

Modification of Mopped to Hybrid Bike

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Abstract: This study has been undertaken to do modification of mopped in to hybrid bike. In automobile industry the need for alternative fuel as a replacement of conventional fuel, due to its availability and amount of emission produced so to overcome this problem the solution is new technology like electric vehicles and hybrid vehicles. But electric vehicle have an issues like Inadequate charging infrastructure. Reliance on battery imports. Reliance on imported components and parts. Incentives linked to local manufacturing. Range anxiety among consumers. High price. Hence it is necessary to come out with alternate solutions like hybrid vehicles.

Index Terms – Battery, Hybrid, Flange, Motor.

I. INTRODUCTION

What is a hybrid? A hybrid vehicle combines any two power (energy) sources. Possible combinations include diesel/electric, gasoline/fly wheel, and fuel cell (FC)/battery. Typically, one energy source is storage, and the other is conversion of a fuel to energy. The combination of two power sources may support two separate propulsion systems. Thus to be a True hybrid, the vehicle must have at least two modes of propulsion. For example, a truck that uses a diesel to drive a generator, which in turn drives several electrical motors for all-wheel drive, is not a hybrid. But if the truck has electrical energy storage to provide a second mode, which is electrical assists, then it is a hybrid Vehicle. These two power sources may be paired in series, meaning that the gas engine charges the batteries of an electric motor that powers the car, or in parallel, with both mechanisms driving the car directly. This hybrid bike is made by using active Honda 110cc in which it runs on both engine and electric motor also. In which we use DC electric hub motor for rear wheel to convert it into hybrid bike and this motor easily take weight up to 300 kg when it runs. Then we use DC controller for control this electric motor and we fix this under the seat. This DC controller has many features and it is special type of controller that we make specially by giving order. Also it has another main feature that helps to charge the lead-acid battery while running use IC engine. This charging happens when you run this bike on engine above the 25km/h to 45 km/h speed continuously, then the motor rotates as per engine speed by flange shaft which is connected to this electric motor that rotates and produces energy in it. That energy taken by DC controller and it send that regenerated power to lead acid for charging. Also we give another option to charge this lead acid battery that is plug in option means using the battery charger to charge this lead-acid battery. This charger is AC to DC charger and it's small in size so you can fix this charger under the seat. For this electric motor, we use lead-acid battery having 24V because this rating is choose as per our electric motor rating. We using lead-acid battery because it's cheap and easily available, we fix this lead-acid battery in the rear seat of bike by making battery pockets by fabrication, after that we use dual throttle to control the speed of electric motor and regular throttle of bike in the handle. Also we remove the some spare parts of the bike to reduce the overall weight of the bike. If you run the bike on motor and you want to run it on engine, then you want to slow down the speed of electric motor and start the engine and run it on engine.

II. LITERATURE SURVEY

India is a country with most number of commuting two wheelers in the world. A few run on petrol and some are driven by batteries. The vehicles which run on fuel have many limitations such as petrol is exhaustible and causes environmental pollution. The battery run vehicles are shallow on the performance side and are prone to malfunction. Also there are less technologies are implemented as compared to other countries, Also there are much more prices of petrol and diesels are in India and that are increases and decreases daily and also will increase in future. Then the level of petrol and diesel are low and may be finish at any time, so we need to use this petrol and diesel very safely and don't waste it. Also this petrol and diesel are increases pollution in the environment and there are many gases occur from exhaust like NO_x, CO₂ and Etc. For this reason many countries start working with electric vehicles and hybrid vehicles and also implement this technology. Hybrid technology is the best way to save the fuel and also reduce the pollution and easy to implement in India, because there are many electric vehicles are available; but there is no more charging stations are available in India; but still India is working on charging stations also the electric batteries are not durable for long time, There are few hybrid bikes are available in the market and are not implement with high and new technology; For this we take survey on prices of petrol and diesel also studied number of literature review about the increasing and decreasing the price of petrol and diesel. Also we compare and discuss about electric bikes, conventional bike and hybrid bike.

Study on technology of hybrid petro electric bikes is an emerging field in now a days and the total turn one on these types of vehicles very profitable for the future and also solves the issue of natural resources scarcity and is an ecofriendly bike. This type of vehicle is very cost effective for middle-class families. The mileage of the bike is increased from 60 to 90 km for 1 liter of gasoline [1, 2].

Study of conventional vehicles with ICE provide a good performance and long operating range but they have caused and continue to cause serious problems for poor fuel economy, environment pollution and human life. Reducing fuel consumption and emissions is one of the most important goals of modern design. The hybridization of a convectional combustion engine vehicle with an advanced electric motor drive may greatly enhance the overall efficiency and achieve higher fuel with reduced emissions [3-6].

