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Conversion of Conventional Scooter into an Electric Scooter

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Abstract: ***The main aim of this paper is to get clear idea about the modification, calculation(Motor Power).In today's modernized world travelling is very essential for human being in order to protract in this world. And to do so his travelling should be done in minimum possible way and in minimum time. This paper details about electric scooter which run on battery thereby providing voltage to the hub motor. This paper compromises with modification in IC engine gearless scooter into an EV. Which make use of electric energy as a primary source and solar energy if possible by attaching solar panel. It also highlights on the modification aspects of the scooter. There is provision for charging the battery by ejecting it by the main system. The electrical power generated which is used to run the scooter can give better fuel economy compare to conventional vehicle ,better performance and also causes less pollution.***

Keywords: Electric scooter, Battery, Fuel economy, modification.

I. INTRODUCTION

Mainly, many vehicles are all dependent on non-renewable energy resources. The basic requirement to drive an IC engine vehicles is petrol and diesel but the fast depletion of crude oil reserves, frequent increase in crude oil prices, high atmospheric and noise pollution have created a need to develop automobile on alternate fuel. Electric vehicles (battery operated) can overcome most of these problems by conversion of gearless IC engine scooter into an electrical scooter it also recycles the old vehicles which reduces amount of scrap. Presently, the daily activities are mainly dependent on vehicles. So the density of vehicles in city areas is increasing day-by-day. In this situation main problem is pollution, with increase in number of vehicles run on petrol and Diesel amount of pollution also increases and affect on human life. Now a days the Arab countries are thinking to reduce the production of crude oil upto 40% which causes sudden increase in fuel price. If all the vehicles are propelled by internal combustion engines, shortage of petrol and diesel occurs after some period of time. Modify a scooter with electrical energy firmly Believe that electrical vehicle is one of the best methods to minimize environmental damage caused by co_2 emissions.

With energy conservation and environmental concern, world should look towards electric vehicles(EV) and hybrid electric vehicles(HEV) in future so go green concept where introduced for redesign, development and application of electric vehicles with major research on batteries, power electronic devices and electric motor. Many ICE automobile manufacturers like TESLA, NISSAN, CHEVROLET, BMW, HONDA invested a lot in design and development of electric vehicles, more efficient in minimizing the previous drawbacks of higher cost, less drive per charge and less top speed.

II. SELECTION OF COMPONENT

Based on the literature survey and availability, we have listed the required components of the electric vehicle.

A. Battery (Power supply unit)
B. Motor controller
C. Brushless DC Hub Motor
D. Battery Charging Kit
E. Bajaj spirit

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1) Battery (Power supply unit)

Figure 1: Lithium ion Battery pack

Lithium-ion batteries are the most suitable in existing technology for electric vehicles because they can deliver high output because of having capability to store high power per unit of battery mass, allowing them to be lighter and smaller than other rechargeable batteries. These features also explain why lithium-ion batteries are already widely used for consumer electro nics such as cell phones, laptop computers, digital cameras/video cameras, and portable audio/game players. Other advantages of lithium-ion batteries compared to lead acid and nickel metal hydride batteries include high-energy efficiency, no memory effects, no self-discharging and a relatively long cycle life. The electric scooter uses battery having capacity of 48V 20Ah capacity.

Table 1: Battery specification

Battery Type	Li ion
Capacity (Ah)	20Ah
Model	48Volts 20Ah
Voltage (V)	48
Weight (kg)	6
Current	30 Amps
Charge Current	10

