FUEL POWERED ELECTRIC VEHICLE

DURAI J [1], JAFFAR SADIQ G[2], N VIDYASAGAR[3], SRIKANTH P[4], HANAMANT H[5]
[1] *Assistant Professor*, [2,3,4 & 5] UG Students
Department of Mechanical Engineering,
Sri Sairam College of Engineering

ABSTRACT

The potential for alternative technologies in automotors such as electric vehicles in india as in the case of many other comparable markets depends on improved battery technologies, driving ranges, government incentives regulations, lower prices and batter charging infrastructure.

While many of the factors that influence the EV market are understood intellectually, we carried out a customer survey to study perceptions and expectations of potential for alternative technologies in automobiles such as electric vehicle (EV) and hybrid (EV).

Assessing future demand for electric vehicles was somewhat challenging since it meant testing consumers preference for a product with which they are largely unfamiliar. For this reason, we focused on uncovering consumers familiarity with EV technologies and products. With there opinions around price , brand, range, charging, the infrastructure, and the cost of ownership , and with the consumers imagined "fits" of an EV in his or her lifestyle given a range of demographic parameters.

Hybrid transmission are one of the new technology option that has the main advantage of reducing fuel consumption and therefore reducing the amount of co2 in the atmosphere. Hybrid vehicle drivetrains transmit power to the driving wheels for hybrid vehicles. A hybrid vehicle has multiple forms of motive power.Hybrids come in many configurations. For example, a hybrid may receive its energy by burning petroleum, but switch between an electric motor and a combustion engine.

INTRODUCTION

An electric vehicle also called as EV, uses one or more electric motors or traction motors for. An electric vehicle may be powered through a collector system by electricity from off-vehicle sources or may be self contained with a battery, solar panels or an electric generator to convert fuel to electricity .

EVs first came into existence in the mid -19th century, when electricity was among the preferred methods for motor vehicle propulsion providing a level of comfort and ease of operation that could not be achieved by gasoline cars of the time. Modern IC engines have been the dominant propulsion method for motor vehicles for almost 100 years, but electric power has remained common place in other vehicle types, such as trains and smaller vehicles of all types.

The 1960s and 1970s saw a need for alternative fueled vehicle to reduce the problems of exhaust emission from IC engines and to reduce the dependency on imported foreign crude oil.

During the year 1960 to the present many attempts to produce practical electrical vehicles occured and continued to occur.

The overall impact of the electric vehicles ultimately benefits the people compared to gasoline powered vehicles, EV are considered to be 97% cleaner producing no tail pipe emissions that can place particulate matter, carcinogens released into the atmosphere by gas powered vehicles. Can increase asthma conditions as well as irritate resperatory system.

LITERATURE SURVEY

Recently renewed interest in reducing dependence on fossil fuels, coupled with increasing pressures to create more environmentally begin modes of transportation, have compelled the automotive and fuel production industries to investigate alternative fuels. Consumer demand for high maximum power leads to the increased engine displacement. Since I.C. engine exhibits low efficiency at part load, the mean efficiency of the propulsion system is decreased. Many researchers have contributed in exploring and evaluating these alternatives from various perspectives. Daniel and Rosen have discussed the availability, cost, performance and emission related several issues. Introduction of hybridization in vehicles will solve most of the problems that a conventional vehicle is facing. The hybrid vehicles, with inherent abilities to significantly reduce fuel consumption and emissions without compromising with performance and safety are by far emerging as the most viable and promising alternative option worth considering. This paper mainly explains a type of powertrain system of HEV.

Basics of HEV

1.0 Hybridization

A hybrid vehicle is a vehicle with multiple distinct energy sources which could be separately or simultaneously operated to propel the vehicle. Many hybridization configurations such as fuel cell, gas turbine, solar, hydraulic, pneumatic, ethanol, electric and many more are proposed over the years. Among these, the hybrid electric vehicles, integrating two technically and

commercially proven and well established technologies of electric motors and I.C. engine, allowing drawing upon their individual benefits have been widely accepted by the technologies and users.