Environmental damage from internal combustion engine is compounded by the problem of air pollution. As well as carbon dioxide emissions, cars also produce dangerous chemicals such as nitrogen oxides (NO_x), Sulphur oxide (SO_x) and carbon monoxide emissions. The problem of lost energy, as well as the need to reduce carbon emissions and dangerous pollutants, has spawned the industry to attempt to meet these challenges, whilst sticking to the traditional petrol and diesel run engine. Indeed a lot of these technologies, whether it be turbo charge to improve fuel efficiency [7-12].

III. OBJECTIVES AND METHODOLOGY

In this work, it has been proposed to increase the power transmission by coupling internal combustion engine and electric motor and improve the fuel economy of hybrid bike in comparison to conventional bike. A plug-in hybrid, as the name suggests, requires plugging into the mains in order to fully recharge its battery. The vehicle can be run in just electric mode. The other type of hybrid electric vehicles is determined by how the power train propels the vehicle down the road and may be considered either series, parallel, or series-parallel. The designed layout of mild hybrid vehicle which is shown in the Fig.1.

A parallel hybrid is propelled by both an internal combustion engine (ICE) and an electric motor connected to a mechanical transmission. Power distribution between the engine and the motor is varied so both run in their optimum operating region as much as possible. There is no separate generator in a parallel hybrid. Whenever the generator's operation is needed, the motor functions as generator. In a parallel mild hybrid, the vehicle can never drive in pure electric mode. The electric motor turns on only when a boost is needed

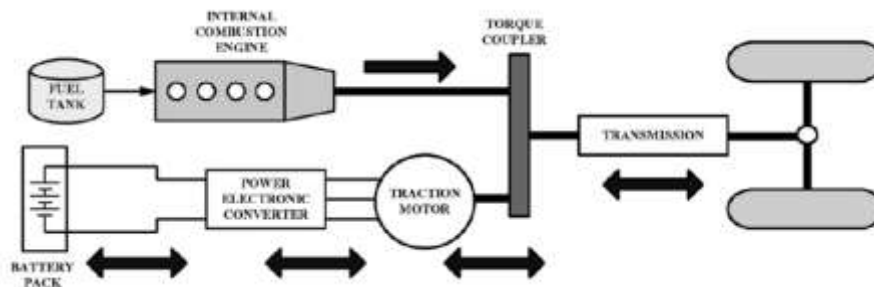


Fig.1 Layout of mild hybrid vehicle

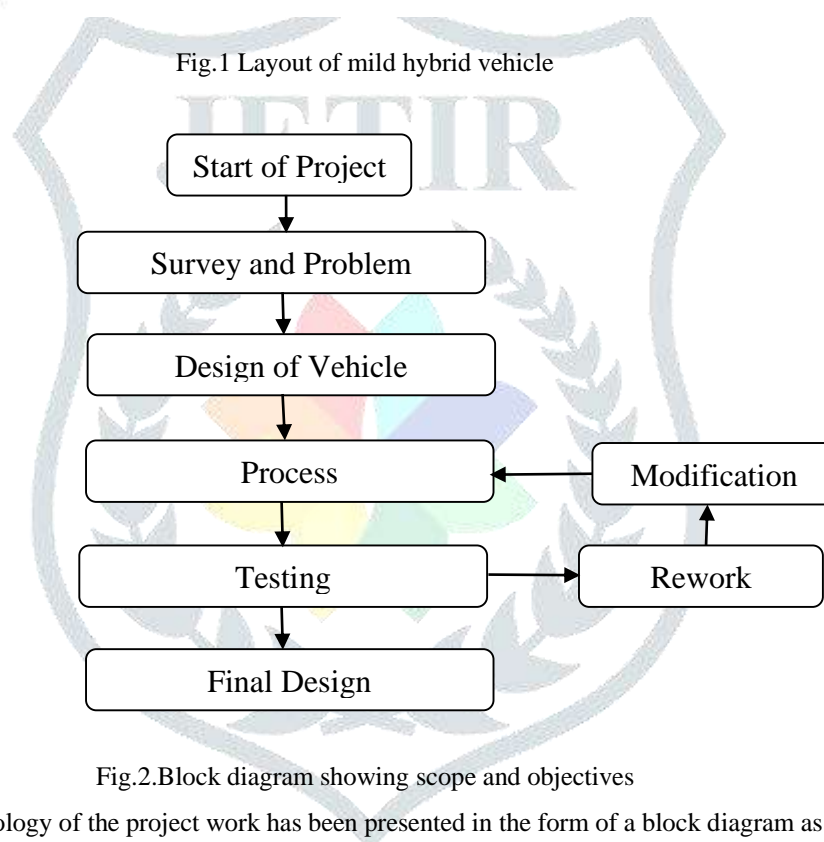


Fig.2.Block diagram showing scope and objectives

The objectives and methodology of the project work has been presented in the form of a block diagram as shown in Fig.2.

