

**A Project report**  
**On**  
**FABRICATION OF SOLAR BASED GRASS CUTTER**

*submitted in partial fulfilment of the requirement*

*For the award of the degree of*

**BACHELOR OF TECHNOLOGY**

**IN**

**MECHANICAL ENGINEERING**

*Submitted by*

**SAMBABU PAVAN**

**19HU5A0322**

**JAJULA DILIP**

**18HU1A0307**

**GUNJA NAVEEN**

**19HU5A0308**

**SHAIK MOHAMMED YAKUB**

**18HU1A0320**

**SHAIK MOHSIN AHAMED**

**19HU5A0325**

*Under the esteemed guidance of*

**Mrs. D.SHILPA, M.Tech**

**Assistant Professor**



**DEPARTMENT OF MECHANICAL ENGINEERING**  
**CHEBROLU ENGINEERING COLLEGE**

**(Affiliated to JNTUK, Kakinada)**

**(Recognized by All India Council for Technical Education, New Delhi)**

**ANDHRA PRADESH, CHEBROLU, GUNTUR-522212**

# **CHEBROLU ENGINEERING COLLEGE**

(Affiliated to JNTUK, Kakinada, A.P)

(Recognized by All India Council for Technical Education, New Delhi)

ANDHRA PRADESH, CHEBROLU, GUNTUR-522212

**2018-2022**

**DEPARTMENT OF MECHANICAL ENGINEERING**



## **Certificate**

This is to certify that the project work entitled “**SOLAR BASED GRASS CUTTER**” is the bonfide work submitted by Samrabu Pavan (Reg. No 19HU5A0322), Jajula Dilip (Reg. No 18HU1A0307), Gunja Naveen (Reg. No 19HU5A0308), Shaik Mohammed Yakub (Reg. No 18HU1A0320) and Shaik Mohsin Ahamed (Reg. No 19HU5A0325) in the partial fulfillment of the requirement for the award of the degree of **BACHELOR OF TECHNOLOGY** in **MECHANICAL ENGINEERING** during the year 2021-2022.

Mrs.D.SHILPA M.Tech

**Project Guide**

Mrs.CH.DHANUJAYANI M.Tech

**HEAD OF DEPARTMENT**

# **CERTIFICATE OF EXAMINATION**

This is to certify that we had examined the thesis and here by accord our approval of it as a study carried out and presented in a manner required for its acceptance in a partial fulfilment for the award of degree of **BACHELOR OF TECHNOLOGY** in **MECHANICAL ENGINEERING** for which it has been submitted.

This approval does not endorse or accept every statement made, opinion expressed or conclusion drawn as in report. It only signifies acceptance of report for the purpose for which it is submitted.

**Internal Examiner**

**External Examiner**

## **DECLARATION**

We hereby declare that the project report entitled " SOLAR BASED GRASS CUTTER" with reference to JNTU-KAKINADA is carried out by under guidance of Mrs.D.Shilpa M.Tech

We also declare that the project report is result of our own effort and were not submitted to any other completion of bachelor of technology in MECHANICAL ENGINEERING course

## **SIGNATURES**

**S. PAVAN**

**J. DILIP**

**G. NAVEEN**

**SK. MOHAMMED YAKUB**

**SK. MOHSIN AHAMED**

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## PROJECT ASSOCIATE

S. Pavan	19HU5A0322
J. Dilip	18HU1A0307
G. NAVEEN	19HU5A0308
Sk. Mohammed yakub	18HU1A0320
SK. Mohsin Ahamed	19HU5A0325

## **ABSTRACT**

A solar grass cutter is the machine that uses rotating blades to cut a lawn at an even length. Even more sophisticated devices are there in every field. Power consumption becomes essential for future. Solar grass cutter is a very useful device which is very simple in construction. It is used to maintain and upkeep lawns in gardens, school, colleges, etc. In this project, changes have been done for the existing machine to make its applications easier at reduced cost. Our main aim in pollution control is attained through this. Unskilled operation can operate easily and maintain the lawn very fine and uniform surface look.

In our project, solar grass cutter uses to cut different grasses for the applications. Solar grass cutter the solar energy converted into electrical energy and electrical energy converted into mechanical energy. The electrical energy transmitted to electric motor.

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## **CHAPTER – 1**

### **1.1 INTRODUCTION:**

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.

