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Chassis Design and Fabrication of Electric Motorcycle

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***Abstract*—In present time, Air pollution is the major concern around the globe, vehicles are accounted for large proportion of air pollution. Moreover, to reduce the energy dependency on foreign countries, so, we have to find alternative options for this. As the price of fuel is hiking day by day which affects every person. These are the reasons which urge us to make "Electric Motorcycle" as it will be less air and noise pollution and reduce maintenance cost.**

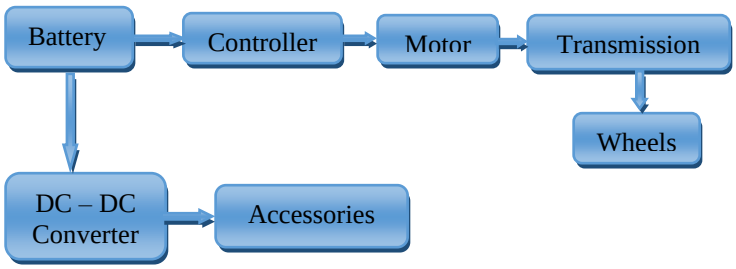
Keywords*— *Electric Energy source (LiFePo4 Battery), BLDC Motor and Controller, Chassis Design

INTRODUCTION

In the world, today, people are tended towards the finding the alternative source of energy for transportation modes, the reason are the price of fossil fuels and the pollution that is produced by vehicles. The EV adaption is the future of mobility and will play a huge role in curbing the growing pollution crisis, as well as reduce the country's dependence on non-renewable energy sources. Electric motorcycles are becoming increasingly popular throughout the world, as more and more people look for efficient, affordable, and eco-friendly modes of transportation.

OBJECTIVE

To decrease the dependency of non-renewable energy sources and to declined usage of fossil fuels. Pollution is the major concern in the current time. Large proportion of pollution is mainly from automobile industries and these pollution effects human health. Increasing price of fuel is burdened for large proportion of people so, to deter these problems we have to use recyclable and renewable source. Our aim is to achieve same efficiency as IC Engine motorcycle.



DESIGN OF CHASSIS

Swing arm: A swing arm is a H or L shaped part that connects the chassis, or frame, via a swing arm pivot bolt and the motorcycle to its rear wheel. Suspension's one end is attached to the chassis and other end is with the swing arm, which allows swing arm and rear wheel to move up and down according to road condition.

We have made swing arm of rectangular box section which provides good resistance to both bending and torsion.

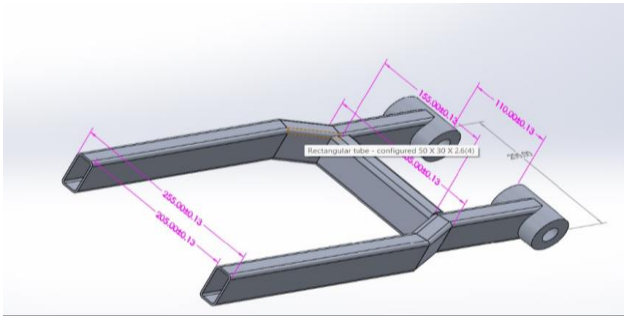


Fig 1. Swing arm

There are multiple types of chassis have been used to make a motorcycle. All types of chassis possess distinct features. So, among all this we have selected 'Double Cradle' type according to requirement. It provides more strength and space over single cradle frame. It is also cost efficient.

Fig 2. Electric Motorcycle Chassis

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Table 1. Motorcycle Geometry

Wheelbase	1330 mm
Rack Angle	23°
Fork Offset	45 mm
Trail	84.36 mm
Swing arm Angle	10°
Monoshock Angle	65°
Ground Clearance	190 mm

Kerb Weight	90 kg
Gross Weight	270 kg
Overall Length	1900 mm
Overall Width	740 mm
Overall Height	1110 mm
Ground Clearance	190 mm
Wheel Base	1330 mm
Chassis Type	Double Cradle

Table 2. Chassis & Dimension

COMPONENTS OF ELECTRIC MOTORCYCLE

1. BLDC Motor and Controller:

a) Radial Flux BLDC Motor: It is a type of Commutator less DC motor. The benefits of this motor are light in weight, high power and less cost as compared to Induction Motor. Motor gets electric power from the battery and transmit it to the rear wheel.

