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Solar Powered Hybrid Electric Weeder

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Abstract - *India is known purely for its contributions in the agricultural domain. Around 60 percent of people in the country work in this sector, yet not much has improved in the technological aspect in this field. Diesel powered equipment is still widely in use that emits an extensive amount of pollution., both, noise and air. From sowing to harvesting, weeding is one of the most essential and tedious aspects of the job. It requires an extensive amount of labour and time especially if the process has to be done manually. Our aim in this project is to use renewable sources such as solar, as our only form of energy to power an electric weeder so as to control the noise emitted, give a more efficient mechanism and to control the pollutants emitted into the atmosphere*

Key Words: solar powered, weeder, L-blade, C-type, Flat Blade

1.INTRODUCTION

In the field, any plant that inhibits the growth by taking a part of the nutrition of the money yielding crop is frowned upon, considered unwanted and is referred to as weed. The process of removal of this undesired growth is known as weeding. The reason weeding is such a crucial part that must be done at the right time is due to the competition the weed provides to the desired crops for nutrients, water, sunlight and many other aspects that affect the overall quality of the harvest. At times, this even causes a reduction in the desired crop production to a considerable amount. Although most weeds are unwelcome some are left to grow on purpose to help stimulate the growth of the crop. According to various researches conducted during recent years, the growth of weed is considered as one of the major factors for destruction of about 33 percent of the crop produced in the world. They cause a production loss of about 35-69% in mung bean,15-40% in cotton,58-85% in soybean and 10-100% in rice. India being an agrarian country with geographical conditions suitable for growth of majority of the crops, wedding becomes a very essential activity and needs to be done right.

The main objective of this project is to design and fabricate a weeding device which is suitable for the use of weeds at varied growth stages, farming methods (different plant spacing and intra-row distances) and in distinct geographical conditions. Although traditionally, the control of these nuisance causing weed growth was removed via chemicals, in recent years, non-chemical weed control methods have gained utmost importance. This is due to the largely unfavorable effect that pesticides have caused over a decade in the form of reduction in the quality of the soil and produce apart from its major pollution causing drawback

With the increase in various cancer causing compounds, the awareness to opt for a healthier lifestyle has increased drastically in the present population This has led to the worldwide adaptation of the concept of organic farming. Mechanical weeding has proved to be one of the most widely used processes in this aspect as it not only keeps the produce clean but also helps in the improving aeration and water intake capacity of the soil. But this comes with a major drawback of noise and air pollution emitted by the conventional diesel based motor. A solar based electric weeder is just the solution required for the emission free output required. This is a more efficient and economical option as against the traditionally used fossil fuel based weeder. Although, the investment for a fossil fuel based weeders is very low, the running and maintenance cost of this device over its lifetime has a vast difference when compared to a solar powered electric weeder, as apart from the initial cost all the other costs are negligible.

The sunlight falls on the stationed solar panels on the device that converts this heat energy into electric form to charge the battery. The battery then, is used to power the motor which in turn causes motion in the worm gear that rotates the wheels. There are two options provided for the charging of this device. One is by the inexpensive solar panel and the other by the typical electric port available in any field. This makes the device extremely reliable under any psychrometric conditions.

1.1 LITERATURE REVIEW

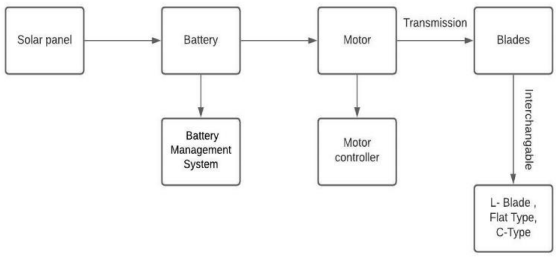
The need to develop a solar powered electric weeder was to reduce the dependencies of the agricultural sector on fossil fuels [7]. Different shapes and sizes of blades give different efficiency and have a varied rate of performance index. The depth of cut of a blade usually decides how much area of the field can be covered in a day and the amount of plant damage given to the desired crop. The results claimed that the 50mm blade in a pair of 2 had the highest field capacity. The 70mm blades in a set of 4, had the highest weeding efficiency observed. Finally, after taking an average of all the calculated values the 3 blades on every flange as the most suitable number.

