Recent Development on Electric Scooter's

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Abstract— This paper provides an overview of the recent work of electric scooters in the region. The paper describes the development of various systems such as GPS Tracking System, FOB-Key operation, Blinker auto cancelation facility. The major components are motor control unit (MCU), Lithium-ion battery. The paper shows explanation of electric scooter and its components with development in EV scooters.

Keywords: Electric vehicle, BMS, MCU & Telematic Control Unit (TCU)

I. INTRODUCTION

The Electric Vehicles gaining more momentum due to reduction in EVs prices, Increasing cost of fuel like petrol. Also, it is eco-friendly. This paper reviews the recent advanced developments in EV charging system, trends in battery technology, as well as providing the new features in upcoming years. In batteries, lithium ion has good features like lightweight, fast charging, low self-discharge and long lifespan so it is used widely. The motor BLDC used in EVs has best, whereas (PMSM) Permanent Magnet Synchronous Motor have better performance over the BLDC motor. It has reduced torque ripple & current ripple. Also, high performance in both low and high-speed operation.

This paper includes the brief information about Electric scooter working and all the parts which is used. Also, some special features

II. THE KEY COMPONENTS IN EV

A. Lithium Ion Battery-

Lithium-ion batteries are currently used in most electric vehicles because of their high energy per unit mass relative to other electrical energy storage systems. They also have a high power to weight ratio, high energy efficiency, good high-temperature performance, and low self-discharge.

The Batteries used in EV Scooters are comes in range between 48 to 50 Volt nominal voltage with 55 to 60 Ah rated Capacity

Lithium-ion batteries have higher energy densities than lead-acid batteries or nickel-metal hydride batteries, so it is possible to make the battery size smaller than others while retaining the same storage capacity.

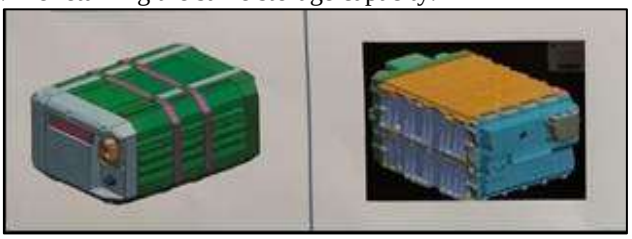

Fig. 1: Lithium Ion Battery

B. Permanent Magnet Synchronous Motor

Permanent magnet synchronous motors are a form of AC synchronous motor in which the field is stimulated by permanent magnets, which produce sinusoidal back EMF

Permanent Magnet Synchronous Motors have the potential to providing high torque-to-current ratio, high power-to-weight ratio, high efficiency and robustness. Due to the above favourable points, PMSMs are commonly used in latest variable speed AC drives, particularly in Electric Vehicle applications. Electric vehicle is a nightmare for the city traffic without providing harmful gases with low noise. Permanent Magnet Synchronous Motor became at the top of ac motors in high performance drive systems such as EV.

The output from the Motor control Unit is fed directly to the power stage. The output of the power stage is three-phase voltage and it is given to the motor. This setup can work as a Brushless DC motor controller or a PMSM motor controller.

Fig. 2: Permanent Magnet Synchronous Motor

C. Motor Control Unit (MCU)

The Motor Controller Unit converts 48v DC supply from battery to three phase AC to drive the motor. The output torque of the motor is controlled by varying current supply from MCU, based on input from Throttle position & Rotor position. Input from brake switch is given to the MCU to control the speed ones the brake lever is pressed.

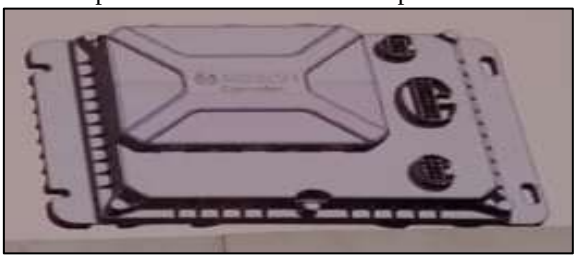

Fig. 3: Motor Control Unit

MCU configures motor speed and torque after receiving comments from VCU (vehicle control unit) via CAN-bus communication. The MCU converts battery pack DC power source to AC power supply to drive PMS Motor. During vehicle braking, it can regenerate DC power back to battery pack for charging this is called as Regenerative Braking System.

D. Charging System

EV charging involves supply of direct current (DC) to the battery pack. As electricity distribution systems supply alternate current (AC) power, a converter is required to provide DC power to the battery.

Conductive charging can be AC or DC. In the case of an AC EVSE, the AC power is delivered to the onboard charger of the EV, which converts it to DC. A DC EVSE converts the power externally and supplies DC power directly to the battery, bypassing the onboard charger.