1.1Hybrid Electric Vehicle (HEV)

This is the most commonly adapted hybrid vehicle which combines propulsion sources of an electric motor and an I.C. engine. The power supply to the electric motor comes from onboard batteries. In a HEV, the I.C. engine cooperates with an electric motor which leads to a more optimal use of the engine. Driving in city traffic involves frequent starts and stops of the vehicle. During idling, the engine consumes more fuel without producing useful work thus contributing to higher fuel consumption, less efficiency and unnecessary emission from exhaust. The HEV solves the problem by switching to power transmission through the motor and shutting off the engine. This way no fuel will be consumed during idling with no exhaust emission. Another advantage of HEV is that when fuel tank gets empty while driving the engine, the vehicle can be driven on electric power within its maximum range.

1.2 Types of Hybrid Powertrain

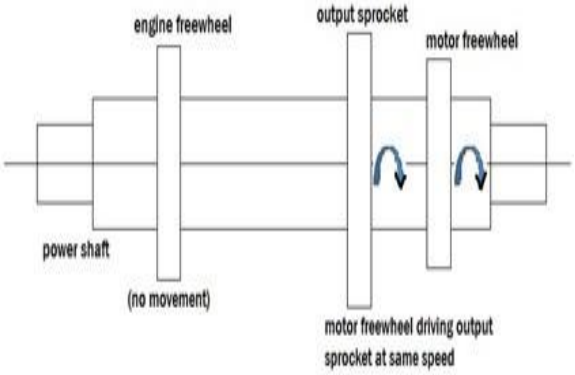
Powertrain in any vehicle refers to the group of components that generate power and deliver it to the road surface. Hybrid vehicles can be classified into three basic categories of powertrain systems which are briefly discussed below.

1.2.1 Powertrain using Chain-Sprocket Mechanism

A new type of powertrain is introduced here using freewheels and chain wheels. In parallel hybrid powertrain system two power sources are mechanically coupled. If they are joined at some axis truly in parallel, the speeds at this axis must be identical and the supplied torques add together.

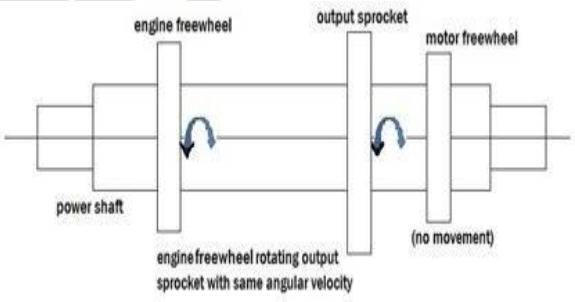
With cars it is more usual to join the two sources through a differential gear. Thus the torques supplied must be the same and the speeds add up, the exact ratio depending on the differential characteristics. When only one of the two sources is being used, the other must also rotate in an idling manner. In this case, the idle source can be connected to the output shaft using freewheel or a one-way clutch. When only one of the two sources is being used, the other must still supply a large part of the torque or be fitted with a reverse one-way clutch or automatic clamp.

The gearbox assembly gets its power from the power-transmitting shaft, which is the most important component of any vehicle. The power-transmitting shaft is mounted on the chassis at an optimal position and it is supported by bearings mounted on the chassis. The shaft is connected by a chain-sprocket mechanism.