Selecting a proper weed control method is a very essential step in farming [11]. A ridge profile weeder is specifically designed for the ridged crops which are hard to reach and remove. Not only growth of weeds, but also improper cutting of them can cause around 30% to 35% loss in yield. Hence designing of the weeder must be done using appropriate dimensions. The power required to run the entire system can be considered as the initial step in this

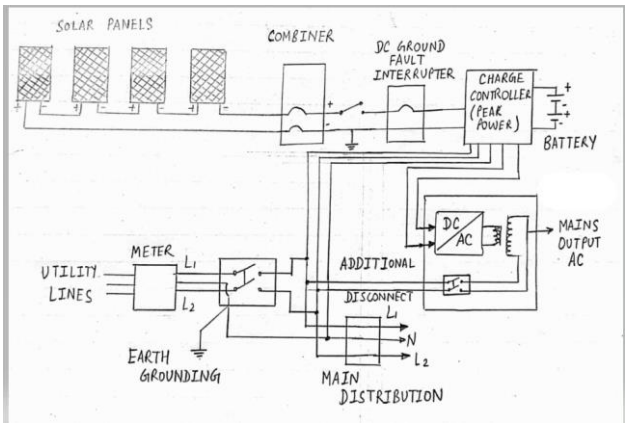
process, the rotor shaft and cutting blades can be calculated using the well-known formulas. Performance evaluation for such weeders can be done by deducing the weed efficiency, plant damage, field capacity and performance index. The inference drawn from the above showed that L type blade has the most ideal characteristics required for the purpose.

2. METHODOLOGY

A. Block Diagram:



B. Circuit Diagram:



C. Components:

Component	Dimensions	Material
Overall length	Length- 1220mm Width - 680mm Height - 700mm	M.S. square section
Flange	Diameter -90mm Thickness- 8mm	Mild Steel
Rotor shaft	Diameter-20mm Length-200mm	Rolled Steel
L-Blade	Width-25mm Thickness-6mm Cutting edge length-50mm	M.S. Flat
Wheels	Diameter=150mm	Mild Steel
Frame	30 × 30 × 2.6mm	Structural steel
Battery	Voltage=60 V Current=38.34 A	-