### **1.2 SOLAR ENERGY:**

Solar energy is the transformation of heat, the energy that comes from the sun. It has been used for thousands of years in many different ways by people all over the world. The oldest uses of solar energy is for heating, cooking, and drying. Today, it is also used to make electricity where other power supplies are not there, such as in places far away from where people live, and in outer space. It is becoming cheaper to make electricity from solar energy. Because the Sun always gives heat, solar energy can be considered a renewable energy and an alternative to non-renewable resources like coal and oil. Solar energy, radiation from the Sun capable producing heat, causing chemical reactions, or generating electricity. The total amount of solar energy incident on Earth is vastly in excess of the world's current and anticipated energy requirements. If suitably harnessed, this highly diffused source has the potential to satisfy all future energy needs. In the 21st century solar energy is expected to become increasingly attractive as a renewable energy source because of its inexhaustible supply and its nonpolluting character, in stark contrast to the finite fossil fuels coal, petroleum, and natural gas. The Sun is an extremely powerful energy source, and sunlight is by far the largest source of energy received by Earth, but

its intensity at Earth's surface is actually quite low. This is essentially because of the enormous radial spreading of radiation from the distant Sun. A relatively minor addition is due to earth's atmosphere and clouds, which absorb or scatter as much as 54 percent of the incoming sunlight. The sunlight that reaches the ground consists of nearly 50 percent visible light, 45 percent infrared radiation, and smaller amounts of ultraviolet radiation.

### **1.2.1 Uses of Solar Energy:**

The potential for solar energy is enormous, since about 200,000 times the world's total daily electric- generating capacity is received by Earth every day in the form of solar energy. Unfortunately, though solar energy itself is free, the high cost of its collection, conversion, and storage still limits its exploitation in many places. Solar radiation can be converted either into thermal energy (heat) or into electrical energy, though the former is easier to accomplish.

- ❖ As heat for making hot water, heating buildings and cooking
- ❖ To generate electricity with solar cells or heat engines
- ❖ To take the salt away from sea water.
- ❖ To use sun rays for drying clothes and towels.
- ❖ It is used by plants for the process of photosynthesis.
- ❖ To use cooking (solar cookers)

### **1.2.2 Advantages of Solar Energy:**

- ❖ Solar power is pollution free and causes no greenhouse gases to be emitted after installation. Reduced dependence on foreign oil and fossil fuels.
- ❖ Renewable clean power that is available every day of the year, even cloudy days produce some power.
- ❖ Return on investment unlike paying for utility bills.
- ❖ Virtually no maintenance as solar panels last over 30 years.
- ❖ Creates jobs by employing solar panel manufacturers, solar installers, etc. and in turn helps the economy.
- ❖ Efficiency is always improving so the same size solar that is available today will become more efficient tomorrow.

### **1.2.3 Disadvantages of Solar Energy:**

- ❖ Cloudy days do not produce much energy.
- ❖ Solar panels are not being mass produced due to lack of material and technology to lower the cost enough to be more affordable.
- ❖ Solar powered cars do not have the same speeds and power as typical gaspowered cars.
- ❖ Lower production in the winter months.
- ❖ Depending on geographical location the size of the solar panels varies for the same power generation.

### **1.2.4 Types of Solar Panels:**

- ❖ Mono-crystalline solar panel
- ❖ Average efficiency range: 15%-24%
- ❖ How it's made: Wafers are cut from a block of a single crystal of highly pure silicon.
- ❖ Appearance: Mono-crystalline solar cells have a uniform appearance, and the cells form a distinctive shape – small black squares with notched corners. Solar panels made with these solar cells typically have either a white or black back sheet.
- ❖ Features: These panels conduct electricity more efficiently and perform better in high temperatures and shaded conditions, enabling them to generate more solar power than other panels of the same size. That makes them ideal for smaller rooftops. Because this type of technology is the most established, it also has a proven track record of durability. However, these are the most expensive panels and 11 generate more waste in the manufacturing process

### **1.2.5 Polycrystalline (or multi crystalline) solar panel:**

- ❖ Average efficiency range: 12%-16%
- ❖ How it's made: Fragments from multiple silicon crystals are heated, melted and together to form a large solar cell.
- ❖ Appearance: These solar cells have a multifaceted, non-uniform, gem-like surface and are typically blue in color.

- ❖ Features: Polycrystalline solar panels are composed of polycrystalline solar cells. They are less efficient but are less expensive. There is less silicon waste in the manufacturing process. These are the most prevalent solar panels globally, primarily due to a production boom in China over the last few years.

### **1.2.6 Thin film solar panels:**

- ❖ Average efficiency range: 7%-13%
- ❖ How it's made: A thin layer of photovoltaic material or combination of materials such as non-crystalline amorphous silicon (a-Si), Cadmium Telluride (CdTe), or copper indium gallium selenide (CIGS) is deposited onto a surface like glass, plastic, or metal.
- ❖ Appearance: Thin film silicon panels are generally larger and have a uniform, solid black appearance.
- ❖ Features: This is a commercially available but newer technology that makes sense where space is not an issue. Thin film solar panels are low cost, easy to produce, flexible, portable, and lightweight. They are expected to be less durable and to have a shorter lifespan.

### **1.3 Photovoltaic Cell:**

First is solar-generated electricity, called photovoltaic (PV). Photovoltaic are solar cells that convert sunlight to DC electricity. The solar cell is PV modules are made from semi-conductor materials. When materials are atoms electrical conductors are attached to the positive and negative side of material allow the electrons to be captured in the form of a Dc current. This electricity can then be stored in a battery as shown in fig:1.3.