Transmission from Engine

The power shaft is welded with total three sprockets. Two of the sprockets are freewheels, the ones that are connected on the rear wheel of a bicycle. Each of the two freewheels on the shaft are coupled with the engine input and electric motor input using a chain drive power transmitting assembly and are welded onto the shaft on its either ends. The uniqueness of freewheel is that it disengages the driveshaft from the driven shaft when the driven shaft rotates faster than the driveshaft. That means, this sprocket transmits power only in one direction and rotates freely if rotated in the opposite direction. The third sprocket on the shaft is a conventional chain wheel coupled with the gearbox assembly input using chain drive power transmitting mechanism. This chain wheel is welded onto the power-transmitting shaft at the center portion. This will make sure that it will rotate all the time irrespective of whether the power-transmitting shaft is driven by the electric motor or the engine. The motor output shaft is mounted with the same freewheel as used on the power shaft with same module and number of teeth since no amplification or reduction of RPM is required.



Transmission of Motor

1.2.2 Charging of Batteries

When driving a vehicle on electric motor, the stored energy in the batteries gets used up quickly.Batteries of a HEV can be charged either by solar charging or through regenerative braking.

1.2.3 Regenerative braking

A regenerative braking system used in automobiles converts the kinetic energy produced while stopping the vehicle into a storable energy form, rather than allowing it to dissipate as heat, which is the case in conventional braking systems. The energy that is recouped during braking is saved and re-routed into the battery packs, which in turn provides power to the electric motor that then supplements the main drive engine.

1.3 WORKING PRINCIPLE

In a traditional hybrid vehicle, we have a complete electric car. It includes an electric motor to provide all of the power to the wheels, as well as batteries to supply the motor with electricity and a completely separate gasoline engine powering a generator.The engine is very small (10 to 20 horsepower) and it are designed to run at just one speed for maximum efficiency. The purpose of this small, efficient engine is to provide enough power for the car at its cruising speed.

During times of acceleration, the batteries provide the extra power necessary. When the car is decelerating or standing still, the batteries recharge. This sort of hybrid car is essentially an electric car with a built-in recharger for longer range. A regenerative braking system used in automobiles converts the kinetic energy produced while stopping the vehicle into a storable energy form, rather than allowing it to dissipate as heat, which is the case in conventional braking systems. The energy that is recouped during braking is saved and re-routed into the battery packs, which in turn provides power to the electric motor that then supplements the main drive engine. The advantage is that the small, efficient gasoline engine gets great mileage.

2. Hybrid Types-Configuration

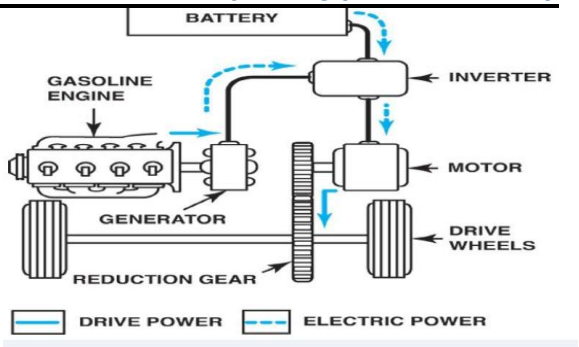
Hybrid Electric Vehicles (HEVs) fall into three basic categories

1. Series Configuration.
2. Parallel Configuration.
3. Power split Configuration.

2.1 SERIES CONFIGURATION

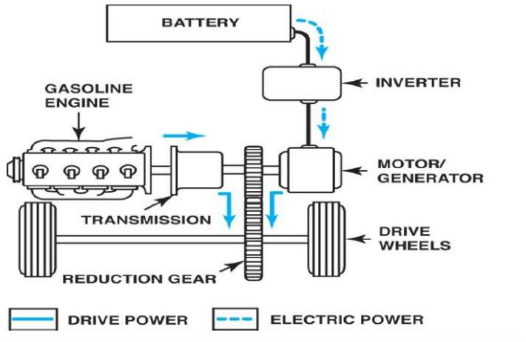
- The engine never directly powers car wheels.
- Instead, the engine drives the generator, and the generator charges the battery which powers an electric motor that drives the wheels.
- A series hybrid is always a strong hybrid, since all the required functions (start/stop, regenerative braking, and hybrid driving, electric driving) are possible.
- Series hybrids are currently used predominantly in diesel-electric locomotives and city-buses.

