

## ADVANCE TWO WHEELR SYSTEM

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### ABSTRACT

For our generation, pollution is the biggest problem. In our cities and metropolitan area due to vehicles, pollution is increasing day to day. For solving these problems, we need to find an alternative sources of energy for the vehicles. Again, but energy source is cheap and effective for all the class of society. Keeping this in mind, this research is for medium class people as well as to provide a solution for the environmental pollution that is in progress. The Advance Two Wheeler developed is driven by DC motor that is situated in middle of vehicle & operated by solar energy as well as Alternator Energy. The solar panels and Alternator will charge the battery. Alternator charge the Battery, when Vehicle is in running condition. This arrangement will replace the petrol engine, the gear box & the fuel tank in case of a two wheeler or a chain sprocket, chain & gearing arrangement of a bicycle being used by most common man. As a part of Life, the Advance Two Wheeler is fitted with a DC motor on rare axle of a Vehicle with power rating of 250W and with a running speed of around 30-40 Kmph. Motor controller is of 24V. There is also a provision for charging of the battery, by the help of Alternator which generates power by the movement of the wheel. Alternator that is attached with the back wheel shaft. When the vehicle is in the running condition, it generates power which is used to charge battery. This vehicle is totally based on the pure and re-consumable energy then we say, it is "ADVANCE TWO WHEELER".

**Keywords:** Alternator, controller, chain drive solar charging, D. C. motor charging,

### 1. INTRODUCTION

In our modern societies there exist an increase in the need of vehicles and because of engine emission problem, pollution is also increasing. Ambient alarms, as for example local pollutant emissions for the atmosphere, also influence the technical decisions related with all kind of vehicles. In this context, new alternatives to the existing internal combustion engines are mandatory. So, vehicles with electric propulsion seem to be an interesting alternative. Starting from this context, this research describes a solution that is developed and studied to be applied in electric vehicles. The solution proposes the combination of two sources of energy, batteries and solar

power [1]. And one more unique feature exists as energy is reusable, by the help of Alternator. Solar power available only at sun light (Day time) but Alternator working all the time. Alternator working with rotation of wheel, at this time dynamo generates power, which is used for charging the battery. Hence vehicle not need external power source [2].

## 2. MAIN PART OF PRESENT ADVANCE TWO WHEELER SYSTEM

- (a) D.C. Motor,
- (b) Frame,
- (c) Battery,
- (d) Solar Panel,
- (e) Alternator,
- (f) Drive Mechanism,
- (g) Throttle,
- (h) Motor Controller
- (i) E Brake

## 3. COMPONENTS DESCRIPTION

**3.1 D.C MOTOR:** 24 Volt 250 Watt 9 tooth 1/8" bicycle chain sprocket. Left or right rotation by reversing wires, motor with gear reduction 300 RPM (after Reduction). We understand the inventive mind and the thrill of creating something all our own. That is why we are proud to present the 24 Volt 250 Watt gear reduction motor complete with a 9 tooth 1/8" bicycle chain sprocket. This motor is great for those wanting to make their own custom electric vehicle, whether it's a scooter, electric bicycle or something the world isn't even ready for. This electric motor with gear reduction produces more low-end torque as compare to standard motor. The point is to be noted that this motor is capable of rotation in either the clockwise or counterclockwise direction by reversing the motor's power wires [2].



**Figure 01 DC Motor**

**Specifications:** Voltage: 24 Volts, DC Output: 250 Watt, Rated Speed (after Reduction): 300 rpm, Rated Speed (Base Motor): 3200 RPM, Rated Current: 19.2 amp, Sprocket: 9 tooth 1/8" bicycle chain.

**3.2 FRAME:** An old bicycle frame to attach the all components with some changes in the frame of bicycle.

- Attach new back cereal for the battery and battery is covered by the solar panel ,cereal is created by the steel with the help of electric arc welding process



Figure 02 Frame

For Main motor and Alternator attachment, disassemble the paddle of bicycle and attach up side the paddle shaft by the help of welding and Fasteners. Alternator gets attached below the Paddle shaft with the help of Welding and fasteners [3].

