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DESIGN AND ANALYSIS OF SEED SOWING MACHINE WITH SPRAYER

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Abstract: - Majority of the sprayer pumps available in market are back mounted, hand pumps that are used to spray pesticides. Pesticide spray pump have to be pumped manually and then carried on the back for spraying in the fields. Agriculture sprayer vehicle operates the pump automatically as it moves, pump is mounted on vehicle so no stress to operator, very low cost. Similarly the seed sowing is done manually or with help of tractor which is costly for small farmers. Hence there is a need to develop the pump which is mounted on the vehicle so the farmer / labor does not have to carry it, so less fatigue. The pumping and seed sowing mechanism is connected to the engine shaft through a gear train. Thus motion of the wheel is converted into automatic pumping of the pumping system and seed sowing system. The sizing, design analysis critical components of Seed sower with sprayer is successfully done and the dimensions of the components have being determined. Estimation of the maximum stress induced in the components of the system have being determined by both theoretical method as well as using Ansys Work bench and the results indicate that the maximum stress values are well below the permissible limit hence the parts are safe under given system of loads. As the maximum load 25 kg> design load 20 kg the designed unit works to optimal design. As the maximum load 25 kg> design load 25 kg the designed unit works to optimal design .At the lowest speed of vehicle the is 2 kmph and max speed 5 kmph. The device can do seed sowing operation in two rows simultaneously. The device can make spraying operation on both sides. The machine is low weight, compact and low cost.

Keywords: *- Spraying, seed sowing, engine operated. Design, Analysis.*

I INTRODUCTION

A seed sower is a device that sows the seeds for crops by metering out the individual seeds, positioning them in the soil, and covering them to a certain average depth. The seed drill sows the seeds at equal distances and proper depth, ensuring that the seeds get covered with soil and are saved from being eaten by birds. After careful review and study of literature of various concepts on the seed sowing it is clear that majority of research is based on the study of special purpose seed sowing only. The general type of seed sower that are designed to suit all tractor based applications. No combination device is available that can be used as seed sower and sprayer .

II PROBLEM DEFINTION

The tractor based units are very costly and cannot be used in small farms and places where the plantation is on slopes, and more over only seed sowing is possible. There is a need of a common device that is at low cost for seed sowing and spraying as well.

Figure 1Tractor operated seed sower

III SOLUTION

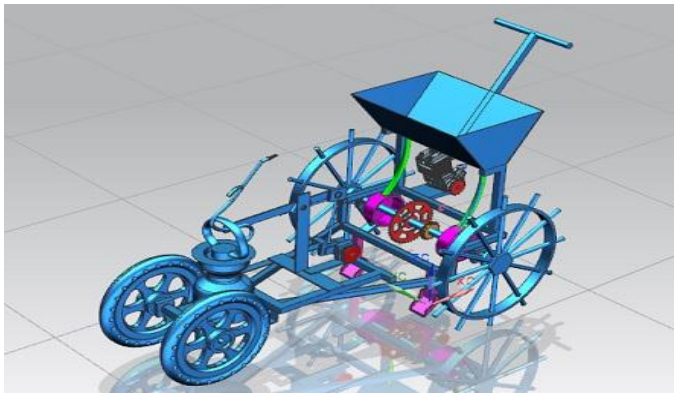


Figure 2 Engine operated seed sower and sprayer

Seed sower with sprayer mechanism uses a 35 cc pertol engine which does three functions namely:

1. Drive the vehicle
2. Operate seed sowing mechanism
3. Drive the sprayer mechanism

IV OBJECTIVES AND GOALS

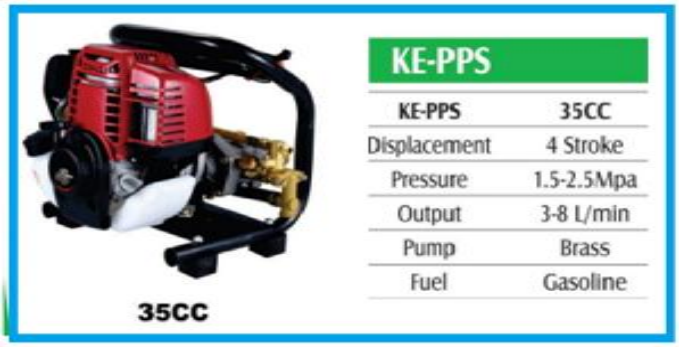
1. To develop an seed sowing machine of 15 kg , to run at maximum speed of 5 kmph.
2. To design spraying mechanism to operate the drive from wheels
3. Test and trial on device to find performance

