Design And Implementation of An Efficient Hybrid Two-Wheeler Vehicles

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Abstract

Nowadays the population of people increases in high volume. Due to that transportation plays a major role to move one place to another place. So the need for vehicle is also high, there has been increase in usage of Oil and Gas vehicle leading to problems like Global Warming, climate change, shortage of fossil fuel, etc. Due to these reasons Automobile Companies have started doing research for making Hybrid Technology usable into the day to day life. So the Automobile companies have started producing the Electronic-Bike to overcome the above problems. There is a lack of rechargeable point in outer area ,this may arise unwanted delay as well as create lot of problems. To overcome these problems, we proposed a new methodology to develop a new hybrid vehicle which runs with the help of both Fuel and Electricity .This Paper is mainly concentrate on the survey on existing methodology ,explanation about the proposed technologies, their function, advantages, efficiency of the proposed system, and the fuels and raw materials used in the Hybrid Vehicle. Finally we conclude the paper with the advantages and disadvantages of Hybrid vehicle and discuss how this technology will take over the world in future .

Keywords: EV,Hybrid Vehicle.

INTRODUCTION:

About electric vehicle:

Every country has its own road and traffic regulations and therefore different requirements. This leads to a large number of vehicle types that are driven in different ways and local characteristics must be taken into account. Driving cycles play an important role in the design and adaptation stage of vehicle manufacturers. Many standardized driving cycles are already available for different purposes.Localized driving cycles can, therefore, be used to capture relevant differences in driving style, vehicle type, environmental conditions, and energy consumption, which play an important role in elec-tric vehicles (EVs). Nowadays, many driving cycles focus on estimating emissions generated by realistic or synthetic driving scenarios. Only a few driving cycles designed for EVs. most E2Ws are not subject to regulations that prescribe driving cycle testing, naturalistic driving cycles can help to improve E2W design, operation, control, power and range estimation. Now a days using only the EV there are so many drawbacks such as if the power of the battery is totaly drained the vehicle will stop runing there are no recharing points in india so it is one of the mojor problem but it can be used for near places. there is no two wheeler that use the concept of hybrid. i am here to use the concept of hybrid in two wheeler.

About hybrid vehicle

A hybrid vehicle is one that uses two or more distinct types of power, such as submarines that use diesel when surfaced and batteries when submerged.Nowadays there are more hybrid cars that uses both electrical power and fuel power and the manufactures

SURVEY ON EXISTING:

A more universal classification of the many different types of electric vehicles will certainly appear, perhaps in a near future, as a result of their mass production, originating from carmaker associations and research teams efforts worldwide. As a matter of fact, a literature review makes it clear that a nomenclature convergence is already easily perceived. This nomenclature is stronger and more definitive when EVs classification is carried out based on either the energy converter type(s) used to propel the vehicles or the vehicles' power and function (Chan, 2007; Maggetto & van Mierlo, 2000). When referring to the energy converter types, by far the most used EV classification, two big classes are distinguished, as depicted in Fig1.

