Plug-in Hybrid-Electric Vehicle

Madhu H T
Department of Mechanical engineering
Jain institute of technology
Davanagere, India

T Shankar Gouda
Department of Mechanical engineering
Jain institute of technology
Davangere, India

Tejas Kumar S B
Department of Mechanical engineering
Jain institute of technology
Davangere, India

Vikas G
Department of Mechanical engineering
Jain institute of technology
Davangere, India

Vinay B N
Department of Mechanical engineering
Jain institute of technology
Davangere, India

Abstract—**Automobile manufacturers Vehicles that are electric, hybrid electric, or plug-in hybrid electric are being developed. In response to government mandates to lower emissions and increase fuel efficiency. Power electronics is a key enabler for the development of these more ecologically friendly cars, as well as the implementation of modern electrical architectures to satisfy rising electric load demands. This report gives a quick overview of present trends, the importance of power electronic subsystems in future vehicle strategies In order to build these cars properly, power electrical components and electric motor drives must be handled. PHEVs (plug-in hybrid-electric vehicles) have become a viable option for fleets aiming to reduce their petroleum consumption. However, because PHEVs receive electricity from the grid, evaluating their potential benefit is more difficult than with other car technologies.**

Keywords: ***Drive cycle, Hybrid electric, Power electronics.***

I. INTRODUCTION

PHEVs (plug-in hybrid-electric cars) have proven to be a promising technology for fleets looking to replace fossil fuels. However, there are many different PHEV designs to choose from, each with its own set of Benefits and costs the relative value of PHEVs is influenced by battery costs, gasoline costs, vehicle performance factors, and driving patterns. This study compares the costs and benefits of PHEVs versus Benefits and costs the relative value of PHEVs is influenced by Battery prices, gasoline prices, vehicle performance characteristics, and driving patterns are all aspects to consider. According to the study, PHEVs equipped with lithium-ion batteries can reduce petroleum consumption by more than 45 percent per car.

II. COMPONENTS

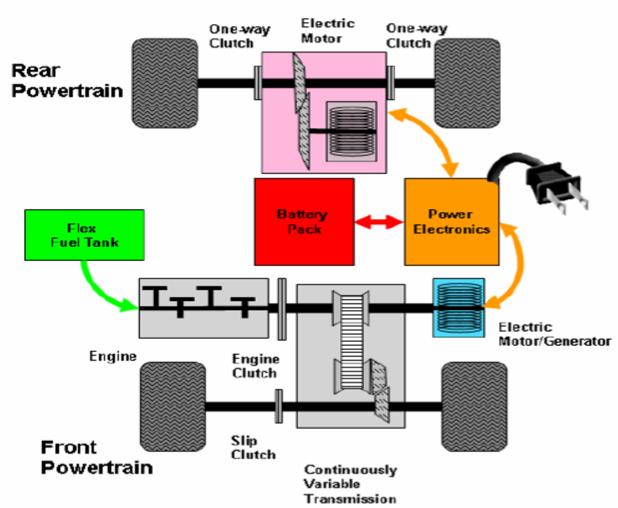

Fig. 1. Components of PHEV

2.1 Battery

The two most significant inputs for the battery sizing model are the PHEV designation and the battery power-to-energy (P/E) ratio. The usable battery energy is computed by multiplying the predicted PHEV distance by an estimate of the vehicle's equivalent electrical energy usage per unit distance. The PAMVEC model is used to calculate the amount of electrical energy used. The SOC design window is then used to compute the total battery energy. Finally, total battery energy is multiplied by the input P/E ratio, and then de-rated by 20% to account for battery power loss over time. Various PHEV ranges require different SOC design windows to attain similar battery cycle life. On a daily basis, the mileage distribution.

2.2 Electric Motor

Various PHEV Different SOC design windows are required for different ranges to attain equal battery cycle life.

2.3 Engine

The engine has to be sized in stages. The PAMVEC model is used to compute the engine and motor's required peak power. Standing acceleration performance determines the power of Different SOC design windows is required for different ranges. As a result, the engine's performance is reduced, although additional performance considerations impose limits on downsizing. Continuous performance events define the minimum engine size (grade ability and top speed). Due to engine heat management and noise, vibration, and harshness (NVH) problems, grade ability performance is limited to 2/3 of peak engine power. The minimum engine size for the basic midsize platform is around 80kW.

2.4 Port for charging

The charging connector allows the vehicle to charge the traction battery pack from an external power source.

2.5 Converter from DC to AC

This device converts higher-voltage DC power from the traction battery pack to the lower-voltage DC power needed to run vehicle accessories and recharge the auxiliary battery.

2.6 Electricity generator

The moving wheels produce electricity while braking, which is subsequently transmitted This device converts higher-voltage DC power from the traction battery pack to the lower-voltage DC power needed to run vehicle accessories and recharge the auxiliary battery.

2.7 Traction motor powered by electricity

This motor drives the vehicle's wheels with the help of the traction battery pack. Motor generators are used in some vehicles to provide both drive and regeneration.

