WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Design & Fabrication of an Electric Vehicle

P. Shyam Sundhar Rao, P. S.Narayana Achari, K. Mehar Giri Teja, G. Sumanth, G. Abinadth,

Mr. R. S. Kiran

1,2,3,4,5. Final Year B. Tech Students, Department of Mechanical Engineering, Sanketika Vidya Parishad Engineering College, P.M Palem, Visakhapatnam, 530041, India.

6. Assistant Professor, Department of Mechanical Engineering, Sanketika Vidya Parishad Engineering College, P.M Palem, Visakhapatnam, 530041, India.

A B S T R A C T

E-pro vehicle is a modified type of electric vehicle which is being used nowadays &as we know electric vehicle are ecofriendly vehicles. Electric vehicles are quieter& smooth operation when compared to I.C engine vehicles

Efficiency, speed, mileage, and performance are the major parameters of the electric vehicle. E-pro vehicle is cost-efficient.

An old scrap bike is used to develop this E-pro vehicle and basic electric vehicle parts are used in this vehicle like motor, battery, controller, etc. The transmission is modified as the torque of the vehicle should be increased.

We aim to increase its efficiency, and it can give better initial pick up when compared to another electric vehicles. We trying to modify the electric vehicle by adding a gearbox, and clutch to control the speed of the vehicle.

Keywords:Electric, mileage, transmission, eco-friendly.

1. INTRODUCTION

An electric vehicle (EV) is an automotive vehicle that uses one or more electric motors for propulsion. It has an electric motor instead of an internal combustion engine (IC). The electric vehicle has createda new path to a clean environment. It doesn't use any liquid fuels for propulsion, has no emissions from the tailpipe, less noise compared to IC engines.

Nowadays Electric vehicle has mainly four types which are run on roads they are,

1. Hybrid Electric Vehicle (HEV)
2. Plug-in Hybrid Electric Vehicle (PHEV)
3. Battery Electric Vehicle (BEV)
4. Fuel-cell Electric Vehicle

The hybrid electric vehicle is a type of vehicle that combinesan IC engine with an electric propulsion system. This type of vehicle is used for fuel economy. It has a regenerative braking system to draw the power during applying brakes.

When IC is used for propulsion the electric propulsion system turns into a generator and supplies electric power to the battery pack. This collected energy is used when IC is turned off or out of fuel.

A Plug-in Hybrid Electric vehicle is also similar to a hybrid vehicle but it has only difference is that we can charge the battery pack from charging stations.

Battery Electric Vehicle is a type of electric vehicle that fully runs on an electric propulsion system. It has an electric motor, battery pack, dc-dc converter, regenerative braking system, BMS, etc.,

The fuel-cell electric vehicle is a type of electric vehicle which uses an electrolysis process to generate electricity from chemicals. It is not popular nowadays because of a small range of uses and toxic emissions.

We choose battery-electric vehicles because of the following reasons.

1. It uses only a battery and it can be rechargeable in many ways.
2. It produces less noise because it doesn't have IC engines.
3. It is cost-efficient

We want to alter an IC vehicle to a battery electric vehicle that should fulfill the following requirements

1. Variation of speeds in same torque
2. Reasonable torque should be achieved to move loads
3. Better maintenance of the battery

Generally, Two-wheelers usea Brushless DC motor (BLDC), Permanent magnet AC motor, IPM, etc.,

BLDC motor is cost-effective when compared to other motors. BLDC motor is generally two types

1. Outrunner BLDC motor: The outrunner is a type of BLDC motor primally used for relatively high torque generation. The rotor is present outside the stator. The magnets are present on the rotor & stator coils from the core. As for high voltage, it requires more magnets, which can slow down the speed. It doesn't require a gearbox. It runs very silently.
2. In-runner near BLDC motor: The In-runner motor is a type of BLDC motor that gives less torque generation and has relatively higher efficiency due to low inertia. The rotor has magnets and stator windings are stationary. It requires a gearbox for power transmission. High speed can be achieved.