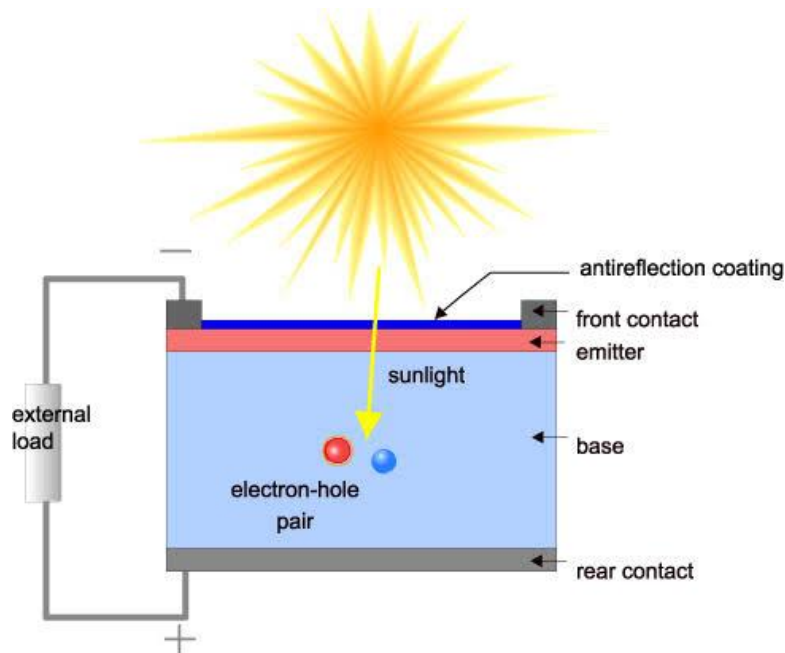


Fig: 1.3 Photovoltaic cell

## 1.4 p-n junction:

The photovoltaic cell where the n-type and p-type silicon layers meet is called the p-n junction.

The p-type Si layer contains more positive charges, called holes, and the n-type Si layer contains more negative charges, or electrons. When p type and n-type materials are placed in contact with each other, current will flow readily in one direction (forward biased) but not in the other (reverse biased).

The p-n junction of a darkened photovoltaic cell. Extra valence electrons in the n-type layer move into the p-type layer filling the holes in p-type layer forming what is called a depletion zone. The depletion zone does not contain any mobile positive or negative charges. Moreover, this one keeps other charges from the p and n-type layers from moving across it.

A region depleted of carriers is left around the p-n junction, and a small electrical imbalance exists inside the photovoltaic cell. This electrical imbalance amounts to about

0.6 to 0.7 volts. So due to the p-n junction, a built in electric field is always present across the photovoltaic cell.

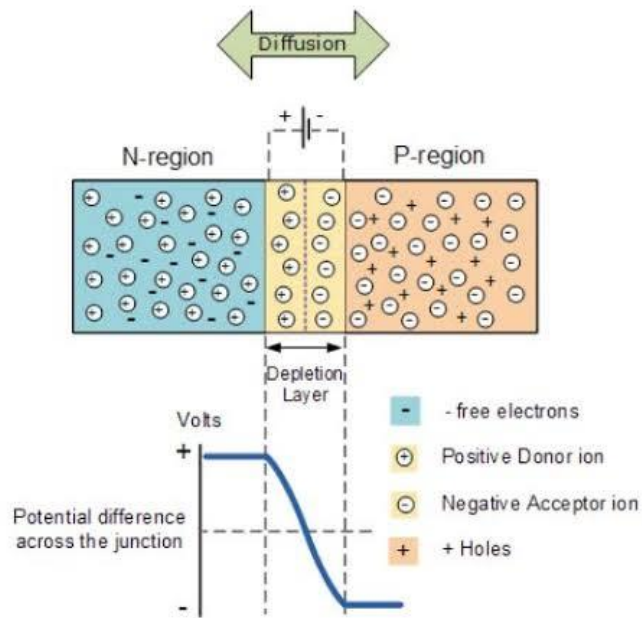


Fig: 1.4 PN junction diode

When photons hit the photovoltaic cell, freed electrons (-) attempt to unite with holes on the p-type silicon layer. The p-n junction, a one-way, only allows the electrons to move in one direction. If we provide an external conductive path, electrons will flow through this path to their original (p type) side to unite with holes as shown in fig (1.4).

The electron flow provides the current (I), and the photovoltaic cell's electric field causes a voltage (V). With both current and voltage, we have power (P) ( $P=V \times I$ ) when an external load (such as an electric bulb) is connected between the front and back contacts, electricity flows in the photovoltaic cell.