2) Motor controller

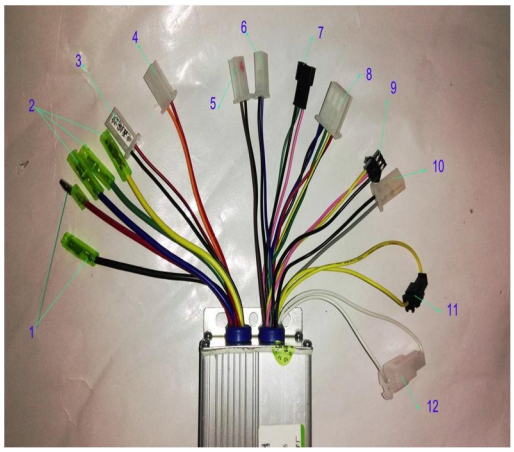

Figure 2: Motor controller

The controller connects the power source to the motor. It controls speed, direction of rotation, and optimizes energy conversion. While batteries produce constant voltages which decrease as they are used up, some controllers require a DC to DC converter to step down this changeable voltage to the motor's expected constant operating voltage, but other controllers incorporate a DC-to-DC converter and can accept a varying voltage. Converter efficiencies are typically greater than 90%.The voltage control is achieved by "chopping" the source current - the voltage is switched on and off, with the ratio of on to off determining the average voltage. Chopping is performed by power electronic circuitry such as diodes and thrusters and silicon control rectifiers (SCR). Controllers also effect regenerative braking, by which the motor is acted as a generator to recharge the batteries. The controller for the motor is being interfaced with the motor speed regulation.

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a) Controller Inputs

i) Battery power input cable;
ii) Motor phase cable;
iii) Battery power output cable(24V output);
iv) Power lock(switch on/off) cable;
v) Reverse switch cable;
vi) Braking switch cable(strong regen braking, when motor is stopped, the controllers still can hold the motor);
vii) Throttle cable;
viii) Motor hall sensors cable;
ix) PAS cable
x) Lower speed switch on/off cable;
xi) Auto cruising connector;
xii) Intelligent learning cables

b) The Functions of DC Controller are listed below

i) Super low noise when starting up.
ii) Speed limit/3 speed.
iii) Under-voltage protection.
iv) Under-current protection.
v) Cruising control.
vi) Water proof.

3) Brushless DC Hub Motor

Figure 3: Hub motor

Hub motors are an interesting development which could offer benefits such as compactness, noiseless operation and high efficiency for electric vehicles. These motors have stators fixed at the axle, with the permanent magnet rotor embedded in the wheel. The traditional “exterior rotor” design has the hollow cylindrical rotor spinning around a stator axle. There is a “radial air gap” between the stator and rotor. The stator consists of stacked laminated steel plates with wound coils. Pulse width modulated current is used to supply current to the stator.

4) Battery Charging Kit

Figure 5: Battery Charging Kit [11]

Lithium ion (Li-ion) batteries’ advantages have cemented their position as the primary power source for portable electronics, despite the one downside where designers have to limit the charging rate to avoid damaging the cell and creating a hazard. Fortunately, today’s Li-ion batteries are more robust and can be charged far more rapidly using “fast charging” techniques.

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III. CALCULATIONS

A. *Motor Selection*

Weight of vehicle	: 200 kg=1962 N
Length of vehicle	: 1.685m
Width of vehicle	: 0.635m
Height of vehicle	: 1.02m
Wheel radius	: 0.127m
Gearbox ratio	: 6:1
Vehicle speed	: 65kmph
Area of vehicle	: 1.069975m^2
Rolling coefficient of friction	: 0.018
Drag coefficient	: 0.0032

1) *Rolling Resistance:* R_r= (Rolling coefficient of friction × Weight in N) = 35.316 N
2) *Air Resistance:* Ra= (Drag coefficient × Area of vehicle × $(velocity)^2$) = 14.466 N
3) *Gradient Resistance*

Slop in degree(α) = 30^0 =0.0137 rad

R_g = (W × sin α)= 0.483 N

4) *Total Resistance:* R_t= (R_r +Ra +Rg) = 50.265 N
5) *Torque Required for Wheel:* T_w= Total resistance × radius of wheel=6.383 Nm
6) *Torque for Motor:* T_m = (torque required for wheel) ÷ (gear ratio)=1.063 Nm RPM for wheel (Speed of vehicle in m per min) ÷ (2×π×Radius of wheel) = 626.912 rpm
7) *RPM for Motor:* N_m= (gear ratio× rpm for wheel) = 3761.472 rpm
8) *Motor Power:* P_m= (2×π×Nmotor×Tmotor) ÷ 60= 418.882 watt

Hence, the power required to propel the vehicle is 418.882 W, which is just below our motor specification 500 W. And the design is safe.

