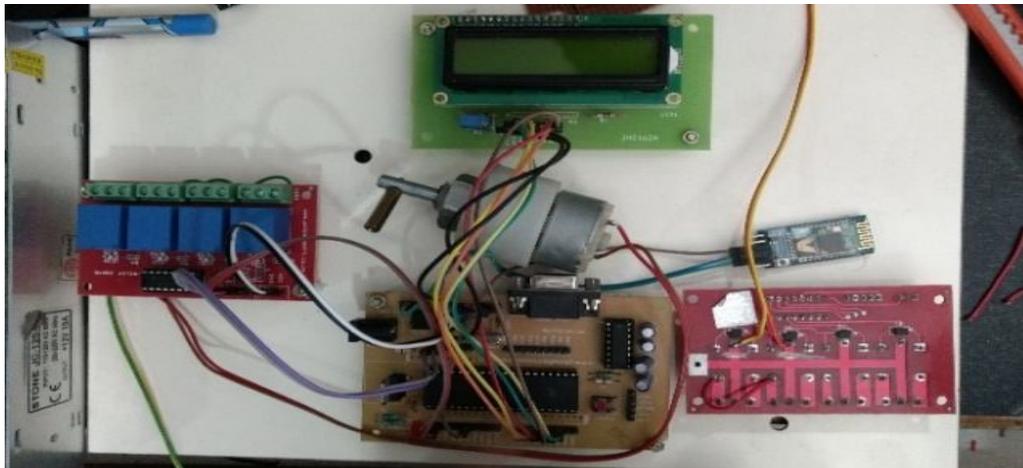
This is used to transfer the signal generated from the android application to the microcontroller unit.

- MECHANICAL PARTS

Different mechanical parts like knuckle joint, fixtures, base frame are used in the complete assembly of the project. Whole set up moves along the specified direction commanded using android application.

Whenever a device is kept ON, signal is transferred to the microcontroller unit which actuates the process of relay and thus process initiates, when it is OFF process stops. These response of microcontroller causes different processes to start and stop. When a signal is given to the hydraulic pump, it actuates and starts the process of ploughing based on the required penetration depth. When shaft connected to the movable joints rotates it causes the seeding process and can be stopped by microcontroller. To start irrigation process water is sent from the reservoir and stopped based on the moisture available. Hence all the processes are being automated in a single unit and can reduce the step wise operations used in India. Here plough moves in a specified direction so that we can attain a row-wise seeding and ploughing operations. Power available in this project is more because it has a hydraulic unit which can develop more pressure and also increase the efficiency of the whole project. All the electrical circuits are connected based on the system requirement. Power supply is given to wiper motor via SMPS so that it could convert the AC signal to DC signal.

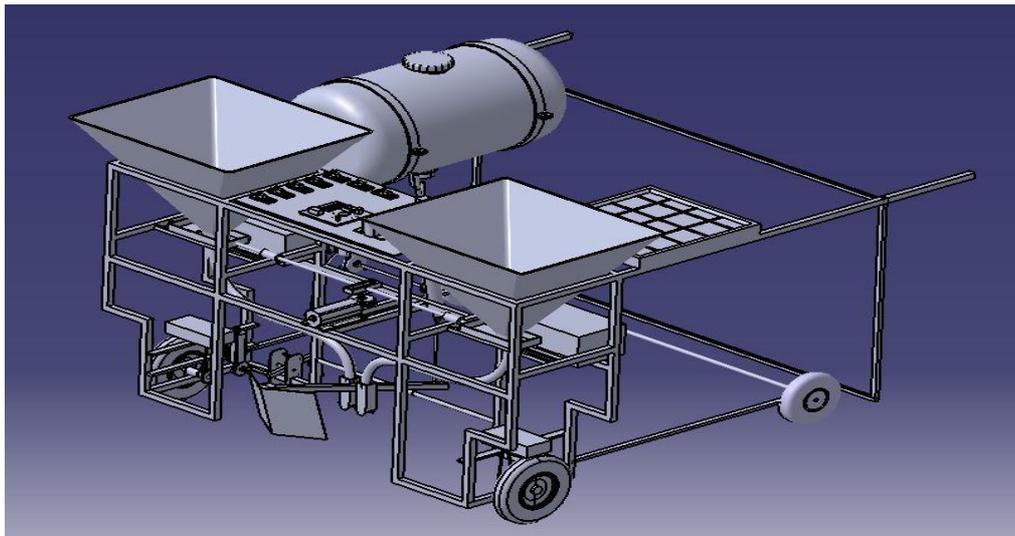
The basic microcontroller based circuit which is being used in our project constitutes IC MAX232, voltage regulator, LCD Display, Relay switches. Microcontroller is being programmed and all the components of electrical circuits are assembled.



