"DESIGN AND FABRICATION OF SEED SOWING MACHINE"

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ABSTRACT

Today's world is marching towards the rapid growth of all sectors including the agriculture field. Agricultural sector is changing the social as well as economic environment of the population due to globalization. Agriculture has been the backbone of the Indian economy and it will remain as it is for a long time. In India most of the people are living in rural area and they are still dependent on the agriculture field but they are using old technique (conventional method). The conventional method is less efficient and time consuming. To meet the future food demand, the farmers have to implement the new technique which will not affect the soil texture but will increase the crop production. This paper deals with the various sowing methods used in India for seed sowing and fertilizer placement. As day by day the labour availability becomes the great concern for the farmers and labour cost is more, this machine reduces the efforts and total cost of sowing the seeds and fertilizer placement. This paper presents a Seed sowing machine which is based on electrical and mechanical platform that performs advance agriculture process. We have developed an electromechanical vehicle which is steered by DC motors to drive wheels. The purpose of this project is to provide agricultural activities for small scale farming such as Polyhouse, Agricultural laboratories, research work and Greenhouses.

INTRODUCTION

In the current generation most of the countries do not have sufficient skilled man power in the agriculture sector and it affects the growth of developing countries. So, it's a time to automate the agriculture sector to overcome this problem by using upgraded technology for cultivation activity. The basic operation of sowing machine is to sow the seed in row at the required depth and maintain the distance between two seeds. The eliminator is used to charge 12V battery which is utilized by DC motors. We have fixed the distance between two seeds and can be changed by changing wheel size or number of teeth on sprocket. By using this innovative project of seed sowing machine, we can save more time required for sowing process and it also reduces laborer's cost. This machine controls the seed depth and proper utilization of seeds to reduce the wastageof seeds.

Sowing is the process of planting seeds. An area or object that had seeds planted will be described as being sowed. Among the major field crops, oats, wheat, and rye are sown, grassesand legumes are seeded, and maize and soybeans are planted. In planting, wider rows (generally 75 cm (30 in) or more) are used, and the intent is to have precise, even spacing between individual seeds in the row; various mechanisms have been devised to count out individual seedsat exact intervals.

PROBLEM STATEMENT

We are motivated for doing this project because it is an agriculture-based project and here we getto deal with the cost of the machine, which is going to be reduced by introducing the common seed storage place in the machine.

1. The design is going to be simple and easy to fabricate.
2. The size of the machine, production cost, transportation, everything will be reduced.
3. . Flow rate will be controllable as per requirements.

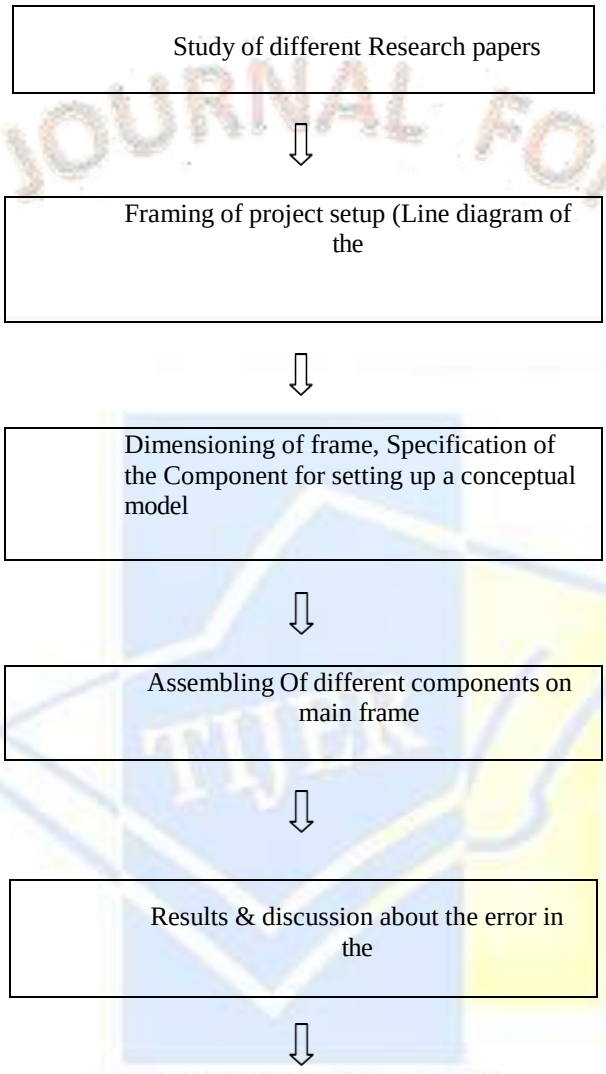
OBJECTIVE

1. Make this smart machine economical and user friendly for Indian farmers to operate.
2. To implement functionality of adding the number of seeds to be sowed using different sprocket.
3. To manufacture seed sowing machine which can be operated by the single operator.
4. To level the ground in small extent

5. To enable the machine for the sowing of several of seed like maize, wheat etc.

6. To maintain the same distance between two seeds at the time of sowing process.

METHODOLOGY



EXPERIMENTAL VALIDATION

In the initial stage of the project, a literature survey was conducted. The knowledge gained from the literature survey aided in coming up with a feasible plan of action with appropriate timelines. Quotations for the necessary components and an estimate of cost of fabrication were used to come up with an approximate budget for the entire project.