2.8 System of exhaust

The exhaust system is responsible for directing the exhaust gases from the engine out the tailpipe. A three-way catalyst is used in the exhaust system to reduce engine-out emissions.

2.9 A fuel station

A nozzle from a fuel dispenser is fitted to the vehicle's receptacle to fill the tank.

2.10 A fuel tank (gasoline)

This tank stores fuel until it's required by the car's engine.

2.11 Internal combustion engine (IC engine) (spark-ignited)

The gasoline is injected into the intake manifold or combustion chamber, where it mixes with the air before being ignited by a spark plug.

2.12 Charger built-in

Charges the traction battery by converting AC current from the charging port to DC power. It connects to the charging equipment and analyses battery data such as voltage, current, temperature, and status of charge while charging the pack.

2.13 Controller for power electronics

This unit manages the flow of electrical energy from the traction battery to control the speed and torque of the electric traction motor.

2.14 System of heating and cooling

This system maintains a safe operating temperature range for the engine, electric motor, power electronics, and other components.

2.15 Pack of batteries for traction

The electricity stored here will be consumed by the electric traction motor.

2.16 Transmission

The engine and/or electric traction motor supply mechanical power to the wheels through the transmission.

2.17 Engine and Electric Motor

The PHEV energy-use model is a power-flow model that reproduces component losses/efficiencies as a function of output power using reverse calculations. As a function of output power, component input power using polynomial formulas are used to forecast engine and electric motor efficiency. The power output of a 4-cylinder gasoline engine with a displacement of 1.9L and a power output of 95kW is used to create the engine curve. This engine was used to fit data from an ADVISOR simulation with a 3rd-order polynomial. The motor curve was created using data from an ADVISOR simulation of a 50kW permanent magnet machine that was fitted with a 9th-order polynomial. The engine and motors mass and cost are calculated as linear functions of the rated output power. The engine mass function is based on a database of 2003 model year autos. Motor-controllers will be used in the not-too-distant future.

2.18 Power train Control Strategy

For a wide range of PHEV designs, a generic control technique was devised. There are four essential parts to this control strategy.

When the SOC surpasses the goal, the engine power need is reduced to improve CD performance. When the SOC goes below the target to recharge the battery, the engine power request is increased. The factor k, which is proportional to the overall capacity of the battery, governs the adjustment. There's also a 10 mph (16 mph) electric-launch speed, below which the approach tries to run the car fully on electricity by turning off the engine power request. The SOC correction and the electric launch, on the other hand, have the potential to exceed the motor's power ratings. As a result, there is a need for a third component.

2.19 Fuel Economy Measurement and Reporting

To measure and report PHEV fuel economy and operating expenditures, The method is based on a modified version of SAE J1711 Recommended Practice for Measuring Hybrid-Electric Vehicles' Exhaust Emissions and Fuel Economy. In both CD and CS modes, the Utility Factor (UF) is determined using fuel and power consumption provided the PHEVs are fully charged every day.

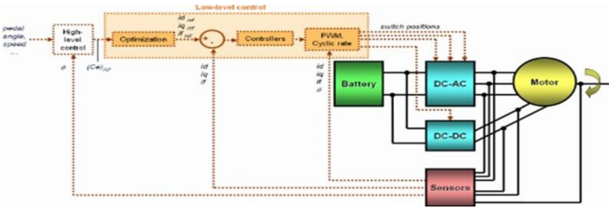

Fig. 2 Connection Lay

III. WORKING

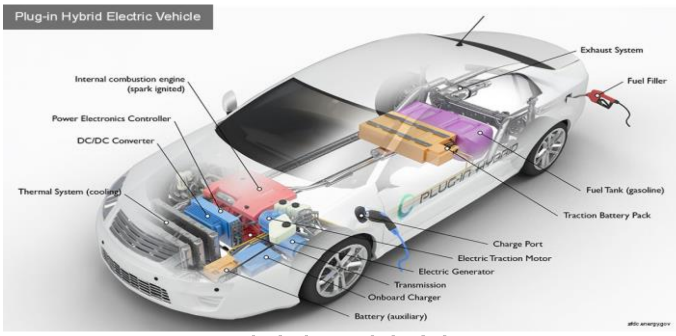

Fig. 3 vehicle that is a hybrid plug-in

A gasoline or diesel engine is combined with an electric motor and a huge rechargeable battery in a plug-in hybrid electric vehicle, or PHEV. PHEVS, unlike ordinary hybrids, can be recharged by plugging them into an outlet, allowing them to travel great distances only on electricity. When the battery is depleted, the car converts to a conventional engine and functions as a non-plug-in hybrid.

Plug-in hybrids release much fewer greenhouse gases than gas-only vehicles because they can run on grid electricity, which is often a cleaner energy source than gasoline or diesel. When they use electricity to drive, they don't produce any pollution from their tailpipes, and they save money on gas thanks to the electric motor and battery. There are fewer of them these days.