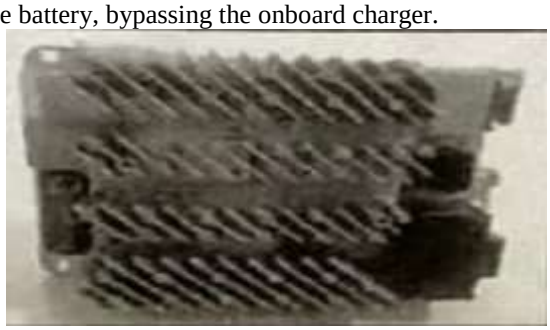

Fig. 4: Electric Charger

Mostly recent electric scooters having the on-board charger so we can charge on domestic socket. These chargers are taking the input power of domestic 230-volt AC and that converted power into the range of 48 volt to 72-volt DC batteries. The charger output is connected directly to the lithium-ion battery for charging. The major benefit of on-board charging is that it uses readily-available AC power and, via an extension lead, the vehicle can be plugged into any of the billions of outlets installed in every building.

AC charging is the most flexible, as charging points are available and can provide the entire charging needs for some users, depending upon their lifestyle and how the vehicle is used. If the vehicle is solely used for commuting during the day, then charging the vehicle overnight is very convenient. AC charging is far less suited to range extension charging, where the distance to travel exceeds the range of the vehicle, as the charging times are simply too long.

III. RECENT TRENDS IN SCOOTER'S

A. GPS Tracking System-

Fig 4: GPS Tracking System

1) Telematic Unit

Telematics control unit (TCU) is the embedded onboard system that controls wireless tracking, diagnostics and communication to and from the vehicle. Increasing amount of connectivity to the vehicle by adding more modems and processing to support communication from the scooter to the cloud, infrastructure or other vehicles. Antenna power optimization with better current sensing, diagnostics and low noise. Reliable, efficient, and faster data transmission enabling communication to other systems in the vehicle. There are the key features of this GPS tracking system.

- Vehicle Status
- Navigation
- Trip Summary
- Trouble Shooting

2) FOB Key Operation

The FOB key is work when the key fob is in the vicinity of the bike, the bike captures the signal from the key fob and goes in to a state of accepting commands. All you have to do is press the switch on the bike and it's on. Fobs perform their function of locking or unlocking a device via a built-in Radio Frequency Identification (RFID) system.

The configuration starts with a code imprinted onto a microchip. The chip contains an assigned frequency that communicates directly with the reader. If the code and the frequency line up, the vehicle will on. Each fob carries a unique code. Thus, only one fob is initially assigned to open a particular vehicle.

B. Combi Braking System

A combined braking system (CBS is a system for linking front and rear brakes on a motorcycle or scooter. In this system, the rider's action of depressing one of the brake levers applies both front and rear brakes. The amount of each brake applied may be determined by a proportional control valve. This is distinct from integrated brakes, where applying pressure to the rear brake pedal only applies some braking force to the front brake

Working Principle:

- By pressing the front brake lever.
- The hydraulic pressure is applied to pvc (pressure control valve) then the pressure is supplied to both front and rear disc.
- Then front disc is connected with p vc so we can able to control the pressure to max and minimum as our requirement.
- The pressure receives directly from the oil tank to rear disc without any control valves.

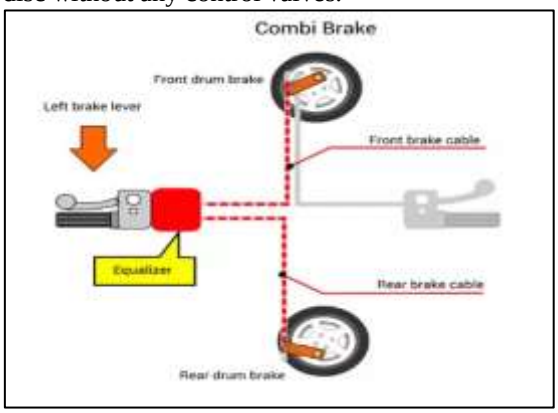

Fig. 4: Combi braking System

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REFERENCES

[1] Ji-Young Byung-ChulWoo,Jong-MooKim andHong Seok Oh "In-wheel Motor Design for an Electric Scooter" J Electr Eng Technol. Nov.2017)
[2] T. J. Miller, "Lithium-ion battery automotive applications and require-ments," in Proc. Seventeenth Annu. Battery Conf. Applications and Ad-vances, 2002.
[3] P. Andrada, B. Blanqué, E. Martinez, M.Torrent, J.A. Sánchez, J.I. Perat. "Electric drives for light e-scooters" lectronically Commutated Drives Group (GAECE), Departament d'Enginyeria Elèctrica (DEE).
[4] PikeResearch. "Electric two-wheel vehicles: Electric bicycles, mopeds, scooters and motorcycles market analysis and forecast.
[5] C.C. Chan, K.T. Chau. "Modern Electric Vehicle Technology". Oxford Science Publications 2001.
[6] Prof. Mahesh S. Khande1, Mr. Akshay S. Patil2, Mr. Gaurav C. Andhale3, Mr. Rohan S. Shirsat4 "Design and Development of Electric scooter" International Research Journal of Engineering and Technology (IRJET).