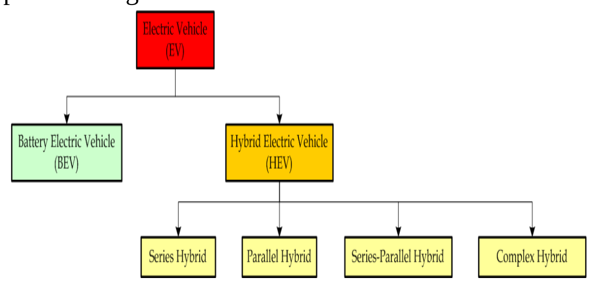


Fig (1) - Classification of electric vehicles

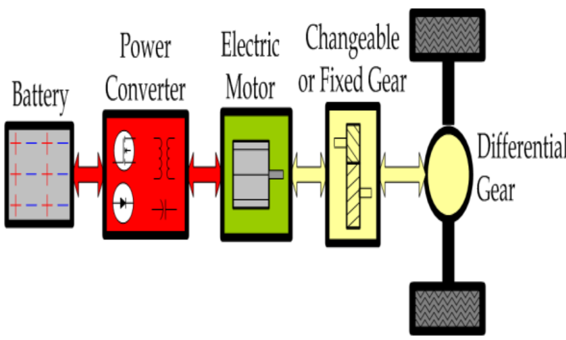
Classification for HEVs places them into the following three categories, according to the electric motor power under the hood: micro hybrid, mild hybrid, and full hybrid (Chan, 2007). In effect, this classification is a measure of the hybridization degree of the HEV (Maggetto, 2000). In other words, it indicates how much important is the role played by the electric motor in the car propulsion. Micro hybrids use electric motor of about 2.5 kW at 12 V. The EM is only a helping hand to the ICE, in the start and stop operations, which dominate in city driving. Even in this driving mode, energy savings is of only about 5% to 10%. This is a very poor economy, obviously with a negligible impact on fossil fuel dependence, metropolitan area air pollution and greenhouse gas emissions, the challenging triad. C3 Citroen is a commercial example. EM in mild hybrids is of 10-20 kW at 100-200 V. As expected, energy savings is greater and reaches about 20%-30%. Commercial models are Honda Civic and Honda Insight. Though fuel (and thus operational) economy may compensate for their greater initial cost as compared to ICE equivalents, turning mild HEVs attractive for consumers, from the aforementioned triad's viewpoint, even if massively adopted, they could not be a remedy, given the targeted global CO2 reduction and, even worse, if one takes into account that world fleet (vastly of ICE vehicles) is increasing more and more, as new consumers come into life in emerging countries. For the sake of illustration, only in Brazil, passenger car fleet doubled in the last decade. The last member of this category is the full hybrid, which embeds an EM of circa 50 kW at 200-300 V and, in city driving, yields energy saving of 30%-50%, thanks to complex control algorithms that manage to operate the ICE, when needed, always at maximum efficient region, directing the excess energy to batteries. Energy is also recovered and saved into the battery and/or super capacitor, during coasting and regenerative breaking. Toyota Prius is a genuine member of this family. Though full hybrids can be an auxiliary player to combat the triad, their efficiency figures are much less than needed to curb the triad by themselves, for the same reasons discussed above. At best, in this author's opinion, they serve to delay the climate tragedy and to give some psychological relief to their owners.

ABOUT BEV AND HEV:

As cars go electric, new design methodologies and power train topologies come to life to optimize them according to criteria such as energy efficiency, types of energy sources, types of energy storage devices, hybridization rate, driving range, power performance, driver's comfort, production cost, ownership cost, and so on (Chen et al., 2009). As market has different demands in distinct regions of the world, and in every region there are different market segments as already discussed, it is normal that a great number of BEVs and HEVs models exist and will continue to increase (Xiang et al., 2008; Gulhane et al., 2006). Automakers strive to create car models that better fulfil the market needs, while maximize their income.