### 3.3 BATTERY

Six batteries have been used in advance two wheeler connection of battery make 3-3 set in Parallel form and both the set add in Series form outlet current is 24V, 21.6 amp. The rechargeable batteries are lead-lead dioxide systems. The dilute sulfuric acid electrolyte is absorbed by separators and plates and thus immobilized. The battery may be accidentally overcharged producing hydrogen and oxygen. There exist special one way valves that allow the gases to escape thus avoiding excessive pressure build-up. Otherwise, the battery is completely sealed, maintenance-free, leak proof and usable in any position [4].

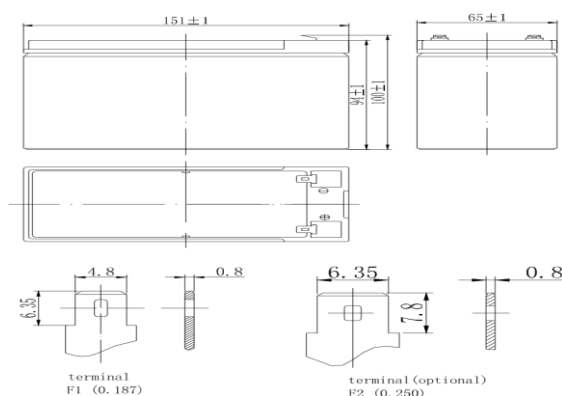


Figure 03 Battery

### *General Features of Battery used in Advanced 2 wheeler system*

- Absorbent Glass Mat (AGM) technology for efficient gas recombination of up to 99% and freedom from electrolyte maintenance or water adding.
- Not restricted for air transport-complies with IATA/ICAO Special Provision A67.
- UL-recognized component. Can be mounted in any orientation.
- Computer designed lead, calcium tin alloy grid for high power density.
- Long service life, float or cyclic applications.
- Maintenance-free operation, Low self discharge.

### **Specifications**

Input Voltage : 12 V

Input Frequency : 12V

Output Voltage : 14.4 V

Output Frequency : 14.1-14.4V

Output Power Wattage:86.4 W

Output Waveform : DC

Transfer Time : 1 ms

Number of Outlet Plugs : 2

### **Dimensions**

Width: 15 cm

Height: 9 cm

Depth: 6 cm

Weight : 2.2 kg

### **3.4. SOLAR PANEL**

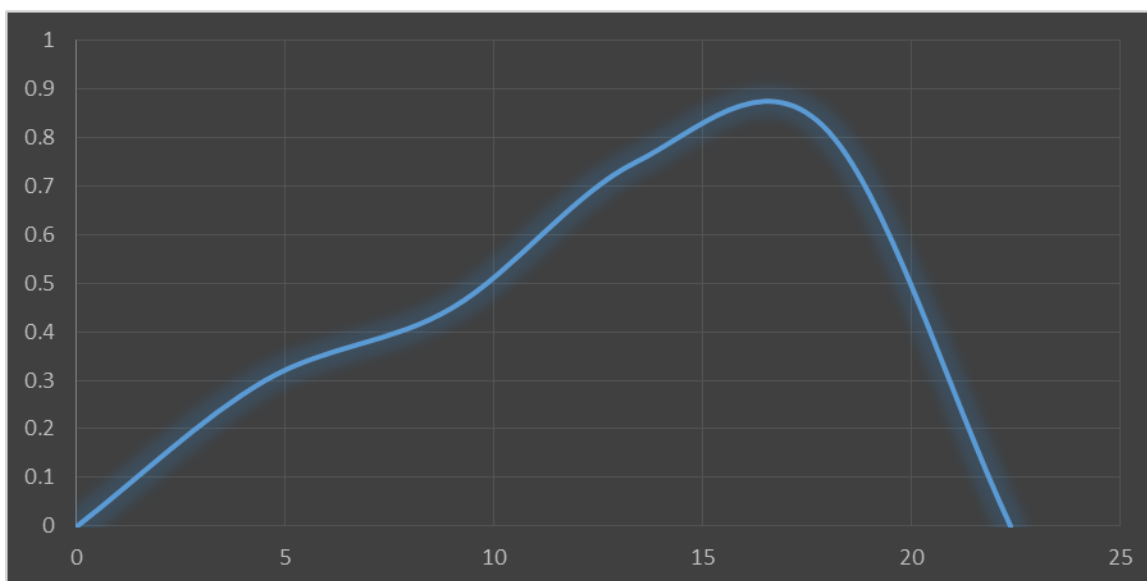
Solar battery chargers are an inexpensive, environmentally friendly, and convenient way to make sure your batteries are always fully charged and ready to go all the time. The problem with charging a battery from a solar panel is the SUN. It does not shine all the time and clouds get in the way. Our eyes adjust to the variations in the strength of the sun but a solar panel behaves differently. As soon as the sun loses its intensity, the output from a solar panel drops enormously. Not only does the output current fall, but the output voltage also decreases. Many of the solar panels drop to below the 13.6V needed to charge a 12V battery and as soon as this occurs, the charging current drops to ZERO. This means they become useless as soon as the brightness of the sun goes away [4].Here we are using solar panel for 12V.

