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E Bike Performance Improvement

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Abstract - Nowadays, the emission from conventional vehicles significantly contributes to environment pollution and many environment issues. In addition to this energy crisis is another major problem which we can face in future so the best alternative for conventional vehicle and to save the environment from serious issues there is need of E-bike. E-bike is best technical application because the visionary resolution for higher world. E-bike include option like high efficiency, light in weight, safe and comfortable riding experience. E-bike reduce toxic emissions that takes place due to conventional bikes and improve energy security problems. E-bike eliminates use of the fossil fuels due to that environmental pollution and problem of energy is solved to some extent. In the presence of environmental pollution and energy crisis their is good opportunity for developing e-bike. The attention of environmental problems and therefore the energy crisis also as incentives from the government many countries unendingly enhance the rapid development of pure electric vehicle.

Keywords: - E-bike, Electric range, Hub motor, regenerative braking system.

1. INTRODUCATION

The conventional vehicles that use solely an internal combustion engine consume fossil fuels and emit gases like carbon oxides, hydrocarbons, and gas oxides. In order to beat the environmental and energy crisis problems that standard vehicles contribute to, hybrid electrical vehicles (HEVs) are developed and applied over the past few years. HEV technologies after a fuel economy improvement and alter HEVs to exhaustless emissions compared to the standard combustion engine vehicles (ICEVs), however HEVs cannot fully resolve the top mentioned problems. Thus, HEVs square measure solely a short lived step in the development from ICEVs to pure electrical vehicles (PEVs). Varaities of electric vehicles has long been thought of a significant barrier in acceptance of electrical quality because of electric vehicles having a considerly shorter vary than standard vehicles. The vary of electrical vehicles influences not solely the planing of the vehicle however additionally driving vogue and operational factors(Zhenhe Li,2019)[1].

Fig.1: Electric Bike[2]
[https://www.rushlane.com/hero-dash-electric-scooter-launch-12321757.html]

2. REVIEW OF LITERATURE

Strong issues connected each to the air quality and the emoloyment of crude oil are caused within the years, by the more and more vehicle traffic notably the foremost of consumptions and pollution are because of the nice mass of the vehicle and to not the mass of handled passengers underneath now of a read, a vehicle because the electrical motor assisted bicycle(E Bike) will be thought of promising different vehicle for each personal quality and product delivery, particularly for little and medium distances(Nguyen Ba adorned,2019)[3].

3. Proportion of standard E bikes:

Over-standard electrical and bicycle are named on an equivalent facilities, and it invetibly ends up in and advanced traffic flow and causes serious of issues it is necessary to live the proportion of over standard electrical bikes during the article, seven observation sites in shanghai chosen for this analysis as well as transit stations, E Bike park tons, communities and roads(Longer Dynasty,2013)[12]

Table-1: Proportion of over standard vehicles in shanghai[12]

Locations(City in China)	Standard bikes	Electric bikes
Nanxiang	57.46 %	42.54 %
Yonghui	59.66 %	40.34 %
Taopu	54.17 %	45.83 %
Caoyang	51.76 %	48.24 %
Zhongshan	68.29 %	31.71 %
Longzhimeng	50.75 %	49.25 %
East nanging	62.50 %	37.50 %

4. Review of Efficiency Improving Components

4.1 Battery:

Li-based batteries are becoming the most widely used and popular storage devices because of their benefits such as high energy density, light weight, no memory effect and no environmental issues(Tie SF, Tan CW,2013-14) [13]. There are four main catagories including Li-ion, Li-ion polymer, Li-iron sulphide, Li-iron phosphate. Among these batteries, the Li-iron phosphate battery having high cost but has much higher power density (2e4.5 kW/kg) and high cycle life of more than 2000 cycles. The Li-iron sulphide battery has a high energy capacity with light weight, while its cycle life is only more than 1000times.(Doshi Nikhil, Prof Mahadik S C,2019)[22]

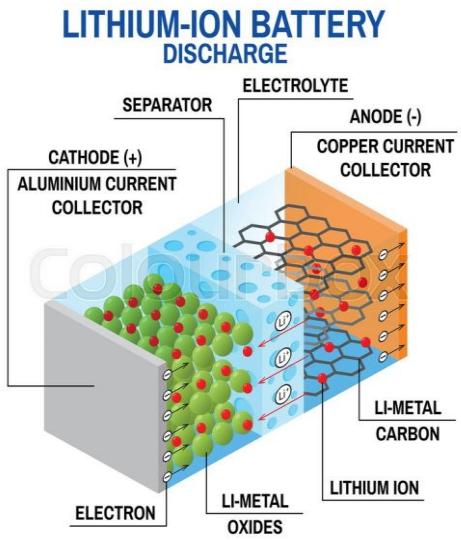

Fig:2. Lithium-Ion Battery [colorbox.com]

The Li-ion polymer has good reliability and rigidity, butits conductivity is poor and the power density is significantly lesser. The Li-ion battery is the good option for cost performance asit has higher specific energy density (up to 250 W/kg), higher power density (ranging from 0.5 to 2 kW/kg) and higher energy efficiency(90 to 100%), low self-discharge, long lifetimes with medium cost. However, it is not worthy that the lifetime of the Li-ion battery can be decreased abruptly due to the effects of the higher temperature and more discharge whilst a protection circuit is important to ensure safe operation. (Zhenhe Li,2019)[1].

