# DESIGN AND FABRICATION OF ELECTRIC SCOOTER WITH TWO WAY POWER SOURCE

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**Abstract -** *The pollution due to automobiles is increasing day by day hence the pollution level at cities and urban areas are at dangerous levels due to use of automobiles. The use of electric vehicles for short distance travelling will help to reduce the pollution to some extent. The electric scooter takes more time for recharging the battery this is not feasible one this is the main disadvantage of existing electric scooter in this project our attempt is to eliminate or reducing dependency on recharging from main supply by introducing a self recharging mechanism. Here we introducing an electric scooter having two way charging mechanism. This electric scooter uses dc generator for generating power while running, uses solar panel when scooter is at rest and a charger that operates from main power supply for charging the battery. This electric scooter uses 24V 250W brushless direct current (BLDC) hub motor and Lithium ion (Li-ion) battery. The Li-ion battery replaces the sealed maintenance free (SMF) battery which is used in existing electric scooter. Li -ion batteries are having more advantages as compared to SMF batteries. Photovoltaic solar panels absorb sunlight as a source of energy to generate electricity.*

***Key Words*: 24V, 250W motor, solar panel**

## 1. INTRODUCTION

Solar based assumes a significant job in our everyday life. We have built up the sun based bike particularly for the crippled individual. In this paper it is talked about that how sun powered power is used for giving the ability to the tricycle, which will decrease the endeavors of the crippled individual. The sun powered tricycle predominantly comprises of Solar board, Brushless DC engine, Battery, Charge controller and Throttle. This paper incorporates all the data with respect to the sun oriented controlled tricycle and its fundamental parts utilized in it.

Air contamination is one of the genuine ecological worries in present time. The prerequisite of controlling this air contamination is a significant perspective. Presently, different mediums are in charge of the air contamination. Be that as it may, to accentuate one medium and controlling it is the Automobile part. A large portion of the

Cities are additionally encountering quick urbanization and most of the nation's populace is relied upon to live in urban areas. The quick urbanization has likewise brought about a colossal increment the quantity of vehicles. So it's critical to adjust the elective techniques to stay away from use of oil and diesel fills. Presently, when underscoring on bikes, there are different choices that can be as of now found in market. The E-bicycles (Electric Bikes) or electric bike are promptly accessible in the market. These bicycles run absolutely on power. The fundamental issue of the electric bikes that we see currently has an extremely low range factors that makes an issue. These particulars make an issue in a city where we don't have quite a bit of electric charge stations as that of petroleum siphons. The answer for this issue is our endeavored task that is the Design and Fabrication of Electric Scooter with Two Way Power Source, the primary method for source is dc flow to battery and the subsequent one is by utilizing sun oriented board which likewise fills in as self charging to batteries, which disposes of the considerable number of issues of Electric bicycle just as the contamination danger of a regular petroleum bicycle/bike.

## 1.1 Renewable energy

Useful energy which is derived from natural resource is known as renewable energy. The source of renewable energy is wind, rain, sun light, tide, wave and geothermal heat. Renewable energy contributions are approx 20% of global energy consumption. They are also fulfilling approx 25% electricity generation.

## 1.2. Arc Welding



**Figure 1: Arc Welding**

Arc welding is a welding process that is used to join metal to me tal by using electricity to create enough heat to melt metal, and the melted metals when cool result in a binding of the metals. Gas metal arc welding (GMAW), sometimes referred to by its subtypes metal inert gas (MIG) welding or metal active gas (MAG) welding, is a welding process in which an electric arc forms between a consumable MIG wire electrode and the work piece metal(s), which heats the work piece metal(s), causing them to melt and join.



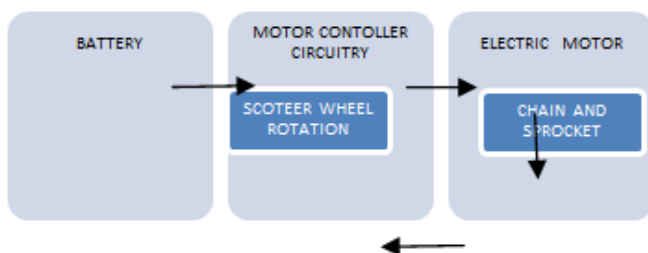**Fig -2**: Arc Welding

## 2. WORKING PRINCIPLE



Fig-3: Working Principle

A motor is an electrical machine which translates electrical energy into mechanical energy. The principle of working of a DC motor is that "whenever a current carrying conductor is placed in a magnetic field, it practices a mechanical force".

The working of our project basically explain by using the five blocks as follows

    I.    Battery.
   II.    Motor Controller Circuitry.
 III.    Electric motor.
 IV.    Chain and Sprocket.
  V.    Bicycle speed Rotation.

### 2.1. Battery:-

Two lead acid rechargeable batteries of 24v, 7 amp are used which are connected in parallel position. It basically stores the electrical energy generated and utilize it to run the motor. A battery has a positive terminal called cathode and negative terminal called anode. The terminal marked positive is at higher electric potential energy and the terminal marked negative is source of electrons when connected to external circuit will flow and deliver energy to external device Rechargeable batteries are recharged multiple times.

### 2.2 Motor Controller Circuitry:-

It used to control all the working of cycle.

### 2.3 Electric Motor:-

Use the specific motor having suitable power and torque according to design.