2.2



PARALLEL CONFIGURATION

- The engine connects to the transmission, as do the batteries and the electric motor.
- So both the engine and the generator/motor can supply power to the wheels, switching back and forth as driving conditions vary.
- In parallel hybrid vehicles the internal combustion engine and an electric drive contribute to driving the vehicle independently of one another.
- Parallel hybrid drives come in a mild-hybrid variant (start/stop, regenerative braking, hybrid driving) or in a strong-hybrid variant (additional electric driving).
- Purely electric driving is not possible with this drive configuration. The electric drive can in fact be used as the sole drive source, but the internal-combustion engine is always engaged when



driving.

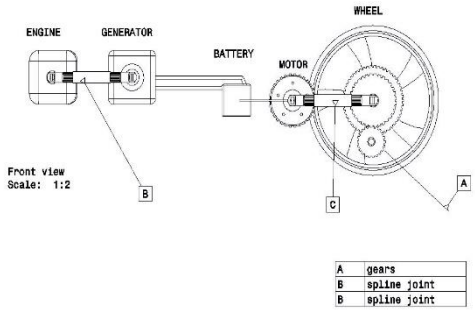
2.3 POWER-SPLIT CONFIGURATION

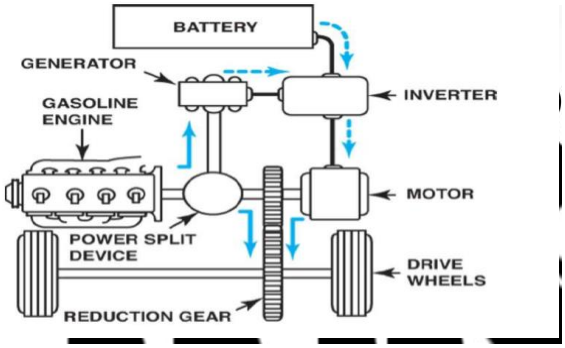
- The engine drives the one axle while the electric motor drives the other.
- Engine can run at a speed independent of vehicle speed, but still can directly give power to the wheel.
- Power-split hybrid vehicles combine features of parallel and series hybrid vehicles. Some of the engine power is converted by a first electric drive into electric power, the remainder-together with a second electric drive-driving the vehicle.

A power-split hybrid is always a strong hybrid, since all the required functions (start/stop, regenerative braking, and hybrid driving, electric driving) are possible.

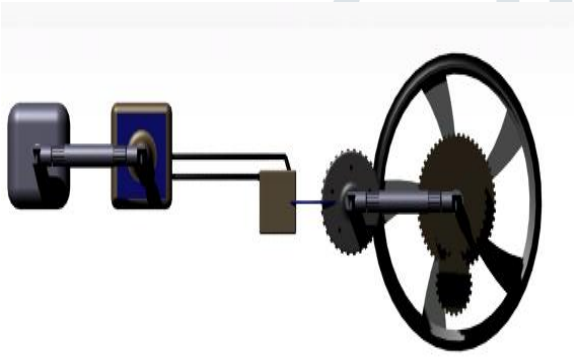
MODELS

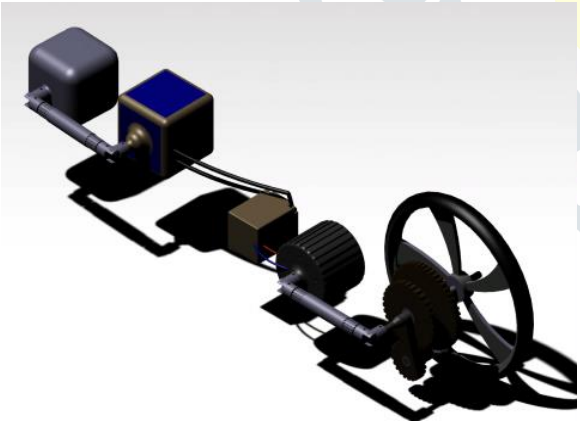
2-D MODEL





3-D MODEL





Advantages

- Environmentally Friendly
- Financial Benefits
- Less dependence on Fossil Fuels
- Regenerative Braking System
- Built From Light Materials
- Higher Resale Value

