

Design and Modeling of Solar Operated Grass Cutting Machine

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Abstract- The objective of this research is to design and modeling a solar powered Grass cutting machine. Generally by using diesel operated Grass cutting machine, there was lot of environment pollution and noise. So present research gives a solution for quick process of cutting the Grass basically in lawn or garden. The proper sizing of solar panel, charge Controller, battery, DC motor were calculated. The maintenance cost has been reduced by using this machine. Proper design of solar panel, battery, charge controller was by catia modeling. Cutting of grass is more time consuming and labour cost. The highly strength blades are used for cutting grass which is powered by DC motor. The present research gives the solution for quick process of cutting grass in order to make environment beautiful.

Keywords- Grass cutting machine, blades, DC motor, maintenance cost

1. Introduction

For the manufacturing of a solar grass cutter we referred to various articles and research papers. From the literature we found that many Grass cutting machines are abundantly available in the market. These tools use diesel as fuels which is harmful for the environment and also do increase the operating and maintenance cost. This motivated us to design and fabricate a real time based solar operated grass cutting machine that is basically solar operated grass cutter.

With this background, we are trying to design and construct a Solar Powered Grass cutter System which will use non renewable energy source (Solar energy) and with less human effort.

2. Proposed Design Principle

I. Sizing of DC motor

As per market availability, RPM of motor=1000 RPM, 12 Volt, 10 Watt

So, the torque can be calculated

$$\text{Power} = 2 \times \pi \times N \times T / 60$$

$$10 = 2 \times \pi \times 1000 \times T / 60$$

$$T = 600 / 6283.185 = 0.095 \text{ RPM}$$

II. Sizing of PV panel

Load calculation = 10 watt dc motor \times 6 hour per day = 60 watt hour

For climate condition total load = 60 + 60 = 120 watt hour

Considering sunshine hour = 5

$$120 \text{ watt hour} / 5 = 24 \text{ watt panel} = 20 \text{ watt panel}$$

III. Sizing of battery

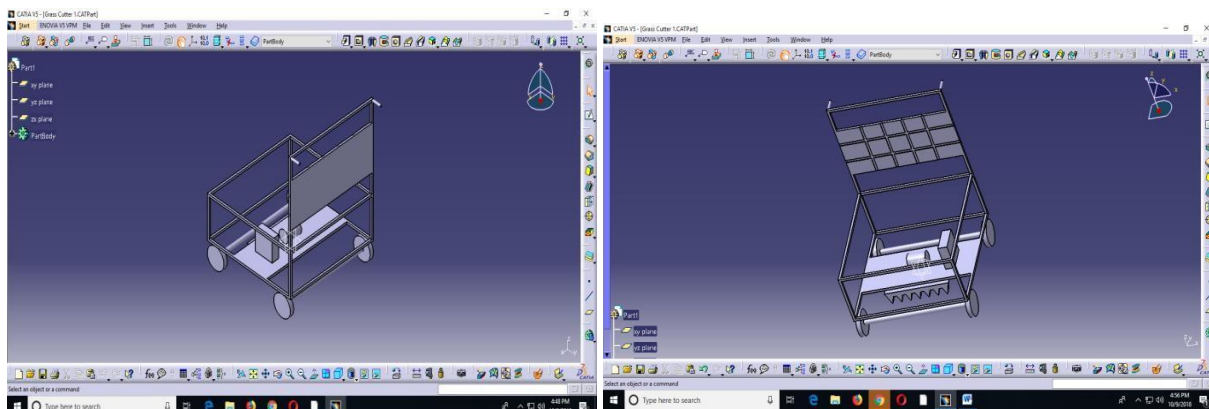
For 3 watt to 100 watt panel 12 volt is required.

$$120 \text{ watt hour} / 12 \text{ volt} = 10 \text{ amp hour} = 7.2 \text{ Ah}$$