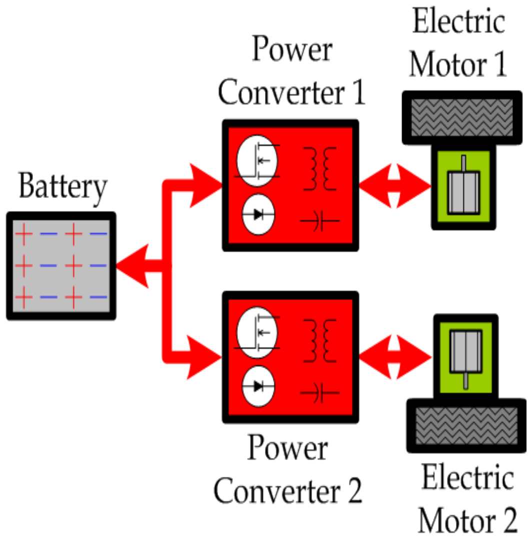
BEVs architectures

Fig 2 Illustrates one of the simplest topology for battery-electric vehicles. The energy stored in the battery (or in a battery pack) is used by the power converter to drive the electric motor. This, in turn, drives the two wheels by means of a fixed or changeable gear and a power splitting differential gear. The power converter unit may include a dc-dc converter and a motor driver. It all depends on the motor type and ratings and on the battery voltage, energy and power density. For maximum efficiency, the vehicle's kinetic energy must be converted to electrical energy by the motor/generator and stored in the battery pack via the power converter, whenever the brake pedal is pressed and during coasting. Of course, the electronic detail of the power converter (e.g., topology, control strategy) is a function of the employed motor type, battery technology and ratings, etc. Anyway, in order to regenerate energy, the power converter must be able to control the power flow in both directions: from the battery to the motor as well as from the motor to the battery. If the battery type cannot be fast charged with the recovered kinetic energy, either a super capacitor or a flywheel may be used for temporary energy storage. If possible, the changeable (or fixed) gear may be cut out, to diminish the mechanical parts counting. In this case, it is replaced by more complex variable speed controller for the motor.



Fig(2) - One-motor BEV

Pure electric vehicles may adopt two (or four) in-wheel motors in their power trains, as sketched in Fig. B. In this case, every motor is driven by a dedicated power converter that must control wheel's speed and torque. Moreover, a central electronic controller must coordinate speed differences (in steering wheels), whenever needed or as a result of wheel slippage, as long as a differential power splitting device is no more present. As expected, the simplification of the mechanical design is attained at the expense of increased complexity of the power electronics and controllers. On the other hand, augmenting the motor number, for a desired vehicle power and performance, leads to significantly smaller motors and, what is less obvious, to lower rated power switches and passive electronic parts, which influence on drive cost and reliability. One interesting operating mode for multiple-motor BEVs is that the vehicle can continue to operate, though at a somewhat reduced power, if one of the motors (in case of two-motor BEVs) gets out of service. Comparing Figs.2 and 1, one notices that in-wheel motor propulsion topology reduces radically EV's number of mechanical links.

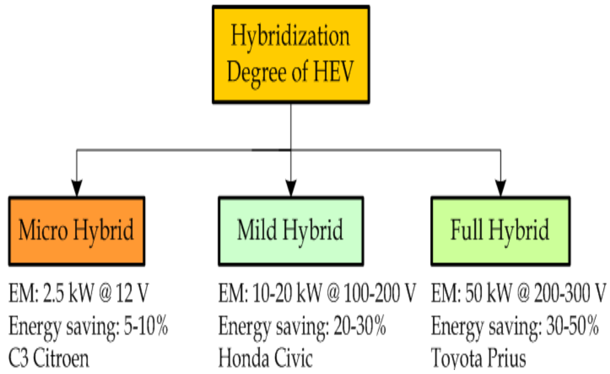


Fig(3) - Two-motor BEV

Upto this date, owing to battery limitations such as high initial cost, relatively low energy and power density, and excessive weight, BEVs are not as attractive as HEVs, because of limited driving range, performance and comfort. Nevertheless, as BEVs are the only zero-emission cars, they must be viewed as an effective tool to combat greenhouse gas emissions, air pollution and petrol dependency. There are arguments to reinforce the idea that strong governmental incentive policies should be adopted in as many countries as possible to benefit owners of BEVs. Examples of such incentives are: government rebate to each BEV owner (say 10% of vehicle price), exemption of purchase tax, exemption of road maintenance fee, road passing fee and parking fee. In some countries some of these actions are under way (Xiang et al., 2008). Data of the U. S. Department of Transportation reveal that 50% of daily vehicle travel is less than 48 km and average daily vehicle trip is about 16 km (Kruger & Leaver, 2010). Today's batteries feature enough energy to easily enable second-car family BEVs (though this class was originally proposed to HEVs) to travel these distances without recharge. Therefore, there is room for a massive production (and adoption) of pure electric vehicles. However, the massive use of BEVs will be no good from the carbon emission viewpoint, if fossil fuel (coal or petrol) is used to generate the electricity that is ultimately put into the car batteries. To be effective, car batteries must be recharged with energy coming from carbon-free resources (such as solar, wind, hydro, and nuclear). On the other hand, every country must study its grid capacity to deal with a big number of new (and of special profile) consumers. The impact of massive use of BEVs on the power grid might be considerable. Yet, in the future, BEVs can serve as distributed energy storage devices that may play an important role in regulating energy demand.