Due to the continuous increase in the cost of fuel and the effect of emission of gases from the burnt fuel into the atmosphere, this necessitated the use of the abundant solar energy

from the sun as a source of power to drive a lawn mower. The solar powered lawnmower is operated by the switch on the board which closes the circuit and allows the flow of current to the motor which in turn drive the blade used for mowing. The battery recharges through the solar charging controller. Performance evaluation of the developed machine was carried out with different types of grasses.

A grass cutter with solar energy will be easier to use, it eliminates down time by frequent trips to the gas station for fill-ups and danger associated with gasoline spillage. The dangerous emissions generated by the gasoline spillage and that of the internal combustion engine into the atmosphere are eliminated. The solar powered grass cutter will help to reduce air pollution.



## CHAPTER – 2

### 2.1 TYPES OF LAWN MOWERS:

A Lawn mower is a machine used to cut grass or plants. The different types of lawn mowers are following below:

- i. CYLINDER MOWERS
- ii. ROTARY LAWN MOWERS
- iii. PETROL LAWN MOWERS
- iv. ELECTRIC LAWN MOWERS
- v. HOVER LAWN MOWER

#### 2.1.1 CYLINDER MOWERS:

Cylinder lawn mowers consist of a cylinder and a number of horizontal blades that spiral around it. If adjusted to the correct height a cylinder mower will give the best cut of any lawn mower. They are however, best suited to flat lawns and can be difficult to use on bumpy or tall grass as shown in (fig 2.1.1).



Fig: 2.1.1 Cylindrical lawn mower

The number of blades that spiral around the cylinder determines the quality of the finish, the more blades, the better and the cut. Cylinder mowers can also be fixed with a roller which flattens the grass giving a smooth finish. A cylinder mower with a rear roller will give the best striped effect.

Some cylinder mowers are entirely hand driven whereas others may have the blades driven by an engine. Self propelled cylinder mowers use an engine to propel themselves forward as well as to turn the blades. This can save the operator a lot of energy as little effort is required to move the mower around the lawn.

### **2.1.2 ROTARY MOWERS:**

These have blades that spin horizontally on a vertical driveshaft. Cutting is due to a horizontal blade striking the grass at a high speed. The two cutting mechanisms can lead to different results. On rotary mowers, the blade is usually not sharp enough to cut the grass cleanly. The speed of the blade simply tears the grass resulting in ragged tips.

By contrast, the cylinder-type reel lawn mowers and manual lawn mowers usually work by scissor action on the blades and a cleaner cut is achieved. Rotary lawn mowers often allow the height of the lawn mower to be adjusted to control the height of the cut grass. On older or less expensive lawn mowers, this is accomplished by manually moving each wheel to a different slot on the chassis. A more recent innovation in rotary mowers is a "one-touch" height-adjust mechanism where the blades are mounted on a frame separate from the rest of the lawn mower and the frame separate from the rest of the lawn mower and the frame can raise and lowered. On hover mowers, height adjustment is provided by the use of removable spacing washers that fit between the blade and the motor spindle, since the mower body must remain at the same height above the grass in order to preserve the aircushion. Lawn mowers need power for two purposes: to cut and to move. The act of pushing or pulling a reel mower provides power for cutting and moving at the same time.

For rotary mowers, the power sources may vary: grass-cutting may be powered by either an internal combustion engine or an electric motor, while propulsion may share that power source or be supplied by the user or another external source such as a tractor.

Wheel-driven gear systems allow for cutting to be powered by the same external sources that used to propel the mower.

### **2.1.3 PETROL LAWN MOVER:**

These lawn mowers fall under the rotary type mowers. They are powered by internal combustion engines. Such engines can be either two-stroke or four-stroke cycle engines, running on gasoline or other liquid fuels. Internal combustion engines used with lawnmowers normally have only one cylinder. er generally ranges from two to seven horsepower (1.5 to 5.25 kW).



Fig: 2.1.3 Petrol lawn mower

In the above fig (2.1.3) shown the design of petrol lawn mower. The engines are usually carbureted and require a manual pull crank to start them, although an electric start is becoming a sales feature in some countries. These lawnmowers typically have an opening in the side or rear of the housing where the cut grass is expelled. Some have a grass catcher attachment at the opening to bag the grass clippings. The key advantage of petrol lawn mowers is that they are both powerful, and highly mobile. A basic petrol lawn mower will have at least 3hp where as an electric mower will only have up to 2hp. The other advantage they have over electric mowers is that they don't require a long power cable to be connected and dragged behind it. Depending on the size of your lawn this could be quite an important issue.

Petrol lawn mowers come in both the 2 stroke and 4 stroke cycle engines:

Two stroke lawn mowers are more powerful, less expensive, have a better power to weight ratio, and can be operated in any orientation. However, they are also louder, less fuel efficient, and do not last as long due to the high revolving engine. They also require the petrol to be mixed with oil prior to use in order to lubricate the engine.