A. Selection of Engine

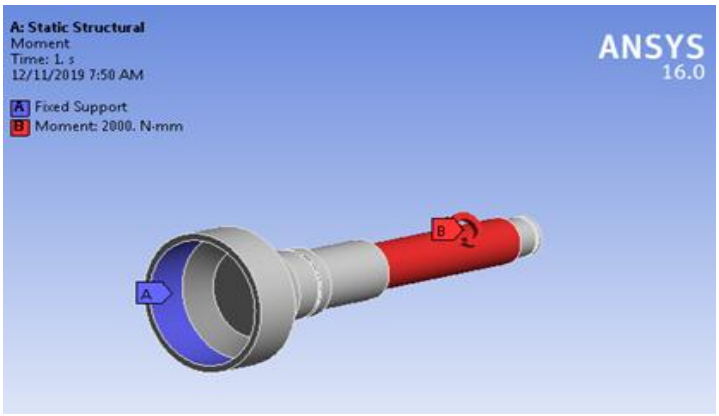
The engine selected for the application is to serve three functions namely:

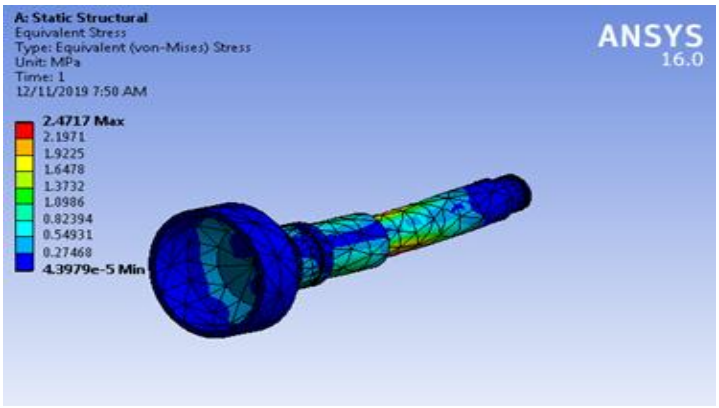
1. Drive vehicle
2. Operate the seed sowing mechanism
3. Operate the sprayer mechanism