HEVs architectures

While BEVs are propelled by electric motors only, HEVs employ both ICE and electric motor in their power trains. The way these two energy converters are combined to propel the vehicle determines to the three basic power train architectures: series hybrid, parallel hybrid, and series-parallel hybrid. Complex hybrid refers to architectures that cannot be classified as one of these three basic types.



Fig(4) - Hybridization

Series HEV

As depicted in Fig.5, in series HEVs the wheels are only driven by the electric motor that also operates as generator during break and coasting, augmenting thus the overall energy efficiency. This topology simplifies the powertrain design, since clutch and reduction gear are not necessary. Speed and torque control is carried out by controlling the electric motor only, which is a very efficient power converter. The ICE's role is charging (or recharging) the battery and supplying energy to the electric motor, always being operated at maximum efficiency. This is another strategy that helps increasing the overall energy efficiency. Series HEVs are said to be ICE-assisted electric vehicles, for obvious reasons. An ICE, one generator and one motor are one of the main disadvantages of series HEV. Moreover, as the vehicles must be capable of cruising with maximum load against a graded road, all the machines, i.e., the ICE, the generator and, of course, the electric motor, must be powerful enough, which will result in relatively over-dimensioned machines. This leads to cost increase.

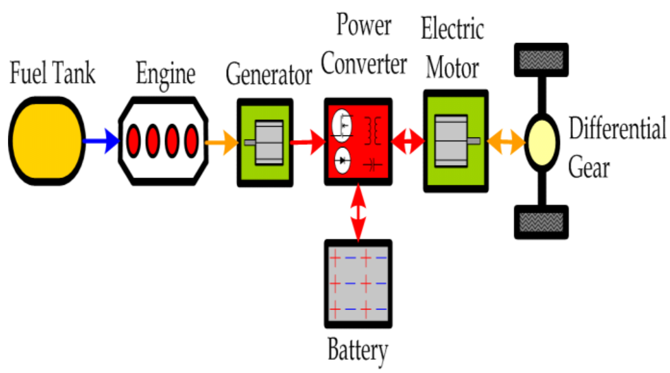


Fig (5) - Architecture of series HEV

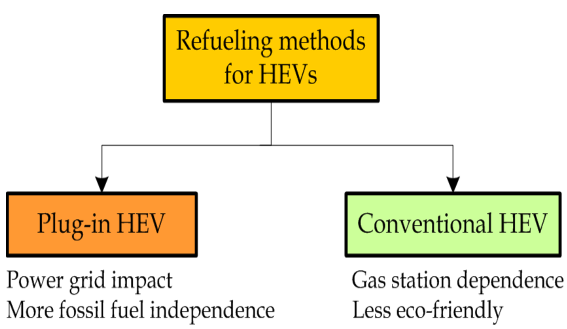
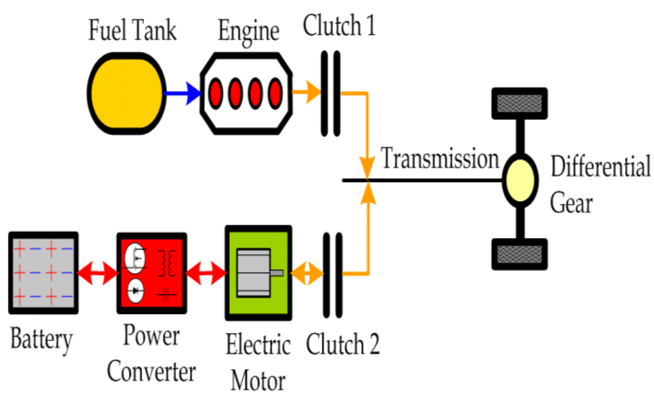