### 2.4 Chain and Sprocket:-

Take the suitable material & no. of teeth according to center distance

### 2.5 Scooter Wheel Rotation:-

Provide the torque and speed to the wheel throughout sprocket.

### 3. COMPONENTS

### 3.1 DC Motor

A DC motor is one of a class of rotary electrical machines that converts direct current electrical power into mechanical power. The most mutual types rely on the forces created by magnetic fields.



Fig-4 : DC Motor

## Specifications:

24 volt dc operation permanent magnet dc motor no load rpm: 3850

No load current: <2.2 amps rated wattage: 250w (0.33 Horsepower)

Rated load rpm: 400

Torque (NM): 22

Rated current: 13.4 amps

Efficiency: 78%

Reduction ratio: 9.78:1

## 3.2 Controller Speed Control Basics:-

The speed controller of an electric bike is an electronic circuit that not only controls the speed of an electric motorbus also serves as a dynamic brake. This controller unit uses power from the battery box and drives it tote motor.



Fig-5: Controller

**Plug**

1. Red& Black (large cable): Battery connections

2. Yellow Blue: Motor connections

3. Red Blue: Key Switch (power lock) (If there is no power door locks, red connection to blue)

4. Yellow black: brake

5. Red& Yellow: Brake light

6. Red Black (small cable): indicator light

7. Red, Black Blue: SpeedRegulator1-4VThrottle (Red: +5v, Black: -, Blue: Signal Wire)

8. Red& Black (small cable): Charger

## 3.3 Chain

A bike chain can be very vitality productive: one investigation announced efficiencies as high as 98.6%.The examination, performed in a spotless research facility condition, found that proficiency was not significantly influenced by the condition of grease. A bigger sprocket will give an increasingly productive drive since it moves the purpose of weight more distant far from the hub, setting less weight on the direction, along these lines diminishing contact in the inward wheel. Higher chain pressure was observed to be progressively productive: "This is really not toward the path you'd expect, in light of on grating".

## 3.4 Solar Panel

Photovoltaic modules utilize light vitality (photons) from the Sun to produce power through the photovoltaic impact. Most of modules use wafer-based crystalline silicon cells or slim film cells. The basic (load conveying) individual from a module can either be the top layer or the back layer. Cells should likewise be shielded from mechanical harm and dampness.

## 3.5 Lithium-ion battery

Lithium-particle batteries can be a wellbeing peril since they contain a combustible electrolyte and may move toward becoming pressurized on the off chance that they become harmed. A battery cell charged also rapidly could cause a short out, prompting blasts and flames. On account of these dangers, testing gauges are more stringent than those for corrosive electrolyte batteries, requiring both a more extensive scope of test conditions and extra battery-explicit tests, and there are shipping impediments forced by wellbeing controllers.



Fig-5: Solar panel

## 4. RESULT AND DISCUSSIONS

NO LOAD SPEED CALCULATION

**Step 1:-**

umber o f teeth on smaller sprocket (motor) (t1)
= 9

Number of teeth on larger sprocket (scooter) (t2)
= 16

Speed on smaller sprocket (motor) (N1)
= 3850 rpm

By using reduction ratio   (9.78), speed will be reduced to
=338 rpm

Speed on larger sprocket (scooter) (N2)
=?

Step 2:-

Using speed ratio formulae,

N1t1 = N2 t2

N2 = 169 rpm

Step 3:-

Diameter of wheel
=180mm

Circumference of wheel
=3.14*180
=565.2mm

Step 4:-

Speed of vehicle = speed of wheel X circumference of wheel
=222 X 565.2
=125474 mm/min
=125.474m/min
=7528.2 m/hr

 = 7.528Km/hr

REQUIRED POWER TO DRIVE BICYCLE

Step (1)

Total load act on bicycle is as follow Normal weight of person    =65 kg
=65*9.81
=637.65N

 Weight of bicycle  = 20 kg
= 20*9.81
= 196.2.N

Other Miscellaneous load =5Kg
=5*9.81
= 49.05 N

The total load = (637.65+196.2+49.04)
= 883.35N

Step (2)

To find reaction on each wheel, the above total load which is divided equally on both wheel Force (Ffw) =Force (Frw)
=883.35/2
= 441.675

Where reaction on rear and front wheel are as follows

Rfw=Rrw
=0.2*441.675
=88.335 N

Step (3)

To find torque on each wheel

Total torque
=Tfw+Trw

T1       =Rfw*(D÷2)

         =88.335*[(18*10-2)/2]

         =7.95Nm

T1=T2=7.95Nm

Total torque on the wheel           =16Nm

Step (4)

To find power on the motor          = (2*3.14*222*8)/60

         =185.98watt

         =186watt

## 5. CONCLUSION:

Self charging Electric scooter is modification of existing electric scooter. It is suitable for both city and country roads, that are made of cement, asphalt, or mud. This scooter is cheaper, simpler in construction & can be widely used for short distance travelling especially by school children, college students, office goers, villagers, postmen etc. It is very much suitable for young, aged peoples. It can be operated free of cost. This scooter is that it does not consume valuable fossil fuels thereby saving cores of foreign currencies. It is eco-friendly, economical & pollution free, as it does not have any emissions. Moreover it is noiseless and can be recharged with the AC adapter in case of emergency or cloudy weather. By using solar panel batteries are self charged.

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