**Table 1 Electrical specification of solar panel**

Power Max (Pm)	20 +/- 5%
Short Circuit Current (Isc)	1.4 A
Max Power Current (Imp)	1.15 A
Maximum Voltage (Vmp)	17.7 V
Open Circuit Voltage (Voc)	21.4 V
Maximum System Voltage	600 VDC

**Table 2 Mechanical specification of solar panel**

Type	Multi Crystalline
No of Cells in Series	36
Frame Type	Aluminum
Weight	2.6 kg



**Figure 4: Performance Characteristics of Solar Module for given Ampere Vs Volt**

### 3.5. ALTERNATOR

An alternator is an electromechanical device that converts mechanical energy to electrical energy in the form of alternating current. The brushes in an alternator carry only excitation current, a small fraction of the current carried by the brushes of a DC generator, which carry the generator's entire output. A set of rectifiers is required to convert AC to DC. To provide direct current with low ripple, a three-phase winding is used and the pole-pieces of the rotor are shaped (claw-pole) to produce a waveform similar to a square wave instead of a sinusoid. We have used alternator of Yamaha bike which works at high RPM since our e-bicycle is limited to low RPM so we altered the windings of alternator and increases the drive ratio. So, that it can function at low RPM.

As we say Alternator is use for the reuse the energy of the vehicle. As an alternator we use the DC Motor which is connect between the rare wheel and it is generated current when wheel is running condition [2].

### 3.6. DRIVE MECHANISM

A Chain is an array of links held together with each other with the help of steel pins. This type of arrangement makes a chain more enduring, long lasting and better way of transmitting rotary motion from one gear to another. The major advantage of chain drive over traditional gear is that, the chain drive can transmit rotary motion with the help of two gears and a chain over a distance whereas in traditional many gears must be arranged in a mesh in order to transmit motion [5].

**Braking System:** For the braking system it is convenient to use braking system used in band brake system which consist of spring loaded friction- shoe mechanism, which is driven with the help of hand lever.

**Sprockets:** The chain with engaging with the sprocket converts rotational power in to rotary power and vice versa. The sprocket which looks like a gear may differ in three aspects. Sprockets have many engaging teeth but gears have only one or two.

- The teeth of a gear touch and slip against each other but there is basically no slippage in case of sprocket.
- The shape of the teeth is different in gears and sprockets.
- Chain Sprocket drive mechanism is use in this vehicle 3 Sprocket (Motor, Alternator, and Rare Wheel) one cycle chain.

### 3.7. THROTTLE

Given Specifications for the accessories used in advanced 2 wheeler system are as follows: Inside Diameter- about 2.2cm, Wire length: approx. 143cm/ 56.2", Color : black grips with silver ends includes 1 throttle grip, 1 normal grip (matching pair), Throttle Control Set Three Pin Blue, signal wire- Black: negative pole, Red: positive pole Electric.



- a) Type: Twist Throttle
- b) The inner diameter of handle: 23 mm.
- c) Inner Total length: 120 mm.
- d) Weight: 210 gm.
- e) Length of Wire: 1.56 m.
- f) Wire: Red – Supply, Black – GND, Green – Signal.



Figure 05 Throttle

### 3.8. MOTOR CONTROLLER

24V 500W DC motor speed controller for Advance Two Wheeler, 24V 350W Motor Brush Speed Controller For Electric Bike, Bicycle Scooter E-Bike Battery :Thick Black (Power Negative) /Thick Red (Power Positive) ,Motor: Thick White (Motor Negative) /Thick Blue (Motor Positive), Ignition Switch: Thin Red(VCC)/Thin Blue Indicator, Thin red (Indicator power output) /thin black (indicator negative) ,Brake: thin yellow (Brake signal)/thin black(Negative Power) ,Speed governor: Thin blue(Speed handlebar Signal input) /Thin black (Negtive Power) /thin red(5V Positive Power) ,Charge Port: Thin red (charge input power Positive) /thin black (Power negative) ,Brake Light: Thin red (power Positive) /thin black (Power negative).