Fig (6) - Recharging methods for HEVs

Parallel HEV

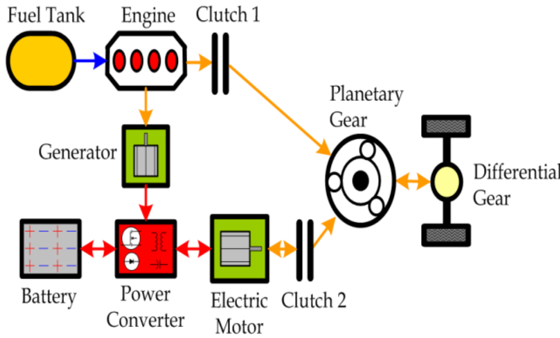
In parallel HEVs, propulsion can be the result of torque generated simultaneously by ICE and the electric motor. As illustrated in Fig. 6, this technology provides for independent use of the ICE and electric motor, thanks to the use of two clutches. One of the key features of parallel HEVs is that, for a given vehicle performance, the electric motor and ICE too, can be significantly smaller than that achieved with series architecture, what allows for a relatively less expensive vehicle. On the other hand, wheel propulsion by the ICE leads to superior dynamic performance of this topology. Complex powertrain controller may enable up to the following six different operation modes: electric motor on and ICE off; ICE on and electric motor off; electric motor on and ICE on, with both of them cooperating to propel the vehicle; ICE on supplying power to drive the vehicle and to drive the electric machine that, in this case, runs as generator to recharge the batteries with energy coming from the fuel tank (maximum overall energy savings can be achieved by running the ICE at maximum efficiency speed, while pumping the excess energy to the batteries); ICE on and dedicated to recharge the batteries through the electric machine (i.e., the vehicle is stopped); regenerative breaking, with energy being stored in the batteries (or in a supercapacitor), via the electric machine. This profusion of operation modes can be conveniently handled by the controller to optimize the driving performance or fuel savings, for example. Parallel HEVs are said to be electric motor-assisted ICE vehicles and their architecture are most appropriate for vehicles of the high class car segment and full hybrid. As already commented, powertrain sizing is carried out based on the desired dynamic performance for the vehicle, cruising speed, and a set of parameters such as maximum road grade, car weight, load, and so on. As expected, this activity counts heavily on computer simulation programs, before prototyping begins (Wu et al., 2011).



Fig(7) - Architecture of parallel HEV

Series-parallel HEV

At the expense of one more electric generator and a planetary gear, a quite interesting architecture for the powertrain is obtained (Fig.7), which blends features of both series and hybrid topologies, and is conveniently named series-parallel architecture. Though more expensive than any of the parent architectures, series-parallel is one of the preferred topologies for HEVs, specially when automakers target excellence in dynamic performance and high cruising speeds for their models. Like parallel HEVs, the hybridization degree is adjusted as a trade-off of performance, cruising speed, fuel economy, driveability, and comfort. As can be concluded by a rapid exam in Fig.7, half of dozen or more operation modes are possible for series-parallel HEVs, which put pressure over the controller development and test. Needless to say, these are devised and developed with the help of computer simulators and experience.