SCOPE OF PROJECT

Seed sowing machine is a device which helps in the sowing of seeds in the desired positionhence assisting the farmers in saving time and money. So, considering these points related to spraying and seed sowing an attempt is made to design and fabricate such equipment which will able to perform both the operations more efficiently and also will result in low cost. Decrease the operational cost by using new mechanism.

1. Work reliably under different working conditions.

2. Decrease the cost of the machine.

3. Decrease labor cost by advancing the spraying method.

4. The machine can be operated in the small farming land (1 acre).

5. Making such a machine which can be able to perform both the operation.

FIGURE -1

SYSTEM DESIGN & COMPONENT

In our attempt to design a special purpose machine we have adopted a very careful approach; the total design work has been divided into two parts mainly;

System design Mechanical design
System design mainly concerns with the various physical
constraint sand ergonomics, space requirements, arrangement of various components on the main frame of machine no of controls position of these controls ease of maintenance scope of further improvement; weight of m/c from ground etc.

MECHANISM AND DESIGN

The entire model has been designed with the help of designing software solid works.

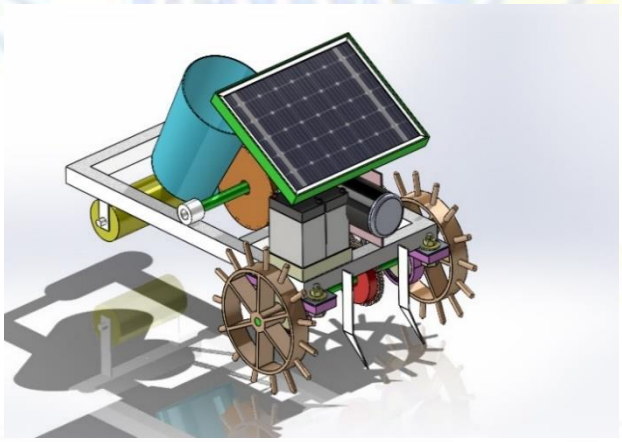


FIGURE -2

DESIGN CALCULATIONS:

1. Design of Motor

Power transmitted by shaft,

$$P = \frac{2\pi N T}{60}$$

Where, N→ Rpm of motor shaft = 25

T →Torque transmitted

$$17 = \frac{2\pi \times 25 \times T}{60} \times 10^3$$

T= 6492.7 N-mm

We know that,

No. of teeth (pinion), N1 = 15

No. of teeth (sprocket), N2 = 15

Ratio = R = 1:1

Torque on sprocket = T /1

= 6492.7 N-mm

Dia. of sprocket,

Periphery = π × dia. Of sprocket

$15 \times 6.35 = \pi \times D$

$$D = \frac{15 \times 6.35}{\pi}$$

D = 30.31 mm

Dia. Of sprocket,

Periphery = π × dia. Of sprocket

$36 \times 6.35 = \pi \times D$

$$D = \frac{36 \times 6.3}{}$$

D = 72 mm

Torque transmitted,

T = Force × radius of wheel

$6492.7 = F \times 100$

F = 64.92 N

$$F = \frac{64.92}{9.81}$$

F = 6.61 Kg

The total weight on shaft coming is weight of sprocket mechanism and seed Sower

$T = \pi/16 \times \tau \times d^3$

$T_e = \pi/16 \times 135 \times d^3$

6492.7 = π /16 x d^3 x 135

d = 6.25 mm

But we are using 12 mm shaft because we need to weld the sprocket, therefore our shaft design is safe.

but we are using 12mm shaft for wheels

For 12 mm Shaft diameter we take standard breaking no. P202

P=pedestal bearing

202 =spherical ball and 12mm bore diameter of bearing

Now,

Linear velocity v for wheel.