2. COMPONENTS

- In runner BLDC motor**(60V\1.5KW)**
- BLDC Controller**(60V)**
- Battery management system**(BMS)**
- Driven shaft**(EN-19)**
- Gearbox**(5 Speed transmission)**
- Chain and Sprocket mechanism**(2.3: 1)**
- Miniature Circuit Breaker **(MCB)**
- Step down DC converter**(60V to 12V)**
- Li-ion Battery**(60V 3KWh)**
- Electric Instrument Cluster setup**(12V)**
- Mild Steel for motor mounting **(150*250*8)**

2.1COMPONENTS WORKING:

BLDC Controller: A BLDC controller is used to detect the position of the rotor and it consists of a hall sensor thatcontrols the motor speed according to load conditions

BMS(Battery Management System); Battery Management Systemis an electronic system that manages a rechargeable battery, such as monitoring the battery state, calculating secondary data, reporting the data, protecting the battery, etc.,

Gearbox: The gearbox consists of two shafts i.e., the input shaft & output shaft. It helps to provide different gear ratios so that we can achieve speed variations in a single unit

3. WORKING PROCEDURE

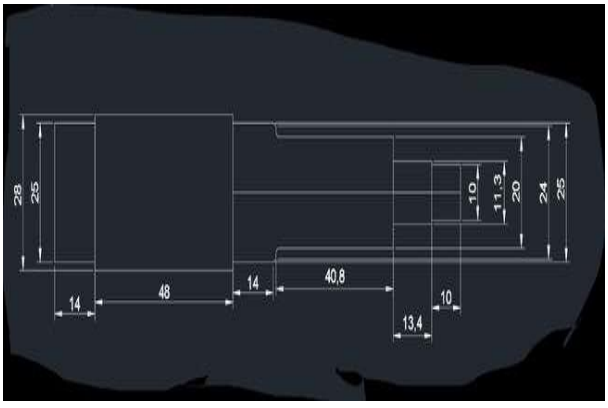
- An in runner 60v 1.5kw BLDC motor is used to propel the vehicle which is controlled by a 60v BLDC controller and mounted on a mild steel plate of 150*250*8 mm dimensions.
- The IC engine gearbox is modified by removing the engine head and bore followed by replacing the crankshaft with our designed EN-19 material shaft.

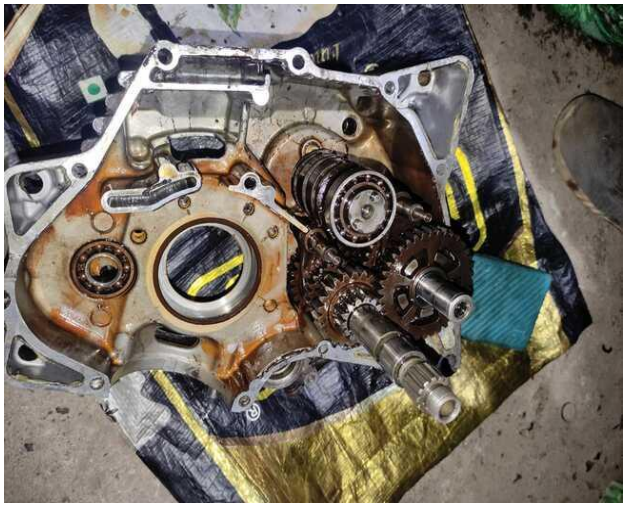
- The motor is connected to a gearbox which completes the transmission by providing the required speeds with constant torque.
- The chain and sprocket mechanism are used as the connection between motor and gearboxi.e., driving and driven shaft with a gear of 2.3:1.
- aAn 12v instrument cluster setup is placed for the major indications like battery percentage, vehicle speed, battery voltage, and basic vehicle indications.
- A step-down DC converter is used to convert 60v power from the controller to 12v power for the purpose of controlling lights, instrument cluster setup, etc.
- A 60v 3kwh battery is used to operate the complete electrical setup of the vehicle and BMS is used to control the battery from voltage fluctuations.

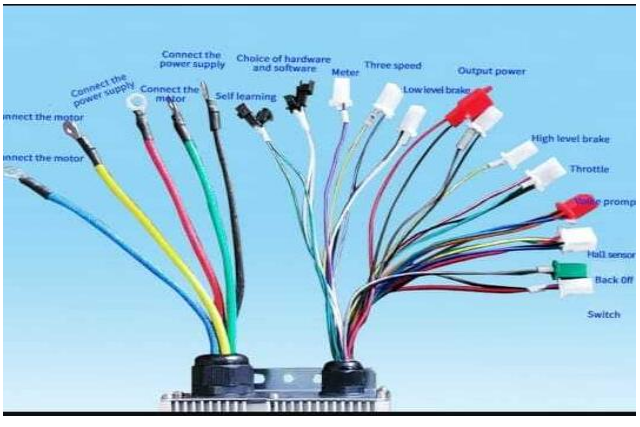
❖ Our project theme is converting an IC engine bike into an EV bike with a gearbox**.** We used an old model YAMAHA FZ-S 2016 model. First of all, our project started' by dismantling the engine ofthe bike. We started removing the unnecessary parts for balancing weight.