Table-2: Comparision of various types of batteries

Battery type	Environmental performance	Safety perfor mance	Energy density	Service life	Charge time	Discharge rate
Lithioum ion	Env.protection	Better	90-150	600-2000	3-4	3-10%
Nickel cadium	**No Env.friendly**	Very good	60	500	2	20%
Ni.hybrid metal	**Env. protection**	general	70	750	3-4	28%
Lead acid	**No env.friendly**	well	27	300-450	9-15	5%

4.2. Supercapacitors:

Super capacitor or ultra-capacitors, have asame structure as regular capacitors but store energy by means of an electrolyte solution between two solid conductors. The capacitance of SCs is much higher than conventional capacitors, which also makes their energy storage capacities as high as 20times that of conventional

capacitors(2018)[14]. There are three important catagories of SCs:electric double-layer capacitors (EDLCs), pseudo-capacitors, and hybrid capacitors.(Zhenhe Li,2019) [15]

4.3. Flywheel:

Flywheels is used to store energy in the angular momentum of a high speed rotating mass (rotor) in a high vacuum environment which enables them to reduce the winding losses and protect the rotor assembly from external disturbances.(Tie SF, Tan CW, 2013)[16].

4.4. Regenerative braking systems:

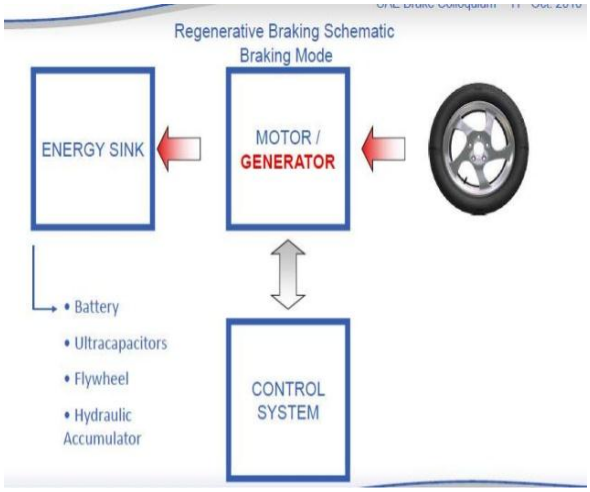

Fig:3. Regenerative Braking System

[slideshare.net]

Regenerative braking systems can provide energy for vehicles from recovering and storing the kinetic energy of the vehicle decelerating stage in the energy storage devices(Laiqing Xie,2019)[4],[7]. If there is absent of regenerative braking systems on the vehicle, then kinetic energy of the vehicle in the decelerating stage is converted into heat by the mechanical braking. Presently, there are four important categories to understand the function of regenerative braking systems. The first basic category is using an electric M/G and batteries or a SC. In the vehicle deceleration, the M/G operates as a generator to convert the kinetic energy into electricity and stores it in the batteries or the SC. When the vehicle accelerates, the M/G operates as an electric motor and releases the energy[2],[18](Martin Mruzek,2017). Another widely used method is using a hydraulic P/M and HACCs. In the braking mode, the P/M pumps the hydraulic fluid from a low-pressure reservoir to the HACCs, which converts the kinetic energy into the hydraulic energy. If the vehicle wants energy, the stored hydraulic energy can be released by the P/M operating as a hydraulic motor to drive the load as an auxiliary power. Thirdly, the kinetic energy of a vehicle can be stored in a flywheel as rotating energy. Furthermore, the braking energy can also be stored as potential energy through springs.(Prof S.C.Mahadik,2016)[24]

Compared to other methods, the hydraulic and flywheel regenerative systems have the higher energy efficiency(Elodie Labeye,2016)[6]. Moreover, the hydraulic regenerative systems have faster charging and discharging ability, higher power density, and a large capacity to recover the maximum possible regenerative braking energy. In contrast, the battery regenerative systems are not suitable to be charged and discharged frequently in order to avoid overheating, reduction of the lifetime or even destruction. The major disadvantage of the SC regenerative systems is the high costs, while the spring regenerative systems have very lower energy efficiency From this paper it is understand that they are focused on the improvement of efficiency of E-bike(Nils Fearnley;2015)[9]. Generally the speed of E-bike is in the range of 40-45 km/hr at maximum. So there they increase the speed of E-bike and design the aerodynamic shape in such a way that the efficiency of E-bike is improved,. For the increasing the speed they are done the comparison of power transmission system. In that they found four power transmission system. Based on Application the out of four any one of them power transmission system is used in E-bike. Generally the chain drive is used for transmitting the power. Along with that there are three different types of motor is also used like Gear hub motors, Crank drive motors and direct drive motors. So after completing experimental study it can be found that due to the specifications like light weight, inexpensive, compact, offering non-slip the chain drive is more efficient as compared to belts or gears(T. Franke).[20]

5. CONCLUSION

The environmental issues such as air pollution and global warming have brought serious impacts on living and production for human beings. The energy crisis is also important and pressing problem. Based on these reasons electric vehicle with high efficiency will be ultimate goal of developing vehicles instead of conventional vehicle. This paper represent an overview of electric vehicle with focus on energy sources. Li-ion batteries becoming more popular and promising. The analysis and development trend indicate that renewable sources are very promising to generate electricity for charging electric vehicles. Finally the main challenges faced by electric vehicles are discussed and general problem solving methods are

provided, with latest development with regard to electric vehicles are presented. Under the pressure from objective environmental factors and subjective incentive from government electric vehicle will be developing rapidly in the next decade.

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