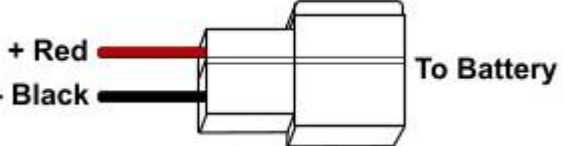
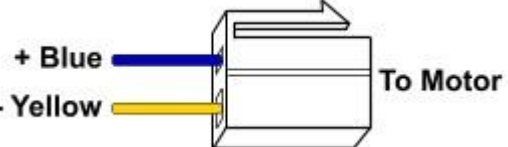
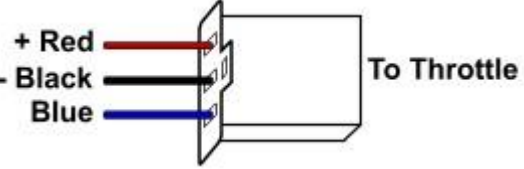
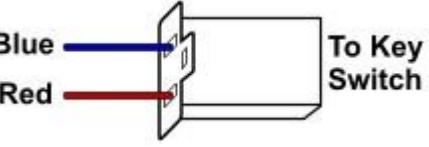

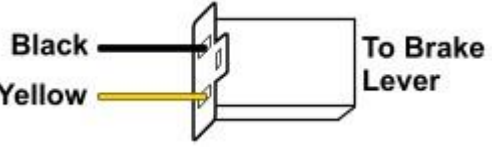



Figure 06 Battery Controller

**Under Voltage Battery Protection:** When the battery pack falls below a specific Voltage the controller turns the motor off preventing over discharging of the battery pack which extends the battery packs lifespan. (The cutoff value is 20 Volts  $\pm$  0.5 Volts)

**Motor Cut-Off During Braking:** When the brakes are engaged the brake switch signals the controller to turn off the motor. The motor turns on again after the brakes are released.

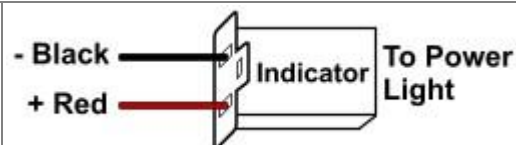
Table 3 Connections of Motor controller

<p><b>*Power Connector</b> Red = Positive Black = Negative</p>	 <p>Required Connection</p>
<p><b>Motor Connector</b> Blue = Positive Yellow = Negative</p>	 <p>Required Connection</p>
<p><b>Throttle Connector</b> Red = + 5V Output Black = Ground Blue = + 1-4V Input</p>	 <p>Required Connection</p>
<p><b>Key Switch Connector</b></p>	 <p>Required Connection</p>
<p><b>Battery Charger Connector</b> Red = Positive Black = Negative</p>	 <p>~Optional Connection</p>
<p><b>Brake Lever Switch Connector</b> Mating Connector Item # CNX-51</p>	 <p>~Optional Connection</p>
<p><b>Brake Light Connector</b> Mating Connector Item # CNX-51</p>	 <p>~Optional Connection</p>



**Power Light Connector**

Mating Connector Item # CNX-51



~Optional Connection

### 3.9 E. BRAKE

- The e-brake lever is a replacement for the regular brake lever and either cuts out the controller or engages regenerative braking in the controller when the lever is squeezed. We have integrated levers for both mechanical and hydraulic brakes, as well as a Trip Wire product which can be added to our existing levers to turn them into e-brakes. All operate as a NO switch, with two wires that close the circuit when the brakes are engaged.
- When building an e-bike make sure to install e-brakes. E.Brakes are an essential part of our system and cannot be overemphasized enough, as they cut power to the motor (or also engage the regenerative braking when you pull the lever if you have a direct drive hub motor). Most factories built bikes include this as standard, as do many kits.