IV. WORKING OF HYBRID VEHICLE

Modifying of existing scooters into hybrid electric which runs on internal combustion engine and configuration of mild hybrid vehicle concept is shown in the Fig.3.

Fig.4 shows installation of BLDC motor to scooter which has engine capacity of 110cc. Also, the rear wheel gets an electric BLDC motor with the help of a flange plate and L-shaped angle plates. Flange plate used to connect rear wheel and the electric motor shaft which operated by electric power, the motor shaft placed as the rear wheel axis, the motor held by welding to motor collar to L-shaped angle plate to scooter chassis. It becomes a 2-wheel drive scooter with the conventional engine powering the rear wheel and electric motor driving the rear wheel.

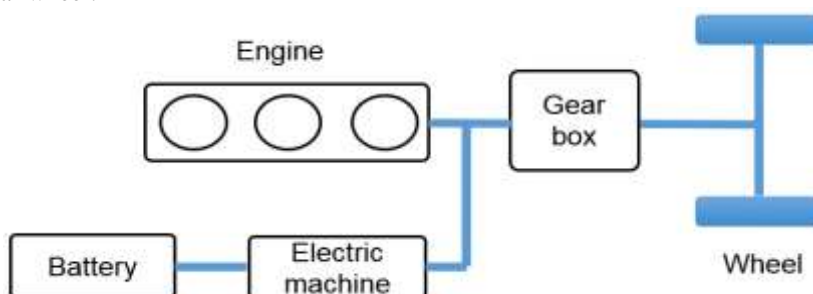


Fig.3 Parallel mild hybrid



Fig.4 BLDC motor installation

A conventional engine is pretty inefficient during start-stop traffic. The engine uses a lot of fuel during such situations and reduces the mileage significantly. By using economy mode for these in which scooter will start and run on BLDC electric motor. Hub mounted electric motor works during crawling traffic and does not need the fuel. Electric motors are much more efficient as they do not draw any power from the battery while waiting in traffic and idling. Second mode is power drive mode. In this case, scooter will start and run on Conventional ICE, which is coupled with the rear wheel. This mode can be used for emergency condition when batteries are completely discharged or if there is any problem in motor. The third mode is hybrid mode. In proposed system BLDC motor with 750W capacity and lead acid battery used which has capacity of 24 volts. For controlling acceleration of ICE as well as motor same controller is used. Here control units are used. One is BLDC motor controller which acts as a mediator for motor, accelerator, brake system and battery. Another control unit acts as a mediator for BLDC motor controller, IC engine and battery. To obtain good average, Lithium-ion batteries are required. For cost cutting purpose we are using lead-acid batteries. To obtain good speed and torque, high wattage BLDC motors are required to be used. Our main aim is to increase power and to improve performance efficiency of existing vehicles. When the battery has less charging, to increase the overall mileage is achieved by combining power of both that is IC engine and hub motor. During starting, as batteries are not used hence, life and performance of battery will improve.

V. RESULTS AND DISCUSSION

Initially the unnecessary parts of the bike were removed in proper way by using fabrication process and also convert the normal petrol bike to Hybrid bike by adding some specific components like lead-acid battery, electric BLDC motor, DC controller, electric throttle etc. and also fitted this all components in that 110 CC activa Honda. We fitted the flange to the rear wheel of the bike by using nut and bolts, the wheel drilled as per required number for fitting the flange the electric motor is fixed through the shafts which are welded and hold by L-shaped clamp and color. We fit lead-acid battery by preparing the new battery pockets by using fabrication. Also our lead-acid battery gives the good and proper backup to run the bike on electric motor and also charging is done while running the bike on engine. Our Hybrid bike properly runs on both engine and electric motor and also all components are fitted properly. After assembly of all the components the vehicle was tested as a whole for all the modes of the vehicle and the following results were obtained by comparing conventional and electric vehicle.

Efficiency- The motor and the engine average efficiencies of the vehicle were tested individually and were compared with their corresponding maximum efficiencies. We can see an increase in the total efficiency in the Hybrid system compare to conventional bike which run only by IC engine which have less efficiency. But compared to electric bike it have less due to use the IC engine which have only 25% efficiency in conversion of fuel energy to work energy.

