

# Advanced Eco-Friendly Grass Cutter

Sulthan Mohyuddin<sup>1</sup> Nazeya Khanam F<sup>2</sup> Vidyashree H V<sup>3</sup> Digesh K D<sup>4</sup> Vivek T K<sup>5</sup>

<sup>1</sup>Associate Professor <sup>2,3,4,5</sup>Student

<sup>1,2,3,4,5</sup>Department of Electrical and Electronics Engineering  
<sup>1,2,3,4,5</sup>Srinivas Institute of Technology, Mangaluru

**Abstract**— A normal grass cutter moving with IC engine will run based on the energy from petrol. The major drawbacks of this technology are high running cost; create noise pollution and air pollution. Also, an IC engine requires periodic maintenance such as changing the engine oil, mechanical maintenance. It is an innovative technology of cutting grass without any pollution, electric solar grass cutter are environmentally friendly. Nowadays, the labor charge is increased day by day. This technology can help the people who are living in rural areas. This project is mainly proposal for reduce the manpower and usage of electricity. The system control is done by the Schmitt trigger circuit. The grass cutter and vehicle motors are interfaced to a Schmitt trigger circuit that controls the working of all the motors.

**Key words:** Solar Panel, Batteries, High Speed DC Motor, Blades, Schmitt Triggers Circuit

## I. INTRODUCTION

This project is a proposed model of the automatic grass cutting machine by using the non-renewable energy (i.e. Solar energy). Solar energy is the renewable energy. Grass cutter with a standard motor is an inconvenience, and no one takes pleasure in it. Cutting grass cannot be easily accomplished by elderly, younger, or disabled people. It creates noise pollution due to the loud engine, and local air pollution due to the combustion in the engine. Also, a motor powered engine requires periodic maintenance such as changing the engine oil. Even though electric grass cutter are environmentally friendly.

Moving the grass cutters with a standard motor powered grass cutters is an inconvenience, and no one takes pleasure in it. Cutting grass cannot be easily accomplished by elderly, younger, grass cutter moving with engine create noise pollution due to the loud engine, and local air pollution due to the combustion in the engine. Also, a motor powered engine requires periodic maintenance such as changing the engine oil. Even though electric solar grass is environmentally friendly, they too can be an inconvenience. Along with motor powered grass cutter, electric grass cutters are also hazardous and cannot be easily used by all. Also, if the electric grass cutter is corded, mowing could prove to be problematic and dangerous. The prototype will also be will be charged from sun by using solar panels.

## II. MAIN COMPONENTS AND BLOCK DIAGRAM

- 1) Solar panel
- 2) Batteries
- 3) High Speed DC motor
- 4) Blades
- 5) Schmitt trigger circuit
- 6) MOSFET

**Photovoltaic Principles:** The photo- voltaic effect can be observed in nature in a variety of materials that have shown that the best performance in sunlight is the semiconductors

as stated above. When photons from the sun are absorbed in a semiconductor, that create free electrons with higher energies than the created there must be an electric field to induce these higher energy electrons to flow out of the semiconductor to do useful work.

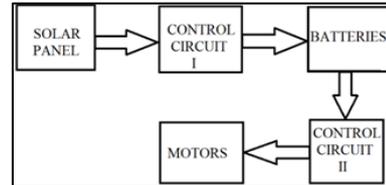


Fig. 1: Block Diagram

A junction of materials, which have different electrical properties, provides the electric field in most solar cells for the photon interaction in a semiconductor. A solar cell consists of Semiconductor in which electron hole pairs are created by the absorption of incident solar radiation. Region containing a drift field for charge separation and Charge collecting front and back electrodes.