D. CAD Model:

Fig1. Front view of the weeder

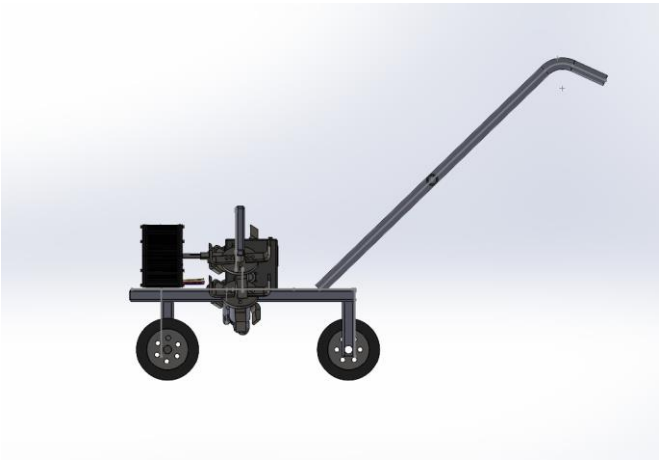


Fig2. Side View of weeder

3. ANALYSIS

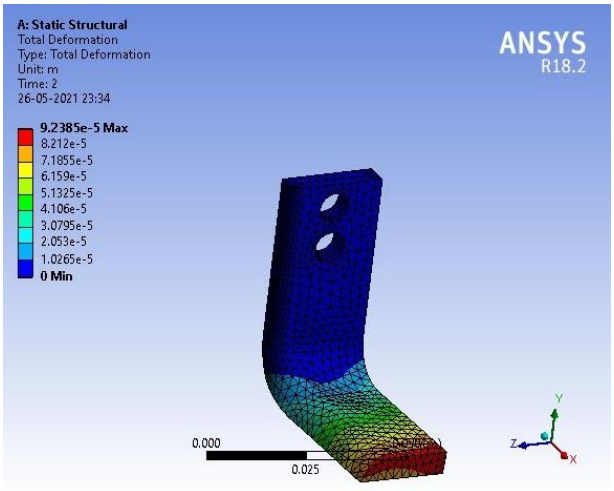


Fig3. Total Deformation of L-Blade

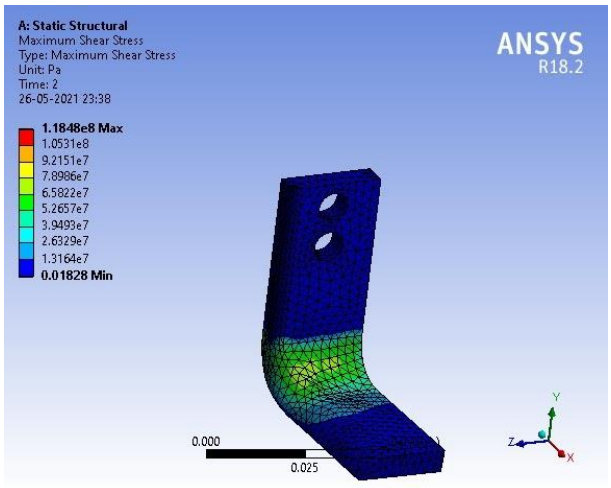


Fig4. Maximum Sheer Stress of L-blade

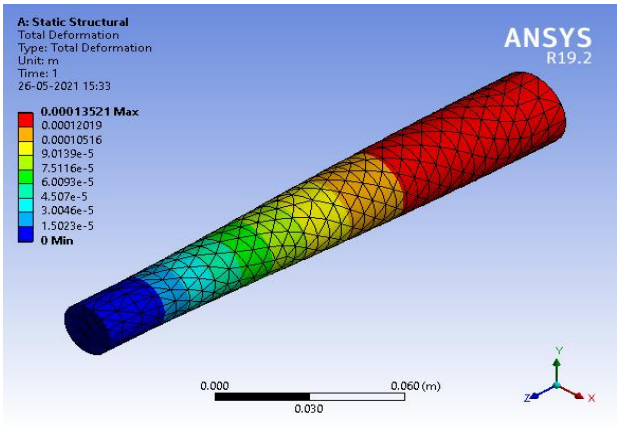


Fig5.Total Deformation of Rotor shaft

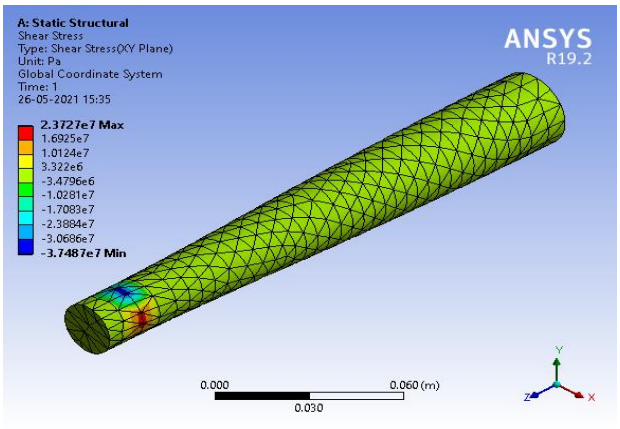


Fig6. Sheer stress in Rotor Shaft

4. CONCLUSIONS

As engineers our aim is to strike a balance at easing others' lives while protecting the environment. Our project aims at doing exactly that by designing an electric weeder powered by solar panels. Looking at the structural analysis done on the rotor shaft, it can be seen that the total deformation is under 0.1325mm and an average shear stress of 3.22*106Pa. Optimization of the L-blade has been done by applying flanges and fixed supports at respective locations. The maximum deformation 0.009mm and a shear stress of 5.26*107Pa. These values show that the life expectancy of this weeder is far more superior than a conventional one. The maintenance cost too for this is minimal. The charging time is quite reasonable and stands at around 4.5 to 5hrs, with battery of 60V and 10Ah.

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