Four stroke lawn mowers by comparison are not as powerful, but contain an oil sump (a separate oil chamber) and don't need the fuel to be pre-mixed. This saves the operator from mixing the fuel but it also means that the mower cannot be tipped on one side as it will cause the oil to fall out of the sump into the fuel chamber.

#### **2.1.4 ELECTRICAL LAWN MOWER:**



Fig: 2.1.4 Electrical lawn mower

Rotary mowers powered by electric motors are increasingly popular. Usually, these mowers are moved by manual motive power the on-board engine or motor only spins the blades. These have the disadvantage of requiring a trailing power cord that limits its range and so these are only useful for relatively small lawns, close to a power socket. There is the obvious hazard with these machines of mowing over the power cable, which stops the mower and may put users at risk of electrocution. Installing a residual-current device on the outlet can reduce the risk of electrocution as shown in fig (2.1.4).

Electric rotary mowers weigh 45-50 pounds. The key advantage of an electric lawnmower is the price. A basic rotary electric lawn mower will cost you about half the price of a

petrol mower, as well as being lighter, more quiet, and requiring less maintenance. For a small lawn an electric mower should do fine, provided you mow regularly. If it is any larger or if the grass tends to get out of hand then you will need the extra power of a petrol mower.

### **2.1.5 HOVER LAWN MOWERS:**

Hover mowers are powered rotary push mowers that use a turbine above the spinning blades to drive air downwards, thereby creating an air cushion that lifts the mower off the ground like a hovercraft. The operator can then easily move the mower as it floats over the grass. Hover mowers can also be applied to very long grass and even light scrub, since their lightness permits most operators to lift the mower up and then let it sink slowly down while the blades progressively chop up the vegetation. The lifting action is made even easier when the mower is swung around with the handle held against as shown in fig: 2.1.5



Fig: 2.1.5 Hover lawn mower

Operator's mid-body to provide leverage. The action of air lifting the mower off the grass makes it hover a few centimeters above the ground thus making it very easy to push around the garden and, providing that you are not interested in getting stripes, means that you can mow the lawn from side to side.

## **CHAPTER – 3**

### **3.1 COMPONENTS OF SOLAR GRASS CUTTER:**

The different components we have used to make solar grass cutter are given below:

- i. Solar panel
- ii. PVC pipes
- iii. Couplings & Reducers
- iv. Blades
- v. Motor
- vi. Wheels
- vii. Wires & Switches
- viii. Solar charge control
- ix. Battery

### **3.2 SOLAR PANEL:**



Fig: 3.2 solar panel

Solar panels are those devices which are used to absorb the sun's rays and convert them into electricity or heat. A solar panel is actually a collection of solar (or photovoltaic)

cells, which can be used to generate electricity through photovoltaic effect. These cells are arranged in a grid-like pattern on the surface of solar panels as shown in fig (3.2).

When it comes to wear-and-tear, these panels are very hardy. Solar panels wear out extremely slow. In a year, their effectiveness decreases only about one to two per cent (at times, even lesser). Most solar panels are made up using crystalline silicon solar cells. These days, solar panels are used in wide-ranging electronic equipments like calculators, which work as long as sunlight is available. However, the only major drawback of solar panels is that they are quite costly. Also, solar panels are installed outdoors as they need sunlight to get charged.

### **3.3 SOLAR CHARGE CONTROLLER:**



Fig: 3.3.1 Solar charge controller

A solar charge controller is used to keep the battery from overcharging by regulating the voltage and current coming from the solar panel to the battery as shown in fig (3.3.1).

#### **The function of the Solar Charge Controller:**

The most essential charge controller basically controls the device voltage and opens the circuit, halting the charging, when the battery voltage ascends to a certain level. More



charge controllers utilized a mechanical relay to open or shut the circuit, halting or beginning power heading off to the electric storage devices.

Generally, solar power systems utilize 12V of batteries. Solar panels can convey much more voltage than is obliged to charge the battery. The charge voltage could be kept at the best level while the time needed to completely charge the electric storage devices is lessened. This permits the solar systems to work optimally constantly. By running higher voltage in the wires from the solar panels to the charge controller, power dissipation in the wires is diminished fundamentally as shown in fig (3.3.2)

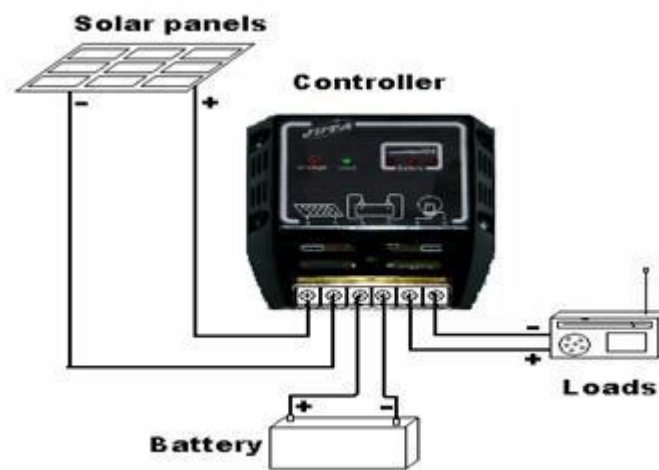


Fig: 3.3.2 Solar charge controller line diagram

The solar charge controllers can also control the reverse power flow. The charge controllers can distinguish when no power is originating from the solar panels and open the circuit separating the solar panels from the battery devices and halting the reverse current flow