Fig(8) - Architecture of series-parallel HEV

Complex HEV

Fig. 9, sketches an architecture named complex HEV. This name is reserved to the topologies that cannot be classified as a combination (or rearrangement) of the basic architecture types analysed to this point. The two bidirectional power converters are utilized, one for the main electric motor, and another one for the auxiliary electric motor. Unlike in series-parallel HEVs, both these motors can propel the wheels concomitantly. In other words, three different torque sources add up to drive the wheels, thus leading to a better foreseeable dynamic performance vehicle and clearly higher cruising speed car. At times, the secondary electric machines operates as generator, in order to recharge the battery or to save into this the excess ICE energy, as this can run at optimal speed generating more power than needed by the vehicle. Once more, the number of possible operation modes for the complex HEVs is half a dozen or greater. Component sizing (electric motors/generators, ICE, gears, battery, power converters, etc) is a very complex task. Control program development and test are highly challenging.

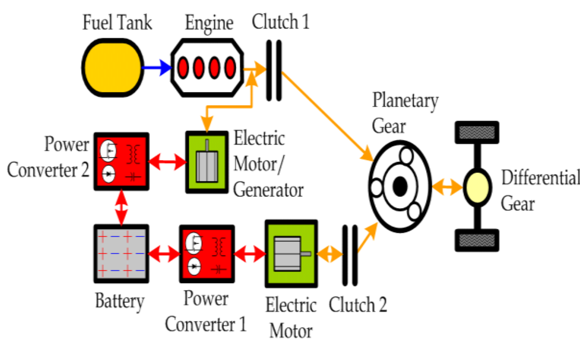


Figure 9 - Architecture of complex HEV

PROPOSED METHODOLOGY:

In this paper we proposed a new methodology to implement Hybrid Two Wheeler and we are discuss about the concept which we are used .For that implementation purpose we have taken hero honda cd100 bike to modify.

THE MATERIALS REQUIRED TO MODIFY:

1.750wats 48 volt BLDC motor specifications:

Construction: Permanent Magnet
Speed (RPM): 450rpm
Commutation: Brushless
Voltage (V): 48
Efficiency: 75%
Output Power: 750W

Rated speed 450RPM
No load speed - 500Rpm
Splash Resistant
Hall effect sensor feedback

Fig (10) - BLDC Motor

APPLICATIONS

The Main purpose and application of the BLDC motors areas follows,Industrial Automation System,Unmanned Aircrafts, Consumer Electronics,Electric Vehicles, Robotics,Computer Hardware etc.

1. Control Unit

For Implementation purpose we are using E-Rickshaw Control unit to control all the activities. The specifications and applications are given below

Fig (11) - Control Unit

SPECIFICATION:

1. Water proof
2. Speed controller opereter
3. Temperature resistant
4. Sound less

POINTS TO REMEMBER:

1. The thin wires include the input supply and the supply to motor.
2. The lean wires include the accleration,indicators,brake.

3. 12 volt converter

The Volt Converter used to convert the current from 48 volts to 12 volts

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Fig (12) Volt Converter

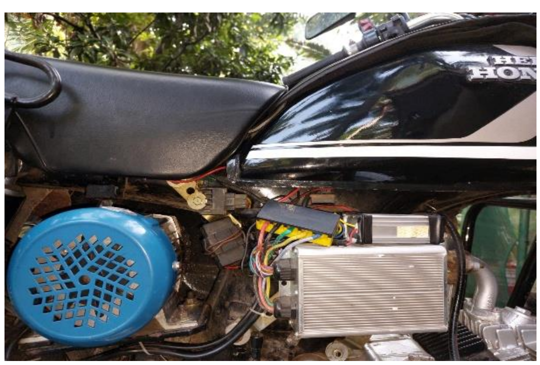
APPLICATIONS OF CONVERTER:

This type of Converter is mainly used in Solar Panel, Scooter, E-Bikes, Wheelchairs, Power wheels, LED Lights,Golf Cart,Boat and Yach. 4.48 volt 24 AH lithium iron phosphate battery

1. Very small in size and weight compared to ni-cd,ni-mh,li-ion and lead acid batteries
2. high discharge rate performance
3. maximum capacity-30AH or 30000 mah
4. battery voltage 48v
5. long life with full capacity for upto 2500-3000 charge cycles

PROCESS DONE:

In this work ,we have fixed the motor just near the wheel of two wheller and the control unit on the place of old battery on the two wheller then the contols of motor was given at left handle bar.i didn't disturb the old circuit or process. then the battery was fixed at the sperate box to hold that.if we inbuilt the battery it is very diffiult to recharge it .