Figure 07: Advance Two Wheeler

## 4. MATHEMATICAL CALCULATIONS

### 4.1 Mechanical Data Analysis

#### *I.Torque*

#### *II.Transmission ratio*

#### *III.Velocity of Advance Two Wheeler*

##### 4.1.1 Torque

Motor speed ( $N_1$ ) = 300 rpm

Power (P) = 250 Watt

Power =  $(2 \pi N T)/60$  Watt

$$250 = (2 * \pi * 300 * T) / 60$$

$$= 7.95 \text{ N-m}$$

#### 4.1.2 Transmission Ratio (T.R.)

Motor sprocket diameter ( $D_1$ ) = 80 mm

Wheel Sprocket diameter ( $D_2$ ) = 72mm

$$\text{T.R.} = 80/72 = 1.12$$

#### 4.1.3 Velocity of Advance Two Wheeler

R.P.M of wheel ( $N_2$ )

R.P.M of motor ( $N_1$ ) = 300 r.p.m.

$$\text{T.R.} = N_2/N_1$$

$$N_2 = 333.34 \text{ r.p.m.}$$

Angular velocity of rare wheel ( $\omega$ ) =  $2 \pi N_2/60$

$$\omega = 34.9 \text{ rad/sec}$$

Velocity of Vehicle ( $v$ ) =  $r \omega$  (r = Radius of wheel)

$$v = 0.32 * 34.9$$

$$v = 11.16 \text{ m/s} = 40.2 \text{ km/hr}$$

## 4.2 ELECTRICAL DATA & PERFORMANCE

The prescribed table here shows the technical specifications and performance constraints of the battery used in Advance two wheeler system

#### 4.2.1 Battery Charging Specification

Table 4 Technical details of battery

Nominal Voltage	12V
Number of cell	6
Design Life	5 years
20 hour rate (0.36A, 10.5V)	7.2Ah
10 hour rate (0.69A, 10.5V)	6.9Ah
5 hour rate (1.16A, 10.5V)	5.8Ah
1 hour rate (4.8A, 9.6V)	4.8Ah

Fully Charged battery 77°F (25°C) < 30mOhms

Self-Discharge 3% of capacity declined per month at 20°C (average)

#### 4.2.2 Operating Temperature Range

Discharge: 20~60°C

Charge: 10~60°C

Storage: 20~60°C

Max. Discharge Current 77°F (25°C): 105A(5s)

Charge Methods: Constant Voltage Charge 77°F (25°C)

Cycle use -2.40-2.45VPC

#### Battery Charging time at Constant Current and Power

Table 5: Discharge Constant Current (Amperes at 77°F25°C)

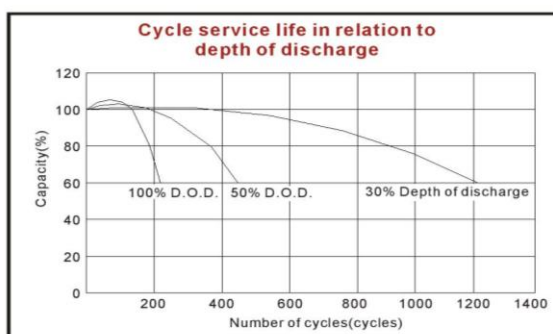
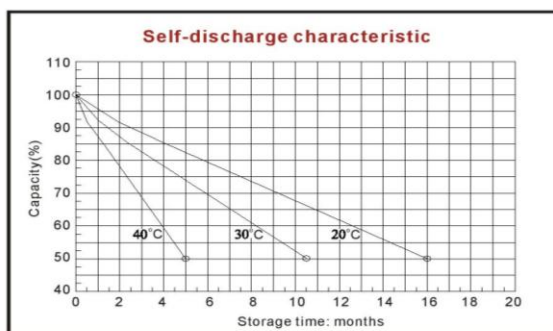
End Point	5min	10min	15min	30min	1h	3h	5h	10h	20h
Volts/Cell									
1.60V	30.0	18.8	15.3	8.50	4.80	1.88	1.29	0.71	0.38
1.65V	28.4	17.9	14.6	8.15	4.63	1.82	1.25	0.70	0.38

1.70V	26.8	17.0	13.9	7.86	4.44	1.76	1.20	0.70	0.37
1.75V	25.2	16.0	13.2	7.56	4.25	1.69	1.16	0.69	0.36
1.80V	23.5	15.1	12.5	7.18	4.04	1.64	1.12	0.67	0.35

Table:6 Discharge Constant Power (Watts at 77°F25°C)