The following engine was selected for the application



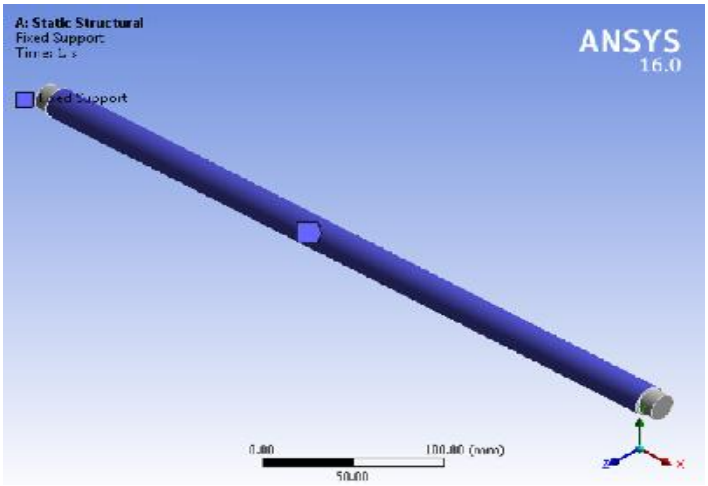
B. Design of Engine shaft

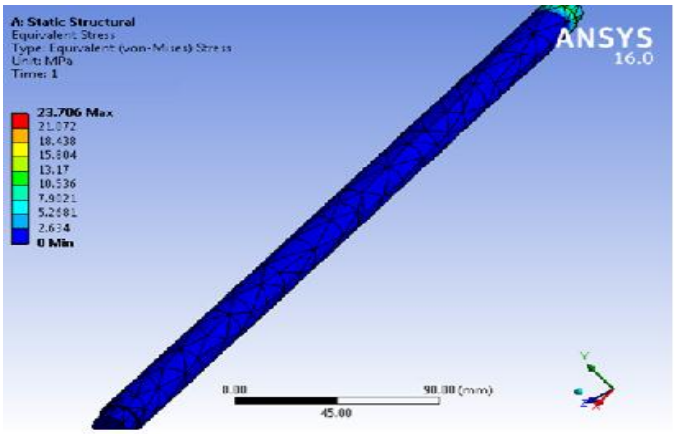




Maximum stress induced by theoretical method in the engine shaft is 7.7 Mpa and the maximum Von-mises stress determined using Ansys Workbench is 2.458 Mpa , both are well below the allowable limit hence the engine shaft is safe under torsion load

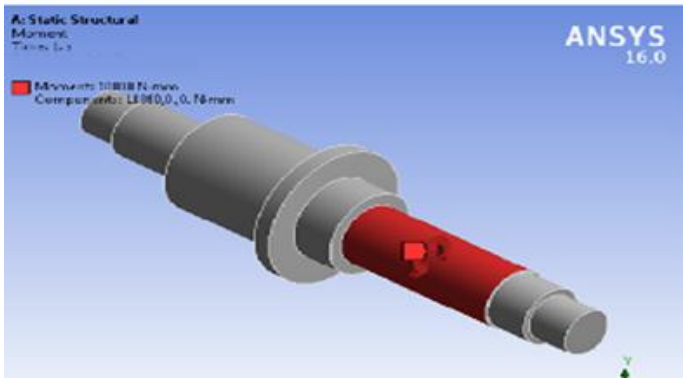
C. Design of wheel shaft

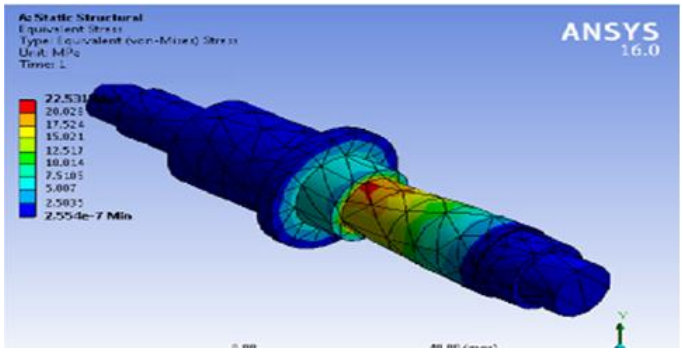




Maximum stress induced by theoretical method in the worm shaft is 6.38 Mpa and the maximum Von-mises stress determined using Ansys Workbench is 23.76 Mpa , both are well below the allowable limit hence the wheel shaft is safe under torsion load