B. *Battery Calculation*

Since motor selected is of 48V hence battery voltage rating should also be 48. Therefore we select four batteries of 12V and 20 Ah in parallel combination of we get 48V and 20Ah.

C. *Charging Time*

Time required to charge the battery by adapter 48 V 6 Ah P= 48* 6= 288 W

T= (48*20) / 288

= 3.33 hours

IV. COMPARISON

Table 2.Compasion between IC engine and electric scooter

Parameter	IC Engine Scooter	Electric Scooter
Energy storage System	Petrol Tank	Battery pack
Total weight in kg	76	58
Maximum Power in kw	2.6478	0.5
Maximum Torque in Nm	4.32@5500 rpm	25 @600 rpm
Maximun Speed	60kmph	55 kmph
Charging time	-	3- 4 hours
Emission $Co_{2\ in\ g/km}$	110	0
Capacity of Battery	12v 5ah	48v 20ah
Running Cost for 45 km	Rs 76	Rs 9
Selling price in India	Rs 40,000	Rs 33,000
Maintenance Cost per year	Rs 2400	Rs 600

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V. RESULTS

Table 3: Result

Speed Range(kmph)	Range km	Average Load Current	Cost of Charging	Cost per km in Rs	Remark
20-30	55-60	11	9	0.1565	On high traffic road
30-40	50-55	17	9	0.1714	On City road
40-55	40-50	20	9	0.2	On highway road

VI. CONCLUSION

The idea of conversion of conventional scooter into an electric scooter is that to find scooter which is run without petrol and in low cost. For conversion into electric vehicle we use old scrap vehicle to reduce production cost.The electric vehicle has many advantages and benefits over conventional vehicle. Electric vehicle is propelled by BLDC hub motor with the help of motor controller and battery pack. We study the basic components required to build an electric vehicle. Its construction and working as well as drive required for electric vehicle.

The belt drive is replaced by BLDC hub motor which has great advantages such as noiseless operation, lubrication not required, less resistance, Compact in size. Battery charging time is major drawback of an electric vehicle industry. Now improvement in BLDC motor that is regenerative braking which helps to charge the batteries at the time of braking. The weight and initial cost of Batteries are very high, research is required to increase life of batteries and reduce the charging time.

REFRENCES

[1] Samir NAZIR, Y.S. WONG , 'Energy and Pollutant Damage Costs of Operating Electric, Hybrid, and Conventional Vehicles in Singapore ,2011
[2] C. Abagnalea, M. Cardoneb, P. Iodicea, R. Marialtoc, S. Stranoa, M. Terzoa, G. Vorraro 'Design and Development of an Innovative E-Bike',2016
[3] Paul Chambon, Scott Curran, Shean Huff, Lonnie Love, Brian Post, Robert Wagner, Roderick Jackson, Johney Green Jr 'Development of a range-extended electric vehicle power train for an integrated energy systems research printed utility vehicle',2017
[4] Roberto Nocerino a, Alberto Colorni a,b, Federico Lia a, Alessandro Luè a,b "E- bikes and E-scooters for smart logistics: environmental and economic sustainability in pro-E-bike Italian pilots",2016
[5] Yashwant Sharma,Praveen Banker, Yogesh Raikwar, Yogita Chauhan, Madhvi Sharma 'R&D on electric bike',2018
[6] Kunjan Shinde 'Literature Review on Electric Bike',2017
[7] https://www.bmsparts.nl/diverse-motorblokken/15297-motorblok-bajaj-spirit- 45km-framenr-md2600129yw-bouwjaar-voor-2005.html