### 3.4 BATTERY:



Fig: 3.4 Battery

In isolated system away from the grid, batteries are used for storage of excess solar energy converted into electrical energy. the only exceptions are isolated sunshine load such as irrigation pump or drinking water supplies for storage. In fact for small units with output less than one kilowatt. Batteries seem to be 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 23 the storage of solar electricity requires a battery with a particular combination of properties.

- ❖ Low cost
- ❖ Long life
- ❖ High overall efficiency
- ❖ High reliability
- ❖ Low discharge
- ❖ Minimum maintenance

we use lead acid battery for storing the electrical energy from the solar panel for lighting the street and so about the lead acid cells are explained below then its solar energy converted into electrical energy. we can use 100 ah batteries and high in capital cost as shown in fig (3.4).

### 3.5 MOTOR:



Fig: 3.5 motor

An electric motor is an electrical machine that converts electrical energy into mechanical energy. Most electric motors operate through the interaction between the motor's magnetic field and electric current in a wire winding to generate force in the form of rotation of a shaft. Electric motors can be powered by direct current (DC) sources, such as from batteries, motor vehicles or rectifiers, or by alternating current (AC) sources, such as a power grid, inverters or electrical generators. An electric generator is mechanically identical to an electric motor, but operates in the reverse direction, converting mechanical energy into electrical energy as shown in fig (3.5).

### 3.6 PVC pipes:



Fig: 3.6 pvc pipes

Polyvinyl chloride is produced by polymerization of the vinyl chloride monomer (VCM),

The polymerisation of vinyl chloride

About 80% of production involves suspension polymerization. Emulsion polymerization accounts for about 12%, and bulk polymerization accounts for 8%. Suspension polymerization affords particles with average diameters of 100–180 $\mu\text{m}$ , whereas emulsion polymerization gives much smaller particles of average size around 0.2 $\mu\text{m}$ . PVC pipes are commonly used for manufacturing sewage pipes, water mains and irrigation. Possessing very long-lasting properties, PVC pipes are easy to install, lightweight, strong, durable and easily recyclable, making them cost-efficient and sustainable. The smooth surface of PVC pipes also encourages faster water flow due to lower amounts of friction than piping made from other materials such as cast iron or concrete. PVC pipes can also be manufactured to varying lengths, wall thicknesses and diameters as shown in fig (3.6).

### 3.7 WIRES:

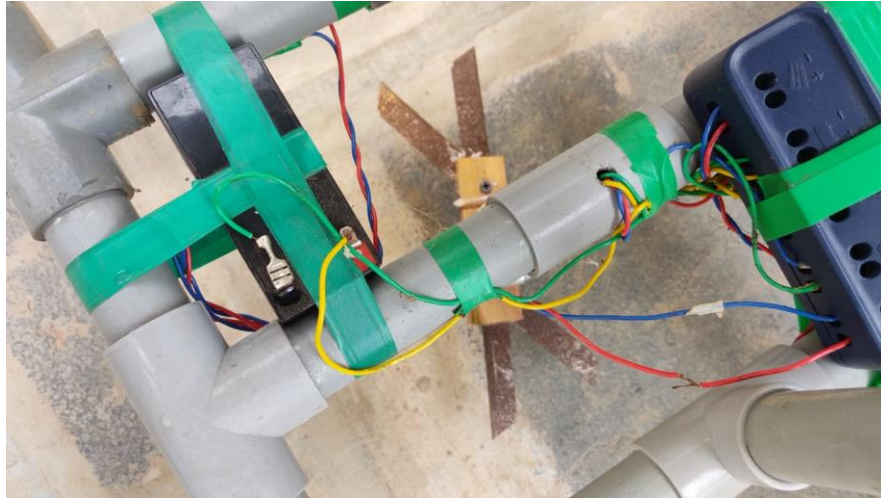


Fig:3.7 wires

A proper electrical wiring is to be put in place putting into consideration the safety of the operator and any other person who may come into contact with the mower. To do this we need to have the correct wire sizing, correct gauges and circuit breakers, switches and terminals put in the right place as shown in fig (3.7).

### 3.8 WHEELS:



Fig: 3.8 Wheels

A wheel is a circular component that is intended to rotate on an axle bearing. Wheels, in conjunction with axles, allow heavy objects to be moved easily facilitating movement or transportation while supporting a load, or performing labor in machines as shown in fig (3.8)

Wheels are used to move high load object with help of caster body move easily. We used the wheel for moving the body.