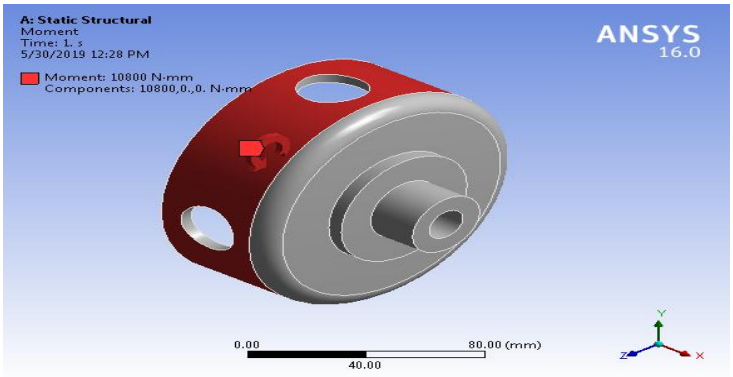
D. Design of drive shaft

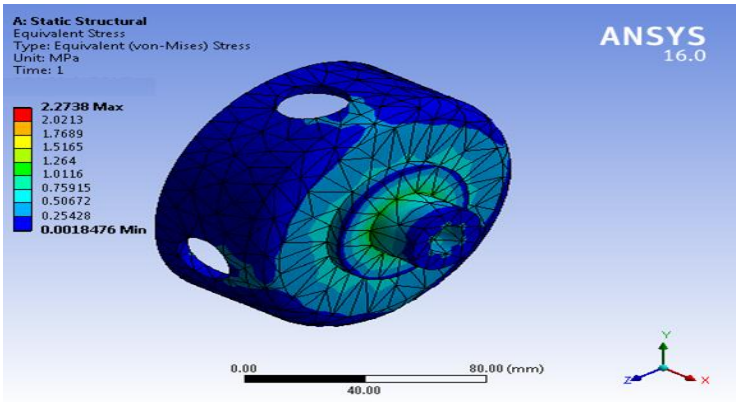




.Maximum stress induced by theoretical method in the worm is 5.263 Mpa and the maximum Von-mises stress determined using Ansys Workbench is 22.561Mpa , both are well below the allowable limit hence the drive shaft is safe under torsion load.

E. Design of seed sower cup





Maximum stress induced by theoretical method in the cup is 1.86 Mpa and the maximum Von-mises stress determined using Ansys Workbench is 2.7 Mpa , both are well below the allowable limit hence the cup is safe under torsional load.

V TESTING RESULTS

II. Results for Conventional Manual Sprayer mechanism :

Sr. No	Walking speed kmph	Area covered / tank m^2	Time
01	2	0.64	8min
02	3	0.76	7.2 min
03	4	0.78	6.4min
04	4	0.86	5.9 min

The table above shows the results of spraying using a manually operated sprayer mechanism

VI RESULTS FOR VEHICLE SPRAYER:

Sr. No	Vehicle speed kmph	Area covered / tank m^2	Time
01	2	0.86	4.2min
02	3	0.98	3.9 min
03	4	1.12	3.4min
04	4	1.24	3.1 min

III. The table above shows the results of spraying by application the vehicle sprayer mechanism

VII RESULT AND DISCUSSION

1.Maximum stress induced by theoretical method in the wheel shaft is 6.38Mpa and the maximum Von-mises stress determined using Ansys Workbench is 23.76 Mpa , both are well below the allowable limit hence the wheel shaft is safe under torsional load.

2. Maximum stress induced by theoretical method in dive shaftis 5.283 Mpa and the maximum Von-mises stress determined using Ansys Workbench is 22.5615 Mpa , both are well below the allowable limit hence the drive shaft is safe under torsional load.

3. Maximum stress induced by theoretical method in the cup is 1.86Mpa and the maximum Von-mises stress determined using Ansys Workbench 2.7Mpa , both are well below the allowable limit hence the cupis safe under torsional load.

4. Maximum stress induced by theoretical method in the hinge shaft is 7.7 Mpa and the maximum Von-mises stress determined using Ansys Workbench is 12.8 Mpa , both are well below the allowable limit hence thetable shaft is safe under torsional load.

5. Maximum stress induced by theoretical method in the engine shaftis 7.7 Mpa and the maximum Von-mises stress determined using Ansys Workbench is 2.4585 Mpa , both are well below the allowable limit hence the table is safe under torsional load.

6. As the maximum load 25 kg> design load 25 kg the designed unit works to optimal design

7. At the lowest speed of vehicle the minimum speed is 2 kmph and max speed 5 kmph

8. The device can do seed sowing operation in two rows simultaneously

9. The device can make spraying operation on both sides

10. The machine is low weight, compact and low cost

VIII CONCLUSION:

The sizing, design analysis critical components of Seed sower with sprayer is successfully done and the dimensions of the components have being determined. Estimation of the maximum stress induced in the components of the welding positioner have being determined by both theoretical method as well as using Ansys Work bench and the results indicate that the maximum stress values are well below the permissible limit hence the parts are safe under given system of loads. As the maximum load 25 kg> design load 20 kg the designed unit works to optimal design. As the maximum load 25 kg> design load 25 kg the designed unit works to optimal design .At the lowest speed of vehicle the is 2 kmph and max speed 5 kmph. The device can do seed sowing operation in two rows simultaneously. The device can make spraying operation on both sides. The machine is low weight, compact and low cost**.**

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