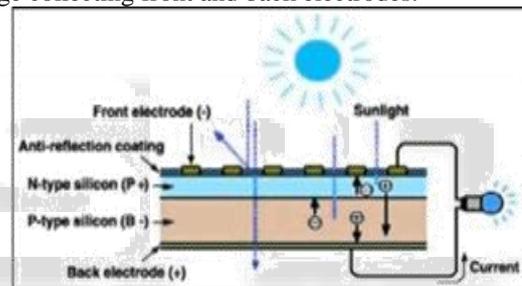


Fig. 2: Solar Panel Design

The batteries are used as a storage device for solar energy which can be further converted into electrical energy. The only exceptions are isolated sunshine load such as irrigation pumps or drinking water supplies for storage, for small units with output less than one kilowatt. Batteries seem to be the only technically and economically available storage means. Since both the photo- voltaic system and batteries are high in capital costs, it is necessary that the overall system be optimized with respect to available energy and local demand pattern. To be economically attractive the storage of solar electricity requires a battery with following particular combination of properties:

- Low cost
- Long life
- High reliability
- High overall efficiency



Fig. 3: Battery

### III. DESCRIPTION OF EXISTING PROBLEMS

A normal grass cutter moving with IC engine will run based on the energy from petrol. The major drawbacks of this technology are high running cost; create noise pollution and air pollution. Also, an IC engine requires periodic maintenance such as changing the engine oil, mechanical maintenance. It is an innovative technology of cutting grass without any pollution, electric solar grass cutter are environmentally friendly.

Nowadays pollution is a major issue for whole world. Pollution is manmade and can be seen in own homes. Due to the emission of gases it is responsible for pollution. Also the cost of fuel is increasing hence it is not efficient. So the Solar grass cutter is introduced.

Solar energy is the renewable energy. Grass cutter with a standard motor is an inconvenience, and no one takes pleasure in it. Cutting grass cannot be easily accomplished by elderly, younger, or disabled people. It creates noise pollution due to the loud engine, and local air pollution due to the combustion in the engine. Also, a motor powered engine requires periodic maintenance such as changing the engine oil. Even though electric grass cutter are environmentally friendly. Along with motor grass cutter, electric grass cutter is also hazardous and cannot be easily used by all. Also, if the electric grass cutter is corded, mowing could prove to be problematic and dangerous. It can save significantly on labor costs. In large size of grass cutter in the park, schools, college, are maintained manually.

Also a motor powered engine requires periodic maintenance such as changing the engine oil. Even though electric solar grass is environmentally friendly, they too can be an inconvenience. Along with motor grass cutter, electric grass cutters are also hazardous and cannot be easily used by all. Solar grass cutter hence we design to make a grass cutter without any power source due to reduce the power consumption. Design a solar grass cutter that utilizes solar power as an energy source is meant to address a number of issues that standard internal combustion engine cutter do not. An electric grass cutter with a solar charger will be easier to use. The unskilled gardener is enough to operate the grass cutter. Most importantly it eliminates the emissions of an internal combustion cutter which are mostly responsible for environmental pollution and causes the greenhouse gases effect believed to be responsible for the worsening global warming of our planet. This is so because solar energy is green/renewable energy.

### IV. MODEL AND CONTROL CIRCUIT

Coming to the working of solar powered grass cutter, it has panels mounted in a particular arrangement at an angle of 45 degrees in such a way that it can receive solar radiation with high intensity easily from the sun. These solar panels convert solar energy into electrical energy as studied earlier. Now this electrical energy is stored in batteries by using a solar charger.

The main function of the solar charger is charging batteries, it also disconnects the solar panels from the batteries when they are fully charged and also connects to the panels when the charging in batteries is low.