End Point	5min	10min	15min	30min	45min	1h	2h	3h	5h
Volts/Cell									
1.60V	53.3	35.8	28.1	15.5	11.8	9.30	5.13	3.68	2.38
1.65V	50.7	34.0	27.0	14.9	11.3	8.90	5.02	3.59	2.34
1.70V	48.1	32.2	25.9	14.3	10.8	8.53	4.89	3.49	2.30
1.75V	45.6	30.4	24.8	13.7	10.4	8.28	4.73	3.38	2.25
1.80V	43.1	28.6	23.8	13.2	10.0	7.90	4.58	3.27	2.19

All the prescribed graphs discloses the overall operation characteristics of battery



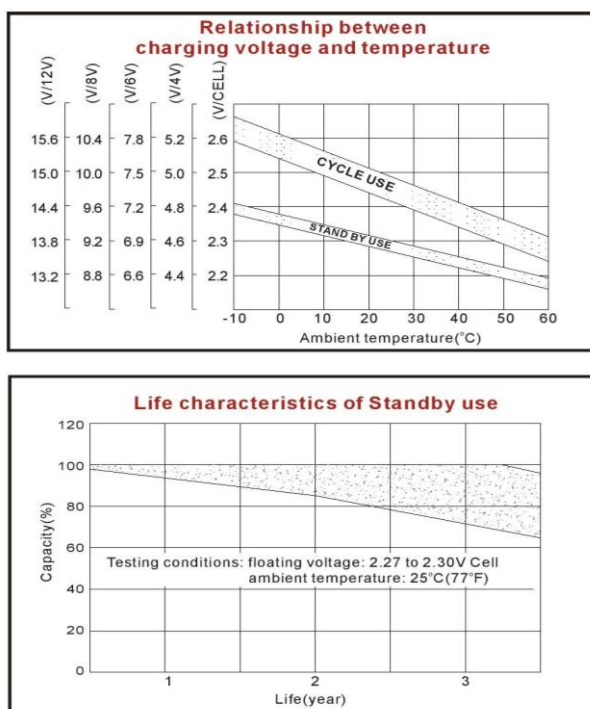


Figure 08 Performance Features of Advance two wheeler system

## 5. APPLICATION OF ADVANCE TWO WHEELER

- In human transportation as a personalized vehicle.
- For inter departmental transportation in huge campuses.
- In industries for different level personnel to move around to inspect the work progress.
- In hospitals, Airports, IT campuses, Hotels & resorts, Power stations, manufacturing units, etc...
- Light weight & easy to control, makes convenient for use by anyone.
- Controlled speed ensures rider's safety.
- Can be used by old aged demography, On site charging facility, No need to visit fuel station.

## 6. ADVANTAGE OF ADVANCE TWO WHEELER

- Solar energy is highly dependent on whether but alternator is always working at the running condition this *increase the performance of Advance two Wheeler.*
- Global warming is a major concern all around and to save Mother Earth, there are several policies, promises and pledges. With the ever increasing emission of greenhouse gases, there is an increased fear of environment pollution at every step. Present design is eco-friendly that almost *eliminates the effects of global warming.*
- With increased number of fossil-fuel dependent vehicles, they not only add to greater level of pollution but are also leading to depletion of fuel resource. It is here that automobile companies felt the need to innovate

motorized vehicle that will *reuse the energy and will not be depending on fossil fuel*, with continuation of above here is our attempt of Advance two wheeler.

## 7. CONCLUSION

This project is designed to improve the normal E-bicycle and make it extra efficient so it can be extensively used by common people. The Advance Two Wheeler is a hybrid and so it can run by solar energy, alternator reusable energy. Thereby this vehicle is Zero emission (Eco friendly). Here are the findings of the current project: Calculated no load speed of bicycle is 35 Km/hr, the required power is =391.69 Watt. This vehicle has key system of start the vehicle, increase the security of the vehicle and improve the technology of starting.

## 8. FUTURE TRENDS OF ADVANCE TWO WHEELER SYSTEM

In future the use of PIC16F72 controller may play key role. This has function of over-current protection, under-voltage protection, helping and so on. The range of an electric bike is usually stated as somewhere between 7 km (uphill on electric power only) to 70 km (minimum assistance) but Advance Two Wheeler increases the range of vehicle because of reusable energy. With the inclusion of above said controller the overall performance of the advance two wheeler gets enhanced. The eco-friendly initiatives need to expand in future and many automobile manufacturing companies already invested in research and development to bring for the electric vehicle that will help people save a few bucks by reducing consumption of already spiraling fuel price, besides fighting global warming.

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