**Figure 2** Electrical circuit

## 5. DESIGN AND ANALYSIS

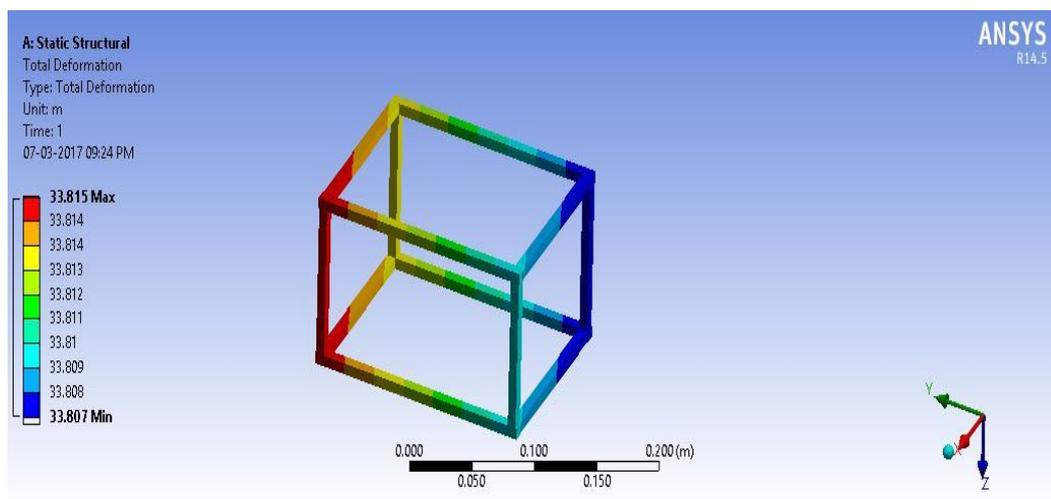
The basic structure of the mechanical section is created in the part module of the Catia V5. This structure is used as a base frame for all the all other components of the system. Because of irrigation unit the weight is too much. Two hoppers are designed as a container box for seed or fertilizers. These hoppers are mounted over a base plate which has a hole and passes the seed when it coincides with the hopper hole. This displacement is caused with some mechanical arrangement.



**Figure 3** Completed Assembly

The main process which needs more pressure is ploughing so it is directly being connected with hydraulic arrangement. Plough moves up and down based on the microcontroller signal. Initially all the parts were drawn in the Catia V5.0 and assembled.

Because the base frame has more weight of all the components so it should be analyzed before fabrication. For the proper application and distribution of loads, Static structural analysis has been done in Ansys 14.5 by meshing and application of loads in all the corners.



**Figure 4** Static structural analysis of frame

Total deformation, maximum principal stress and strain energy were analyzed after meshing and applying loads on the frame. The obtained data after the analysis was found to be under the limit and hence the fabrication work was started.