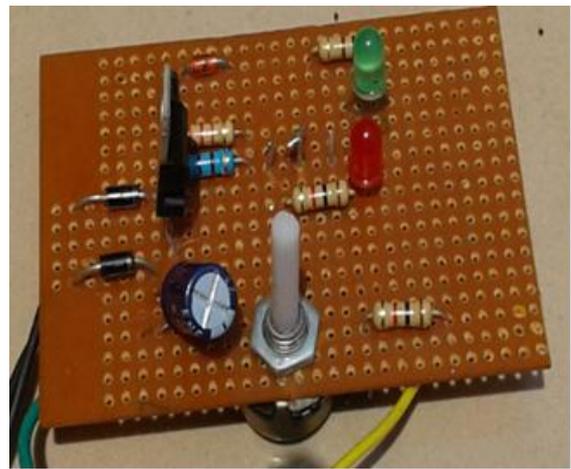


Fig. 3: Charging Circuit



Fig. 4: Control circuit

The positive feedback increases the switching speed, i.e. A slowly changing input wave form will become a fast (steep) changing output wave form. The hysteresis region reduces impact by input noise (as determined by VH). The major difference between a simple comparator and the Schmitt Trigger is how they respond to input noise. If the input signal  $V_{in}$  shows noise near  $V_T$ , then the output signal  $V_{out}$  will show some corresponding chattering

### V. OPERATION AND DISCUSSIONS

A blade is that portion of a tool, weapon, or machine with an edge that is designed to cut and/or puncture, stab, slash, chop, slice, thrust, or scrape surfaces or materials. The blade is seldom sharp enough to give a neat cutting.



Fig. 5: Blades

Power mosfets, on the other hand, are majority carrier devices with no minority carrier injection. They are superior to the bjts in high frequency applications where

aswitching power losses are important. Plus, they can withstand simultaneous application of high current and voltage without undergoing destructive failure due to second breakdown. Power mosfets can also be paralleled easily because the forward voltage drop increases with increasing temperature, ensuring an even distribution of current among all components.

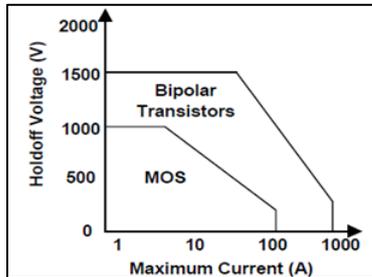


Fig. 6: Current-Voltage Limitations of mosfets and bjts.

However, at high breakdown voltages (>200V) the on-state voltage drop of the power MOSFET becomes higher than that of a similar size bipolar device with similar voltage rating. This makes it more attractive to use the bipolar power transistor at the expense of worse high frequency performance. Fig 4.9 shows the present current-voltage limitations of power mosfets and bjts. Over time, new materials, structures and processing techniques are expected to raise these limits.

A Schmitt Trigger is essentially a comparator with hysteresis. It can be implemented by connecting positive feedback to the non-inverting input of a comparator or differential amplifier. In the non-inverting configuration, when the input voltage is > a chosen threshold ( $V_{TH}$ ), the output voltage is high. When the input voltage is < another chosen threshold ( $V_{TL}$ ), the output voltage is low. When the input voltage is between  $V_{TL}$  and  $V_{TH}$ , the output voltage maintains its present value. This dual-threshold behaviour is called hysteresis.

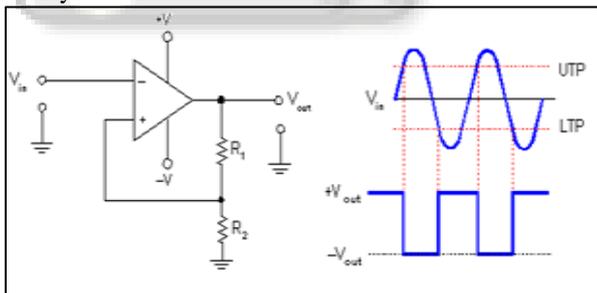


Fig. 7: Schmitt Trigger Circuit

In fact, we need to consider output voltage levels,  $V_{OH}$  and  $V_{OL}$ , when we look at  $V_{TL}$  and  $V_{TH}$ . Furthermore, we should also consider the inverting configuration. The VTC for both configurations are shown in the figures below:

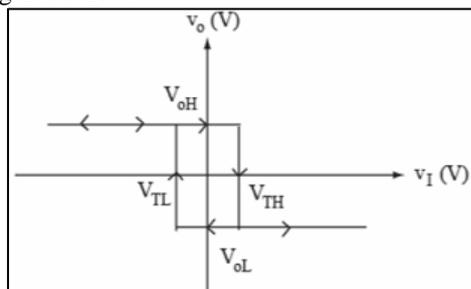


Fig. 8: VTC Configurations

The left VTC is for an inverting Schmitt Trigger; the right VTC is for a non-inverting trigger. The VTC of Schmitt Trigger dictates that its operation must “cross” the hysteresis region. We define the hysteresis voltage  $V_H \equiv V_{TH} - V_{TL}$  and mid-hysteresis voltage  $V_M \equiv (V_{TH} + V_{TL})/2$ .

## VI. CONCLUSION

The output of this project can be improved by increasing reduction of cost, increasing the efficiency of the blades and weight reduction. We can implement with booster circuit and speed control circuit for more reliable and stable operation. If panel used of high watt, then the machine can be used during night time for garden lighting or room lighting. Because we can store more power and at night time however you keep aside. So the power in the battery can be used for this purpose. Due to the power demand we choose the renewable energy. So there is no running cost. The DC motor is operated in low power with high efficiency. DC-DC converter is maintaining the output voltage is constant and high. The sensors are not affected the environment and animals. It will be very much useful for the user. This project concludes that the DC motor is control in a constant speed by control circuit. The DC motor maintains in a constant speed in the condition of the load applied. The battery is charged by the photovoltaic panel in a constant voltage. The output of the photovoltaic panel is varying but IC LM317T is act as a voltage regulator and got the varying input from the photovoltaic and gave the output in constant. The battery is sensing by the controller unit continuously it helps to maintain the constant input to DC motor. The DC motor speed can be able to maintain constant and the performance can be done in proper manner.

## REFERENCES

- [1] “The Design of Equalizer Windings for Lap-Wound DC Machines”, Alaric Pagel, Member, IEEE, Alan S. Meyer, and Charles F. Landy, Senior Member, IEEE. IEEE Transactions on Industry Applications, Vol. 37, No. 4, JULY/AUGUST 2001.
- [2] “Cascaded DC-DC Converter Connection of Photovoltaic Modules”, Geoffrey R. Walker, Member, IEEE, and Paul C. Sernia, IEEE Transactions On Power Electronics, Vol. 19, No. 4, July 2004.
- [3] “Energy Management Based on Frequency Approach for Hybrid Electric Vehicle Applications: Fuel-Cell/Lithium- Battery and Ultracapacitors”, Abdallah Tani, Mamadou Bailo Camara, Member, IEEE, and Brayima Dakyo, Member, IEEE, IEEE Transactions On Vehicular Technology, Vol. 61, No. 8, October 2012.
- [4] “Optimal Design of a 3.5-kv/11-kw DC-DC Converter for Charging Capacitor Banks of Power Modulators”, Gabriel Ortiz, Dominik Bortis, Student Member, IEEE, Jürgen Biela, Member, IEEE, and Johann W. Kolar, Senior Member, IEEE, IEEE Transactions On Plasma Science, Vol. 38, No. 10, October 2010.
- [5] “DC-DC Power Converters”, Robert W. Erickson Department of Electrical and Computer Engineering University of Colorado Boulder, CO 80309-0425, Article in Wiley Encyclopedia of Electrical and Electronics Engineering.

- [6] "MPPT Controller For Photo Voltaic Systems Using CUK DC/DC CONVERTOR", Neeraj Tiwari, D. Bhagwan Das<sup>1,2</sup> Dayalbagh Educational Institute (Deemed University), Agra, International Journal of Advanced Technology & Engineering Research (IJATER).
- [7] "Design of a Voltage-Controlled PFC Cuk Converter-Based PMBLDCM Drive for Fan", Rajesh R PG Scholar, Regional Centre, Anna University Chennai, Coimbatore, India, International journal of innovative research in electrical, electronics, instrumentation and control engineering vol. 1, issue 2, may 2013