$V = \pi DN/60$

= 3.142 x 0.20 x 25/60

V = 0.26 m/s. = 0.9396 kmph

Seed sowing transmission consists of 32 and 18 teeth

No. of teeth (pinion), N1 = 18

No. of teeth (sprocket), N2 = 32

Ratio = R = 1:1.77

Torque on sprocket = T /1.77

= 3668.19 N-mm

RPM of seed sowing disc = 25x1.77= 44.25 rpm

Diameter of disc = 120

Number of holes on disc 10 nose

Periphery = π × dia. Of disc

Distance of seed sowing x 10 = 3.142 x 120 = 37.69

2. Design of chain pin failure

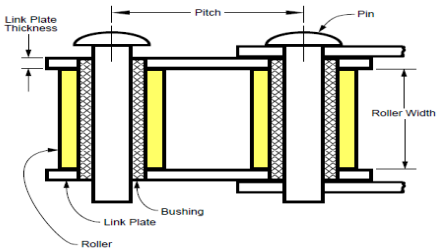
T = F x radius of sprocket

6492.7 = F x 15.15

F = 428.56 N

So tension in tight side = 428.56 N

We know,



Stress = force / area x 2

Stress induced =428.56 / (3.14 * 2.3^2 / 4) x 2

Stress induced = 51 N /mm^2

As induced stress is less than allowable stress = 135 N /mm^2 design of sprocket is safe.

3. Battery Calculations

Charging Time:

Battery - 6V x 4.5 Amp = 27watt X 2 batteries = 54 watt

Solar Panel – 3 watts

Current (I) = P/V

I = 3/10.2

I = 0.29 Amp

Charging Time = (Battery Watt/Panel Watt)

= (27/3)

= 9 Hrs. each battery

Discharge Time = (Battery watt/Total watt Consumed)

= 54/17

≈ 3.17 Hrs.

= 190 min

4. Design of bolt for sheer stress failure

Bolt is to be fastened tightly also it will take load due to rotation. Stress for C-45 steel. Standard nominal diameter of bolt is 5.5 mm. From table in design data book, diameter corresponding to M-6 bolt is 6 mm

Figure 1 Nut bolt

Let us check how much load bolt can sustain -

P =? N is the value of force

Stress = load/area

$\sigma = \frac{P}{A}$

$A = \frac{\pi}{4}d^2$

$A = \frac{\pi}{4} 5.5^2 = 23.75\ mm^2$

$P = 135x23.75$

P = 3207.36 N = 326.78 kg

The calculated load is much higher than any applied load, hence our design is safe.

5. Design of transverse fillet welded joint.

Figure 2 Transverse fillet weld joint

Hence, selecting weld rod size = 3.2mm

Area of Weld = 0.707 x Weld Size x L

= 0.707 x 3.2 x 25
= 56.56 mm^2

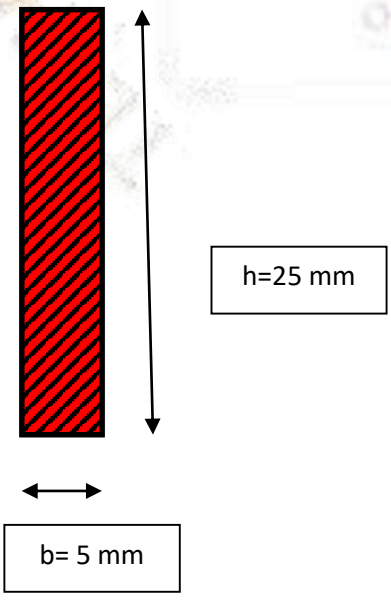
Force exerted = ---N

Stress induced = Force Exerted / Area of Weld

21 = F / 56.56

F= 1187.76 N = 121.07 kg

Maximum Allowable Stress for Welded Joints = 21 N/mm^2



FEATURES

1. Reduces human efforts required seed sowing
2. Reduces number of workers required.
3. Develop a seed sowing machine which is simple and cost effective.
4. Minimize the production time.
5. Promote productivity.
6. Minimizes- operation and to make it safer and easier to operate due to its compact- machine design and structure.

CONCLUSION

In each complete rotation of rotating Wheel there is seeds falls from this seed drum and seed plantation process taken place smoothly and without wastage of seeds. The sowing disc is rotate in the seed chamber; the seeds are falls in the seed chamber through seed storage tank. The seed buckets are collecting the seeds from the chamber and it sow in the ground as required depth with the help of plough. Here the wastage of seeds is also being reduced to a greater extent. This system has been developed for the sowing of seeds in an automatic way. Here with the help of a robot the seeds are been dispensed in the soil in a proper sequence hereby reducing the wastage of seeds The planting process of the onion crop only has been implemented by using this Seed Sowing V robot autonomously. This robot will help the farmers to do the farming process efficiently.

FUTURE SCOPE

1. The developed robotic vehicle can be a full-fledged example of agricultural automation. However, since the field of agriculture is very large, further improvements can be done in this project to make it smarter and multipurpose.
2. This vehicle can be added with other sensors such as soil pH sensors and temperature and humidity sensors which are other factors in farming. The vehicle can be added with mechanism to remove the weeds; thus, the single vehicle can be used for sowing as well as preparing the soil.
3. Also, addition of rainfall sensors can be used to detect and calculate the amount of irrigation to the crops in addition to the moisture sensor. Thus, this platform which we have fabricated in our project can be used to expand the flexibility of the project by adding more application to the vehicle and also leaves the space for future research.

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