3.1Petroleum Consumption and Cost Modeling for PHEVs

Two elements contribute to a PHEV's lower per-vehicle fuel consumption:

1. Petroleum is displaced during CD-mode, which is tied to the PHEV designation because to the vehicle's enhanced battery energy capacity, as previously indicated. 2. Hybridization improves the degree-of-hybridization (DOH) or higher battery power capabilities of the vehicle are linked to in charge-sustaining (CS) mode, fuel efficiency is high. This second factor is the only way for HEVs without a CD-mode to save money.

3.2 Power train Architecture

A CD operating mode and a recharge hookup are the two features that distinguish a PHEV from a HEV. As a result, any of the major HEV architectures can be used to build a PHEV (power-split, parallel, or series) A parallel architecture with the ability to declutch the engine from the power train was assumed for this investigation. This parallel technique is superior to Honda's parallel integrated motor assist (IMA) technology. Architecture allows for more flexibility in engine on/off management.

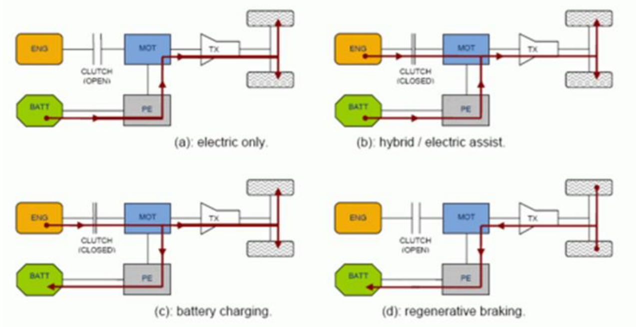

Fig. 4 Power Train Architecture

Where the motor and the engine are always connected. All accessories (including air conditioning) were to be powered electronically from the battery to give for more flexibility in engine on/off control.

IV. APPLICATIONS

- EMC and safety
- Technology for storing data
- Vehicle-based energy and power
- Diagnostics and prognostics are two aspects of management.
- Concerns about electromechanical vibration
- Off-road and other industrial utility vehicles

V. RESULTS

The study looked at the PHEV2, 5, 10, 20, 30, 40, 50, and 60 automobiles. In addition, a HEV0 without the charger/plug was modelled as a PHEV2. The P/E ratios were programmed to fluctuate between 10% and 55% Oh, my goodness(Motor power divided by total motor plus engine power) The engine downsizing limit corresponds to a DOH of roughly 32%, and a DOH higher than that results in excess electric power capabilities onboard the automobile. Between the HEV0/PHEV2 and the PHEV60 are the HEV0/PHEV2 and the PHEV60, the total battery energy ranges from 1.5 to 25 kWh. Across the DOH range, battery power ranges from about 10 to 100 kW. Included are dashed lines with a constant P/E ratio ranging from 1 to 50.

The optimal DOH is heavily influenced by the vehicle platform and performance parameters, as well as the driving pattern. The study should be re-done to see how PHEV designs differ from those of other vehicles (such as sport utility vehicles). PHEVs should also be modeled during real-world driving cycles to see whether there are any changes in when compared to conventional test cycles; all-electric operation and petroleum displacement are superior.

VI. CONCLUSION

In this paper, PHEVs were compared to HEVs and CVs in terms of expenses (car purchase price and energy costs) as well as benefits (lower petroleum usage). According to the findings, there are a variety of HEV-PHEV designs available, each with its own set of features as well as the advantages In addition, the cost-benefit equation for PHEVs is highly sensitive to a range of factors. Costs of batteries, gasoline, vehicle performance, and driving habits all influence the relative worth of PHEVs. Because many of these elements are unpredictable and ambiguous, predicting how well PHEVs will be tough to break into the market and minimize fleet petroleum usage in the future.

PHEV's, on the other hand, have a huge potential to reduce per-vehicle petroleum use. Using PHEV20 or higher designs, reductions of more than 45 percent are possible. This compares well to the predicted 30 percent reduction for HEVs. However, even in the long run, the higher the battery capacity of a PHEV, the higher the cost of the vehicle. In the study's predicted scenario, a midsize vehicle HEV would have a retail cost increase of US$3,000. Long-term cost hikes for the PHEV20 and PHEV40 midsize electric vehicles on the other hand, are expected to be 536,000Rs and US$11,000, respectively. It's difficult to predict the economics of PHEVs in the future without knowing future fuel costs. However, it appears to bathe case based on the evidence.

REFERENCES

[1] Ali Emadi, IEEE Senior Member, Young Joe Lee, IEEE Kaushik Rajashekara (June 2008)
[2] Edwin Haesen, IEEE, Kristen Clement-Nyns, IEEE, Johan Driesen, IEEE (Oct 2007)
[3] IEEE members Eric Sortomme, Mohammad M. Hindi, S. D. James Macpherson, and S. S. Venkata.
[4] Clara Marina Martinez, Xiaosong Hu, Dongpu Cao, Efstathios Velenis, Bo Gao Matthias Wellers, Xiaosong Hu, Dongpu Cao, Efstathios Velenis, Bo Gao Matthias Wellers
[5] IEEE members Zahra Darabi and Mehdi Ferdowsi.