### **3.9 BLADES:**

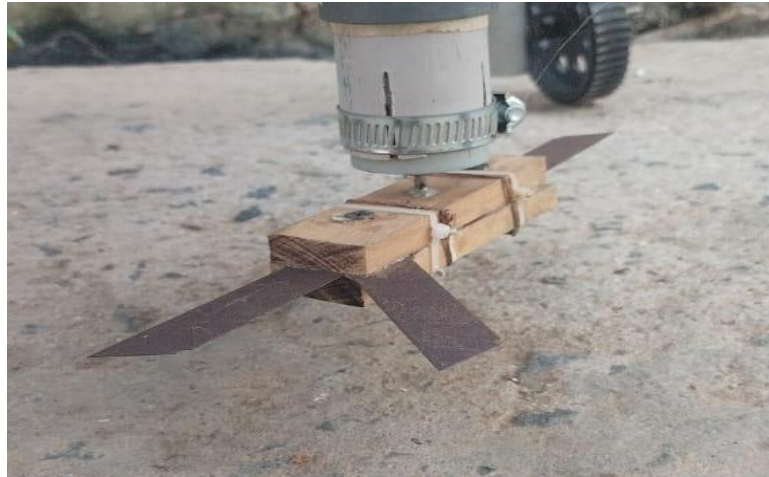


Fig: 3.9 Blades

A blade is the portion of a tool, weapon, or machine with an edge that is designed to chop, slice, scrape surfaces or materials. Blades are typically made from materials that are harder than those they are to be used on. Modern blades are often made of steel or ceramic as shown in fig (3.9)

We use stainless steel blades attach with a wooden plank. It has four wings and cuts grass frequently. The depth of cut is 8mm

### 3.10 COUPLINGS & REDUCERS:



Fig: 3.10 couplings & Reducers

A coupling is a device used to connect two shafts together at their ends for the purpose of transmitting power. The primary purpose of couplings is to join two pieces of rotating equipment while permitting some degree of misalignment or end movement or both as shown in fig (3.10)

It uses to connect joints and corner joints of the frame.



## **SPECIFICATIONS OF SOLAR GRASS CUTTER**

### **SOLAR PANEL**

Solar panel capacity	:	20W – 12V
Solar panel weight	:	2.5kg
Panel size	:	450*350*22 cm
Solar panel type	:	poly crystalline

### **BATTERY**

Battery capacity	:	12V – 1.3AH
Battery weight	:	550gm
Charging time	:	6-7 hours

### **MOTOR**

Rated torque	:	60 Nm
Motor current	:	12V DC
Motor weight	:	130 gm
Motor speed	:	1000 RPM

### **PVC PIPES:**

Type of plastic	:	PVC
Required amount	:	2 PIPES
Diameter of pipe	:	2.5 CM
Thickness of pipe	:	2MM



**BLADES:**

Type of material : IRON

Thickness of material : 1MM

**COST OF COMPONENTS:**

<b>S.NO</b>	<b>DESCRIPTION</b>	<b>COST OF ITEM IN (RUPEES)</b>	<b>NO. OF ITEMS</b>
<b>1</b>	Solar panel	<b>1400</b>	<b>1</b>
<b>2</b>	Motor	<b>150</b>	<b>1</b>
<b>3</b>	Battery	<b>500</b>	<b>1</b>
<b>4</b>	PVC pipes	<b>1000</b>	<b>2</b>
<b>5</b>	Wheels	<b>200</b>	<b>4</b>
<b>6</b>	Solar charge controller	<b>400</b>	<b>1</b>
<b>7</b>	Blades	<b>100</b>	<b>4</b>
<b>8</b>	Wires	<b>100</b>	<b>5 (meters)</b>
<b>9</b>	Couplings & reducers	<b>500</b>	<b>20</b>
<b>10</b>	Switch	<b>20</b>	<b>1</b>
<b>11</b>	Bolts & nuts	<b>50</b>	<b>4</b>
<b>TOTAL</b>		<b>4500</b>	

## CHAPTER – 4

### 4.1 CONSTRUCTION:

First of all, We take pvc pipes and cut them in required dimensions to make frame.

And those pipes are connected with the T joints, couplings, reducers fits together to make frame. After that we arranged wheels to the frame with the help of nuts and bolts.

Solar panel is placed inclined position at top of the frame. Solar charge controller is placed on the frame. It helps to keep the battery from overheating by regulating the voltage and current coming from the solar panel to the battery.

Here, we used a rechargeable battery it is placed beside of charge controller the power of the battery is 12V.

DC motor is attached at bottom of the frame and it's fit by the reducer the motor runs with the battery power the end of the shaft has attachment with the four wings blade. When the motor runs the blade rotates as the speed delivered by the motor

The electric connections are given to battery, motor, and solar panel to solar charge controller. Those are all controlled by the switch operator.

Finally, we conclude that solar grass cutter ready to operate manually.