4. EQUATIONS OR CALCULATIONS

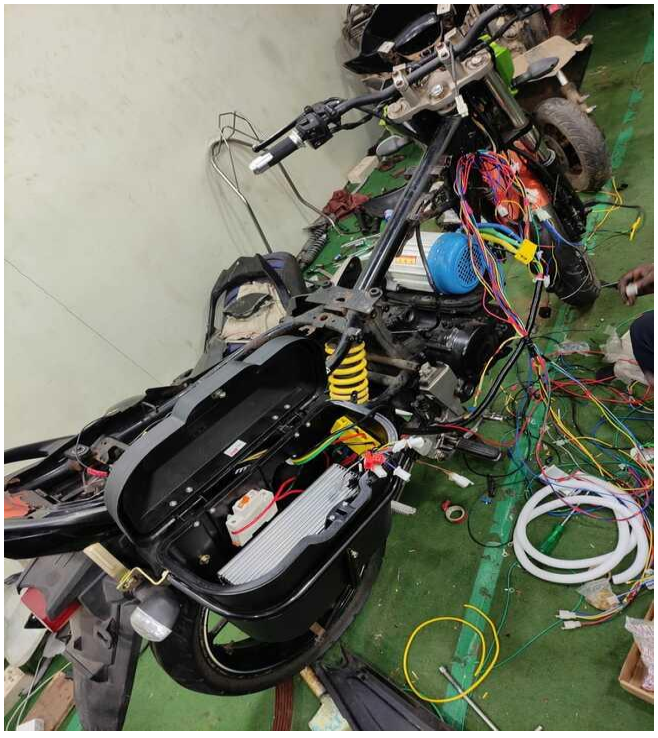
TORQUE = Force * distance(radius)
6.2 = Force* 0.02
Force = 310 newtons
Therefore 310 newtons is applied to rotate the gear shaft (input shaft)
We are using gear ratio is about 2.3: 1
So that, the motor runs about 3000rpm
So at gear shaft rpm = 2.3*3000
=6900 rpm
And torque will be 2.6956 N.m
Thus 2.695 N.m & 6900 rpm are the inputs to gearbox input shaft
At final drive (rear wheel)
Torque = 150N.m
Speed = 50 kmph+ (according to load conditions the speed varies)
FORMULAE
P=0.1471*NT
Where P= power (kw)
T= torque (N.m)
N = speed (rpm)
Chain & Sprocket
R = (N2/N1)
Where N1 = speed of driver
N2 = speed of driven
R = sprocket ratio
R= 6900/3000
= 2.3:1


28
25
10
11,3
20
24
25
14
48
14
40,8
10
13,4




Connect the power supply
Choice of hardware and software
Meter
Three speed
Output power
Connect the power supply
Connect the motor
Self learning
Low level brake
High level brake
Throttle
Hall sensor
Back Off
Switch

PRE-ASSEMBLY



5. CONCLUSION

Our electric vehicle can provide various speedsthat can be achieved at constant torque as same as IC can provide

6. REFERENCE

1. ***"Global EV Outlook 2021 / Technology Report". IEA.org. International Energy Agency. April 2021. Archived from the original on 29 April 2021.***

2. *Lepetit, Yoann (October 2017). "Electric vehicle life cycle analysis and raw material availability" (PDF). Transport & Environment. Archived (PDF) from the original on 23 February 2018. Retrieved 22 February 2018.*

3. *Richardson, D.B. (March 2013). "Electric vehicles and the electric grid: A review of modeling approaches, Impacts, and renewable energy integration". Renewable and Sustainable Energy Reviews.* ***19****: 247–254. doi:10.1016/j.rser.2012.11.042.*

4. *"Explaining Electric & Plug-In Hybrid Electric Vehicles | US EPA". US EPA. US EPA. 17 August 2015. Archived from the original on 12 June 2018. Retrieved 8 June 2018.*