Disadvantages

- Less Power
- Can be Expensive
- Poorer Handling
- Higher Maintenance Costs
- Presence of High Voltage in Batteries

CONCLUSION

Hybrid-electric vehicles (HEVs) combine the benefits of gasoline engines and electric motors and can be configured to obtain different objectives, such as improved fuel economy, increased power, or additional auxiliary power for electronic devices and power tools

The transmission of power using freewheels and chain wheels are very cheap and reliable. One disadvantage is that driving on electric power is not a good option for a long distance travel. Though this combined power train system can become much useful in more stop and go traffic situations. With the use of this powertrain system, the overall fuel consumption and fuel economy is improved. Such vehicle would run on fuel but would use its electric motor to boost the power when needed. The costs of HEVs are a little more than the conventional cars but they more efficient and the exhaust emissions are less.

The transmission of power using freewheels and chain wheels is very cheap and reliable. One disadvantage is that driving on electric power is not a good option for a long distance travel. Though this combined power train

system can become much useful in more stop and go traffic situations. With the use of this powertrain system, the overall fuel consumption and fuel economy is improved. Such vehicle would run on fuel but would use its electric motor to boost the power when needed. The cost of HEVs are a little more than the conventional cars but they more efficient and the exhaust emissions are less.

This paper presented an intelligent predictive algorithm for improving reliability feature using fuzzy logic, a fault detection and a fault correction algorithm for fault-tolerant system, specific hybrid vehicles. We used the most common type of hardware redundancy named TMR, which means we increase input module from one to three modules in order to increase reliability feature. If an error occurs in one of these modules, two non-faulty modules produce final output. If all inputs are faulty, the final input will be the last correct output.

REFERENCES

1. Man Ho Kim , S. L., Kyung Chang Lee . "A fuzzy predictive redundancy system for fault-tolerance of x-by-wire systems." Elsivier,2011.

2. E. Dubrova, Fault-Tolerant Design, New York Heidelberg Dordrecht London: Springer, 2012.

3. M. Jain and R. Gupta, "Redundancy Issues in Software and Hardware Systems: an Overview," International Journal of Reliability, Quality and Safety Engineering, vol. 18, no. 1, p. 61–98, 2011.

4. A. Bemporad, "Model Predictive Control Design: New Trends and Tools," Decision and Control, 45th IEEE Conference on, 2006.

5. Dr G. Reza Latif-Shabgahi, D. S. B., Dr J. M. Bass, "Smoothing voter: a novel voting algorithm for handling multiple errors in fault-tolerant control systems." Elsivier 27, (2003).

6. Faraneh Zarafshan, G. R. L.-S., Abbas Karimi (2010). "A novel weighted voting algorithm based on neural networks for fault

7. Abbas karimi , F. Z. (2010). "An optimal parallel average voting for fault-tolerant control systems." IEEE

8. Abbas Karimi, Faraneh Zarafshan, Adznan Jantan, Abdul Rahman Ramli , M. Iqbal b Saripan, S. A. R Al-Haddad ,"Exact Parallel Plurality Voting Algorithm for Totally Ordered Object Space Fault-Tolerant Systems." Academic 20(1), 2012.

9. ALAGOZ, B. B. (2008). " Hierarchical Triple-Modular Redundancy (H-TMR) Network For Digital Systems." OncuBilim Algorithm And Systems Labs 08.

10. Abbas Karimi, F. Z., and S.A.R. Al-Haddad "A Novel N-Input Voting Algorithm For X-By-Wire Fault-Tolerant Systems." The Scientific World, (under publish).