## **4.2 WORKING:**

We designed a broad and commendable range of Solar Grass Cutter along with solar panel. As the energy conversation is very important in the current scenario and should be done to a maximum extent where ever it is possible. Still, these mowers grass cutting machineries all need the same things to work right -- a motor, a rotating blade, a means of getting around and a way to get rid of the grass.

Solar panel receives the solar energy and converts it into the electrical by the bombardment of electrons takes place due to that some energy will produce this energy indirectly called as an electrical energy.

The produced electrical energy will store in the battery by the bond formed the salt bridge. The stored electrical energy is transferred to the motor by connecting electrical wires.

At the end of the motor shaft, the four wings blade is connected.

Solar charge controller helps to keep the battery from overcharging by regulating the voltage and current coming from the solar panel to the battery. It is programmed at 15-A/200-W unit and uses MPPT (maximum power point tracking) to accelerate solar charging of the battery up to 30% per day.

A stainless steel was used in the construction of the cutting blade because of its strength and weight which can transmit same speed as that of the DC motor or a little less cause of friction.

When the machine is running on the grass is occupy the place between the blade and the fixed blade automatically cuts the grass in proper way in given direction manually.

### 4.3 FINAL DESIGN:



Fig: Front view of design



Fig: Top view of design



Fig: Side view of design



## CHAPTER – 5

### 5.1 ADVANTAGES:

- Less maintenance is required
- It does not cause any environment pollution
- It working on solar no fuel cost
- More life of the solar panel
- As the battery is used for the backup. It can be run in the night also
- We can reduce the wastage of the power
- Very easy to use
- Easy assemble and disassemble
- Design is compact.

### 5.2 DISADVANTAGES:

- It requires large time to remove the grass
- It is Manually operated machine
- Difficult to operate in rainy seasons

### 5.3 APPLICATIONS:

- It useful in all garden areas and public parks
- To make pitches of all playground
- Espically for football and cricket grounds
- Mainly it can be used in our college



## CALCULATIONS

- Solar rated power = 20 W
- D.C motor voltage = 12 V, rated current = 0.6 A
- D.C battery rated voltage = 12 V, ampere hour = 1.3 Ah

### ASSUMPTIONS:

From International Journal of Creative Research Thoughts (IJCRT)

- Solar panel efficiency = 18% = 0.18
- D.C motor efficiency = 85% = 0.85
- Battery charging efficiency = 95% = 0.95
- Operating power per day = 1 hour
- D.C motor power = D.C motor voltage \* rated current
$$= 12 * 0.6$$
$$= 7.2 \text{ W}$$
- D.C motor power supply to blades = D.C motor power \* D.C motor efficiency
$$= 7.2 * 0.85 = 6.12 \text{ V}$$
- Output of solar panel = solar rated power \* solar panel efficiency
$$= 20 * 0.18 \text{ W}$$
$$= 3.6 \text{ W}$$
- Time required to charge battery = battery voltage \* ampere hour / output of solar panel
$$= 12 * 1.3 / 3.6$$
$$= 5 \text{ hours}$$
- Output power of D.C battery supply to motor = battery charging \* battery voltage \* ampere hour
$$= 0.95 * 12 * 1.3$$
$$= 14.82 \text{ Wh}$$
- Input power required of the D.C motor per day = D.C motor \* one day
$$= 7.2 * 1$$
$$= 7.2 \text{ Wh}$$

- D.C motor operating time = output power of D.C supply to motor / Input power required  
To the D.C Motor

$$= 14.82 / 7.2$$

$$= 2 \text{ (DAYS)}$$

## **RESULTS**

Finally, we fabricate the solar based grass cutter.

The project aim is to utilize renewable energy source like solar energy and motorised the lawn grass cutter with a pvc framed setup for reducing the weight and cost.

The solar panel can fully charged the battery within 5 hours. And, the battery can upstand upto 2 hrs when motor running continuously.

The machine running time can be increased by the capacity of battery.

## **CONCLUSION**

We have presented a detailed description of methodology, components, design and with images of grass cutting machine. In this way we conclude review of a of grass cutting machine. The grass cutter was designed, fabricated and tested. This does not have engine and is powered by the operator. Test revealed that, higher grass cutting efficiency is obtained when the lawn is dry before mowing. The machine is simply powered by motor by using solar energy. Therefore, it can be used by both rural as well as urban dwellers. It is also affordable since the cost of production is low. High moisture content and undulated nature of the field surface affected the efficiency of the machine. Now it is necessary for cleaning gardens. Since it is easily operating machine so now it is used for various applications.

## **FUTURE SCOPE**

We completed our project successfully with the available sources. But the results and modifications are not up to the expectations. This can be further improved by incorporating the following modifications to obtain better results.

The project which we have done surely reaches the average families because the grass can be trimmed with minimum cost and with minimum time. Finally, this project may give an inspiration to the people who can modify and can obtain better results.

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