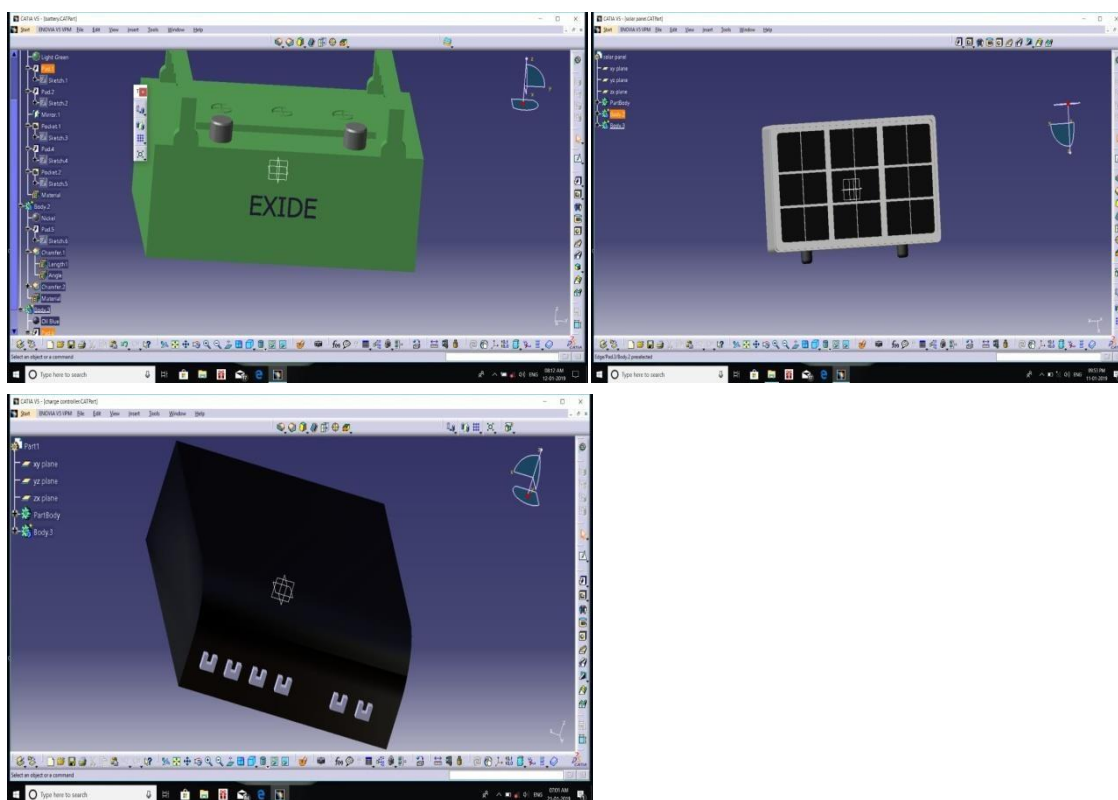
Sizing of charge controller

20 Watt/12volt=1.6 Ah= 10 Ah

3. Design and modeling for the Grass cutting machine



(Figure 1 shows the catia design of solar operated grass cutting machine)



(Figure 2 shows the catia design of battery, solar panel charge controller)

4. Bill of Quantity

Bill of Quantity for Solar Operated Grass Cutting Machine							
Sl. No	Description of Item	Unit	Quantity	Total	Total weight	Rate/Kg	Total Cost
1.	Solar Panel(20 W,18V,1.2A, $V_{oc}=21.6V$, $I_{sc}=1.29A$)	PC	1				2000
2.	DC motor (1000 RPM, 12 VOLT, 10 WATT)	PC	1				1500
3.	Batteries (12volt, 7.2 Ah)		1	NA	NA		800
4	Charge controller(10 Ah		1				850
4.	Square bars	PC	20 feet	NA	NA	NA	2000
5.	Wheels	PC	4	NA	NA	NA	1000
6.	Cutter	PC	1	NA	NA	NA	200
7.	Electrical components	NA					
	a. Wires		10 feet				
	Mechanical components		1	NA	NA	NA	250
	a. Clamp		10				
	b. Welding electrode						
8.	Switch	NA	NA	NA	NA		120
						Total	9000

5. Conclusion

The main objective is to design a compact size and portable solar operated grass operated machine. It will be used for easy move from one place to another place. It will not create any air pollution and noise. It is easy to operate and Zero emissions and zero waste of conventional sources It is Cost saving and less maintenance. Future scope will be for designing automated solar powered grass cutting machine.

References

1. Prof Vijaykumar S. Ghorade, Prof. Pramod R. Dabhade and Prof. Shrikrushna M. Dhole “Design and Fabrication of Solar Grass Cutter”. International Journal for Scientific Research & Development (IJSRD 17), ISSN No: 2321-0613, Volume 5, Issue 6.
2. Ms. Lanka Priyanka, Mr. Prof. J.Nagaraju and Mr. Vinod Kumar Reddy “ Fabrication of Solar powered Grass Cutting Machine” International Journal & Magazine of Engineering, Technology, Management and Research(IJMETMR,15), ISSN No: 2348-4845, Vol 2, Issue 6.
3. P. Amrutesh, B. Sagar and B. Venu “Solar Grass Cutter With Linear Blades By Using Scotch Yoke Mechanism” International Journal of Engineering Research and Applications (IJERA, 14), ISSN No: 2248-9622, Vol 4, Issue 9.
4. Rohan Patil, Onkarmagdum, SushilKhade and OmkarVibhute “Paper on Design, Development and Fabrication of Solar Operated Lawn Cutting Machine” International Research Journal of Engineering and Technology (IRJET, 18), ISSN No: 2395-0056, Vol 5, Issue 2.
5. D. Satwik, Mr. N. Ramalingeswara Rao and, Sreeram Reddy “Design and Fabrication of Lever Operated Solar Lawn Mower and Contact Stress Analysis of Spur Gears” International Journal of Science, Engineering and Technology Research (IJSETR, 15), Vol 4, Issue 8.