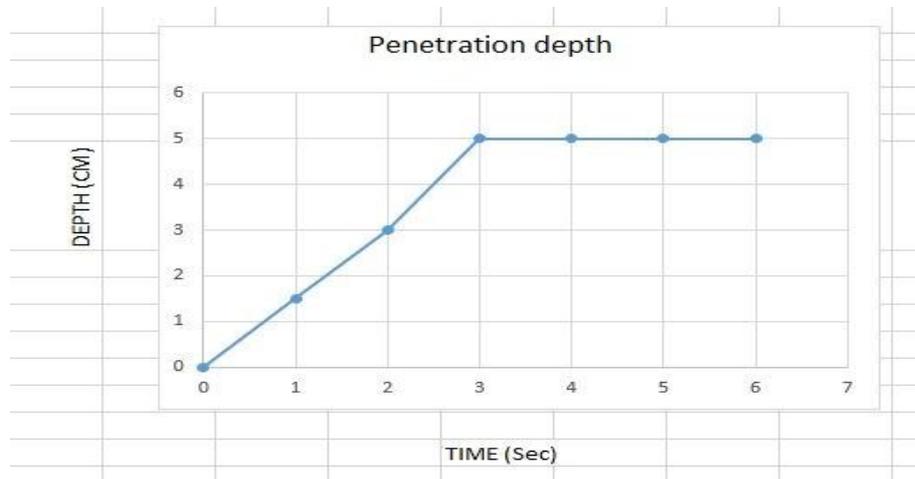
## 6. RESULT AND DISCUSSION

When the whole setup was assembled and electrical circuit was mounted over the base frame, testing process was initiated. In this when device 1 was kept 'ON' it gives signal to the Bluetooth which further transfer it to the microcontroller unit for process actuation. When device 1 is kept 'OFF' it stops the whole setup to move front or back. For the actuation of plough, signal is sent to the hydraulic pump unit which actuates it. It is also being done by the relay operation. Sprinkling of water is also being done by the microcontroller response. The main part of these operations are android application and microcontroller. The further results obtained by the basic testing of equipment is as follows:

**Table 1:** Real Time Data

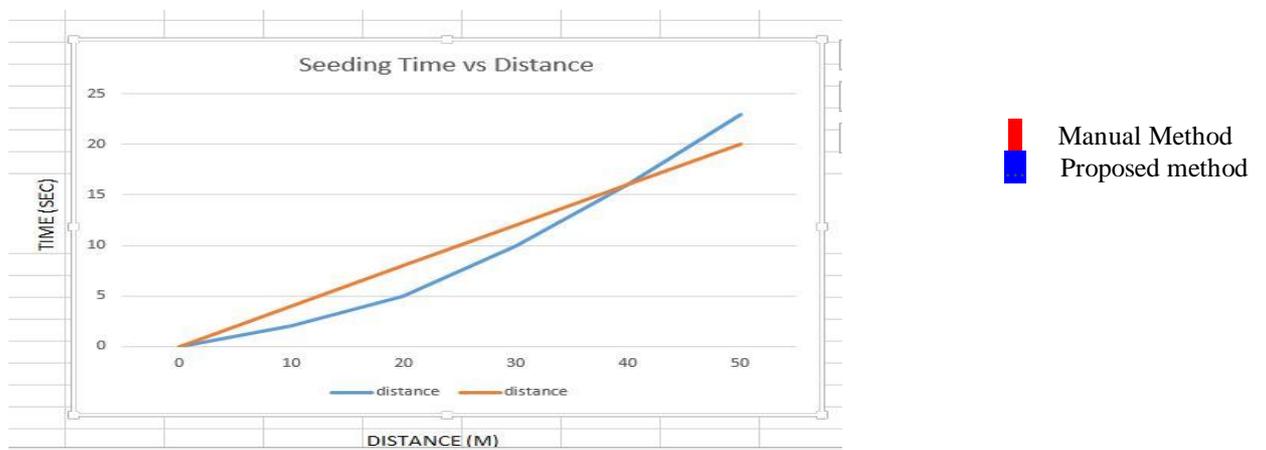
Parameter	Result
Field Area	20 x 10 m
Forward time	50 sec
Backward time	50 sec
Plough down time	3 sec
Plough up time	2 sec
Operating Depth	0.05 – 0.06 m
Total time for single operation	105-120 sec
Operating speed	0.4 m/s

Penetration depth in our project was 0.05-0.06m which is desirable depth for well growing a seed inside as in this arena, availability of moisture and biological fertilizers are more.



**Graph 1:** Depth v/s Time

The graph here is the time versus distance graph which is plotted using real time data of the machine compared to manual and it is found approximate time taken for hand seeding was 55 sec whereas the time taken with the machine was approximately 50 sec.



**Graph 2:** Seeding time v/s Distance

## **7. CONCLUSION**

In this project, there is an effort made to overcome problems in agriculture. The main labor problem which is faced in the agriculture industry can be managed with this machine. This machine reduces human labor and also increases the efficiency and the process of seeding can be completed in lesser time compared to the human labor. This does not damage the fertility of the soil and it does not disturb the soil and helps in seeding at a depth which is necessary for growing crops. Most of the agricultural machines used today are fuel based IC engines which require high skilled technicians and cause unnecessary environmental pollution. This machine is extremely affordable to farmers when compared to the tractors.

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