SAMPLE IMAGES:

ADVANTAGES:

- Hybrid two wheelers can important in the energy transition process
- It can reduce our use of fossil fuels
- It reduce air pollution, particle pollution and noise pollution
- Hybrid two wheelers can help to slow down global warming
- Energy can be used quite efficiently
- Hybrid cars/two wheelers are often not as heavy as conventional cars
- Lower emissions and better mileage
- Hybrid two wheelers use no energy during idle state, they turn off and use less than petrol engines at low speeds
- Due to the regenerative braking technology, the batteries need not be charged by an external source
- **LIGHTER CARS:** Hybrid are manufactured with lightweight materials, which allow vehicles to run on less energy. Their smaller sized and lightly built engines also contribute to conserving energy
- **HIGHER RESALE VALUE:** As more and more people are getting tired of gasoline price fluctuations and care about our planet, they are becoming more willing to make the switch to hybrids. As a result, the resale value of such vehicles keeps increasing.

DISAVANTAGES:

- **LESS POWER:** Hybrids combine both an electric motor and a gasoline engine, with their gasoline engine primarily operated as the power source. Therefore, neither the gasoline engine nor the electric motor works as strongly as they do in conventional gasoline or electric cars. But hybrids work just fine for "normal" drivers who usually drive around the city.
- **HIGHER RUNNING COSTS:** Due to their engine and continuous development in technology, it may not be easy to find a mechanic with the required expertise. And they would likely charge you a little more for maintenance and repairs. Moreover, the highest running cost occurs when replacing the battery.
- **POOR HANDLING:** Hybrids have more machinery than conventional cars, which adds extra weight and reduces fuel efficiency. so, hybrid car manufactures have had to make smaller engines and batteries to cut down on weight. But this results in reduced power for the vehicle and support in the body and suspension.
- **ELECTROCUTION RISK:** The batteries in hybrids contain a high voltage, which can increase the risk of the passengers and rescuers being electrocuted in the event of an accident.
- **TEMPORARY SOLUTION:** It takes a long time to charge and then extra weight of batteries reduce fuel efficiency. They may have less power when compared to standard ICE (Internal combustion engine) vehicles.

WORK FUNCTONS:

The function of an vehicle is based on the electrical motor and the fuel. when the two wheeler is switched on , the current passes from the battery to the converter .The converter control the flow of current , it converts the 48volt to 12volt then the 12volt supply was given to the control unit . then the control unit control harness of the two wheeler and battery supply. When the accelaration was given to the control unit. The control unit controls and give the required amount of current to the motor based on the accelaration given by the rider.When the power of the battery is fully exhausted in the two wheeler, then manually converted from electrical power to fuel power then the vehicle start functioning as the normal bike.

EFFICENCY:

- Speed--45 to 50 km
- Per charge-58 to 60 km.
- Recharging time-3 hours
- Uses both Electrical and fuel power.

CONCLUSION:

Hybrid vehicles have plays a major role in future of transportation. Driving cycles plays an important role in the design and adaptation stage of vehicle manufacturers. Many standardized driving cycles are already available for different purposes.By using the EV Vehicles, Most EVs have pretty short ranges.. Although EV range is constantly improving, it’s still have some drawbacks,Recharging can take a while when it is Compared to the minutes it takes to fill up a conventional car at the gas station. They’re a large initial investment. If you’ve never shopped for an EV before, you might experience a bit of sticker.Charging station availability is inconsistent. Perhaps you live in an area where electric vehicles are relatively.To overcome these issues ,i have modified an fuel bike into hybrid bike to provide less fuel consumption aswell as less electricity and based upon the millege and RPM our proposed methodology provides better results than EV vehicles .In future we try implement the concept into four wheeler etc.

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