Energy Management system - An Energy Management system was developed successfully which can make decisions based on speed to obtain maximum mileage and reduce fuel emissions. Comparatively hybrid bike has a moderate speed which higher then electric and lower than convention.

Emission - In this case also hybrid bike has a moderate emission produced which The CO₂ emission in an IC engine is maximum in all the speeds but the electric vehicles which are less emission as the motor only used in all the speed & range so the emissions are negligible. The emissions are less in hybrid compared to conventional vehicle in the speed range of 20-40, and the vehicle majorly runs in this range, hence it significantly decreases the emissions. So speed, range and fuel consumption the hybrid bike are better.

VI. CONCLUSIONS

The hybrid bike can be powered by dual source such as IC engine and electricity. Compared to ordinary bikes this hybrid bike is more efficient and economic. This hybrid bike will be an innovation in automotive era, it is more eco-friendly because it cause less pollution. The hybrid bike is a better solution for hiking fuel cost day to day. It can be configured to obtain different objectives, such as improved fuel economy and increased power. The fuel consumption decreased and the range of vehicle increased which resulted, better of overall vehicle performance, There is a need to develop batteries for HEVs (in our hybrid bike used lead acid batteries) whose requirement characteristics like energy density and specific power will be intermediate between those of EVs and HEVs. There is also a need to improve the battery life, number of deep discharge cycles and charging/discharging efficiencies even under cold climatic conditions.

A great deal of testing is required to determine its safety in a crash or fire. For electric propulsion motors, the future challenges were is light weight, wide speed range, high efficiency, maximum torque and long life. Controllers for these motors also need to be developed for the robust vehicle operations. Reliable and affordable power switching devices and associated control system were developed.

REFERENCES

- [1] G. Adi Narayana, Ashok Kumar and M. Ramakrishna, Fabrication of Hybrid Petro Electric Vehicle, International Journal of Engineering Research and Applications, 4 (10):142–144.
- [2] Sharada Prasad N and K R Nataraj, Design and Development of Hybrid Electric Two Wheeler Suitable for Indian Road Conditions, International Journal of Electrical & Electronics and Data Communication, 2(9): 59 – 62.
- [3] Harish N, Amar Thakur, Alwin George and Mahmad Ali, Hybrid Two-Wheeler, International Journal of Latest Engineering Research and Applications, 3(5): 45 – 47.
- [4] Toshali Mohanty, Ph.D. Thesis on Design of Hybrid Vehicles, Department of Electrical Engineering National Institute of Technology Rourkela.
- [5] Ruthvik P. Sankar, Sagar N, Sarthak J, , Shubham P. Toraskar and Yashvanth Kumar, Design and Development of Smart Hybrid Two Wheeler, International Journal of Innovative Research in Science, Engineering and Technology, 6(6).
- [6] Mohamed Mudassir B A and C. Thamotharan, Design and fabrication of Hybrid Two-wheeler, International Journal of 4Pure & Applied Science (IJPAS), 119 (12):10257-10263.
- [7] Karan C. Prajapati, Ravi Patel and Rachit Sagar, Hybrid Vehicle: A Study on Technology, International Journal of Engineering Research & Technology, 3(12):1076 –1082.
- [8] Dr. Nataraju S N, Prem Singh, Raghavendra Prasad C, Somashekar G and Manoj N, Fabrication and Development of Hybrid Vehicle (Scooter), National Conference On Advances In Mechanical Engineering Science (NCAMES-2016), :219 – 222.
- [9] Basil P Elias, Dino Devassykutty, John George and Akhila K, Hybrid Bicycle, IQSR Journal of Electrical & Electronics Engineering, :100-104.
- [10] Balasubramani N, Hari Prasath S, Jagadeesh Kumar A, Karna Prakash S and Karun Prasath D, Fabrication and Performance Analysis of Hybrid Two-Wheeler, International Research Journal Of Engineering And Technology, 5(3): 3672-3676.
- [11] Arun Eldo Alias, Geo Mathew, Manu G, Melvin Thomas and Praveen V Paul, Energy Efficient Hybrid Electric Bike with Multi -Transmission System, International Journal of Advance in Electrical Electronics and Instrumentation Engineering.
- [12] Tanuj Joshi, Ravikant Sharma, Vinod Kumar Mittal, Vikas Gupta and Om Parkash, Project on Fabrication Of Hybrid Bicycle For Minimizing Pollutant Emissions. International Conference on Future of Engineering Systems and Technologies Journal of Physics.