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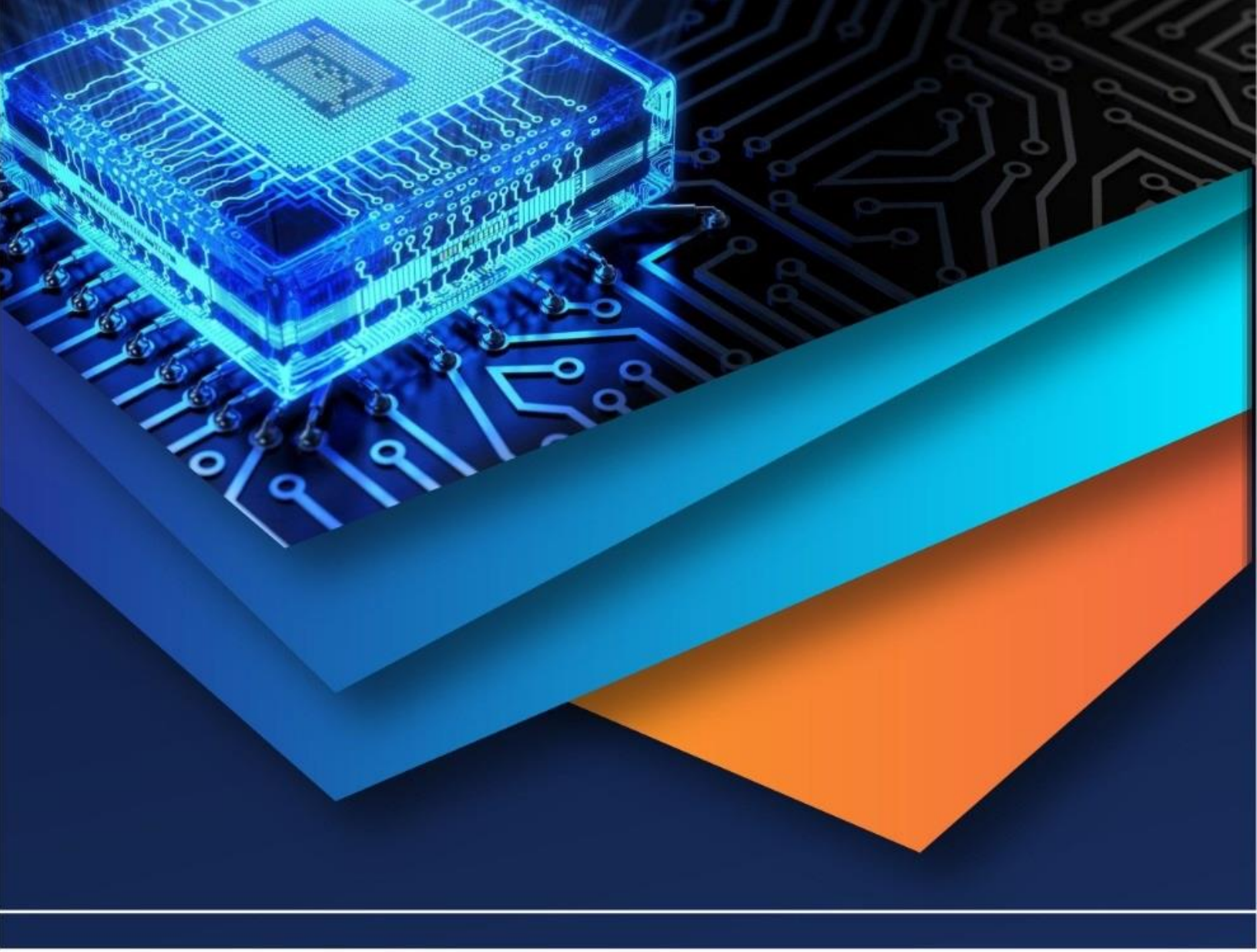

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