Power / Peak Power	1000 w / 2400 w
Voltage	48 V
RPM	3000 ± 100
Torque	3.18 NM
Weight	Approx. 5 kg
Diameter	150 mm
Efficiency	>83%

Table 3. Motor Specification

Torque Calculation:
Power = (2*π*N*T) /60
1000 = (2*3.14*3000*T) /60
Torque = 3.18 NM

BLDC motor current rating:
Current = Power / (√3 * Voltage * Power Factor)
=1000 / (√3 * 48 * 0.8)
=15.035 Amp.

Fig 3. BLDC Motor

b) Electronic Controller: Electronic Controller commands the power converter by providing control signal to each and then controls the operation of electric motor to produce proper torque and speed, according to the command from the accelerator lever. Controller indicates malfunctions such as Throttle fault, Overload fault, Controller fault and Motor fault.

- 48v
- Current limit 50Amp
- Type: Sinusoidal (The sinusoidal current drive provides higher efficiency, lower torque ripple and lower acoustic noise)

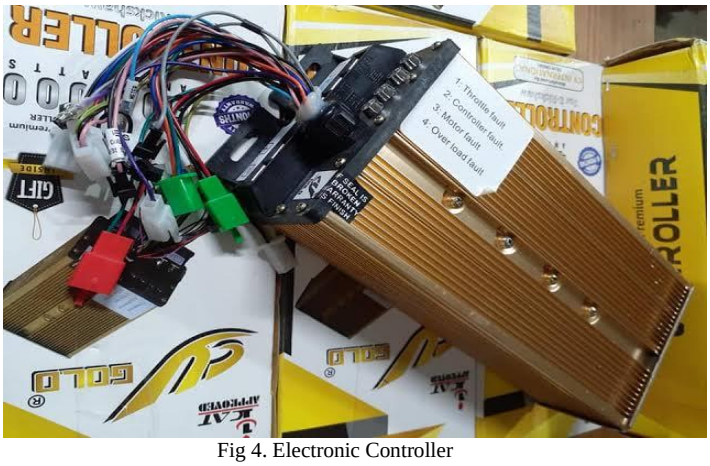

Fig 4. Electronic Controller

2. Lithium Phosphate (LiFePo4) Battery:

It is considered as a heart of electric vehicle. This is a type of Lithium Ion Battery. It is widely use in Electric vehicles. Lithium Ion Phosphate as the cathode and a graphitic carbon electrode with metallic backing as the anode.

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Fig. 5 LiFePo4 Battery

Nominal Voltage	48 V
Ah	36
Cut Off Voltage	42 V
Discharge Current	40 A

Table.4 Battery Specification

3. **Drive Type:** Chain drive is a type of mechanical power transmission system that uses chains to transfer power from one place to another. It is the positive drive, which is one of the great advantage of it.
Power transmission: There are two sprockets one is attached to the shaft of BLDC motor and the other is attached to the rear wheel. The chain is used to transmit the power from BLDC motor to the rear wheel.

- **Front Sprocket Teeth:** 13
- **Rear Sprocket Teeth:** 50
- **Final Drive Ratio:** 3.84:1
- **Speed Calculation:**
Convert rpm in to linear velocity =
Motor's rpm/Final drive ratio =
3000/3.84 = 781.25RPM

Speed of the motor in $v_{(kMH)}$ in kilometre per hour is equal to 0.1885 times of the speed $\mathbf{N_{(RPM)}}$ multiply by diameter $D_{(m)}$ in meter. The formula for converting Rpm to kmph formula can be written as,

Theoretical Vehicle speed:
= 0.1885 * Wheel RPM * diameter of the tire.
= 0.1885 * 781.25 * 0.4318
= 63.58 km/h

4. **DC-DC Converter:** DC-DC Converter is a component which is use to convert power from the high voltage bus to the 12V low voltage to power the on board electric devices.

- Input voltage:48V to 72V
- Output voltage:12V
- Output current: 10amp

Fig. 6 Electric Motorcycle

CONCLUSION

Electric Motorcycle is the best option to replace the I.C Engine motorcycle. Moreover, in present time electric vehicle is the way to overcome Air pollution. Though, Initial price is higher (Price can be reduced if we commence production of battery in India) and more time is required to charge the battery are the main downsides that we have to work on in future. However, its pros outweigh the cons.

REFERENCES

[1] https://gaadify.com/different-types-of-motorcycle-chassis/
[2] Modern Electric, Hybrid Electric & Fuel Cell Vehicles by Mehrdad Ehsani, Yimin Gao, Sebastien E. Gay, Ali Emadi.
[3] Fundamental of Vehicle Dynamics by Thomas D. Gillespie

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