A Survey on Various Techniques for Electrical Vehicle

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***Abstract*—**This paper describes various techniques used for hybrid electrical vehicles now a days as we know battery fed electrical vehicle are commonly used as there are so much of advantages over commonly used IC engine vehicles. This proposed work aims attechniques that are used to improve the performance of battery fed electrical vehicles. There is increase in efficiency by the use of the dc-dc converter by maintaining battery voltage level to the motor rated voltage. Various methods for speed control of electrical vehicles are discussed.

Keywords: *Battery fed electrical vehicle (BFEV), dc-dc converter, battery.*

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I. Introduction

As we know tremendous dependency of humans on petroleum products is overloading our environment with carbon dioxide and also petroleum resources across the world is decreasing at a high rate due to the large dependency of the transportation sector on petroleum as the primary fuel. As it is very well known that these petroleum resources are finite but our consumption is increasing day by day, this is causing the increase in petroleum prices.It is estimated that current global petroleum resources could be used up within 50 years if they are consumed at present consumption rates. Also due to this large consumption, there is a vast greenhouse gas emission which causes global warming, which traps heat, steadily drive up the planet's temperature. This has motivated a tremendous interest for the design of the vehicles with lesser or no dependency on the petroleum resources.

This has forced the increase in rate of the development of the Electric Vehicle (EV) and Hybrid Electric Vehicle (HEV) technologies in past twenty years.Hybrid energy sources complement drawbacks of each single device.The first HEV car was introduced during 1900 by Lohner Coach Factory, which was driven by a hub motor powered by the generator run through a gasoline engine with a small battery for reliability. But since then due to the better development in the ICE technologies and the cheaper petroleum prices made the ICE run vehicle a better option than a HEV. Therefore the growth of the HEV technologies remained almost stagnant until recent past two decades when the petroleum prices started rising due to their limited availability and greater consumption as well as because of the degrading atmospheric and environmental conditions because of the emissions due to hydrocarbon combustion.

Nowadays, the usage of light electric vehicles (LEV) is fostered by the public administrations to reduce pollution and traffic congestion in the city areas, therefore An HEV uses combination of both energy storage system (ESS) and ICE technology. Since the vehicle is no longer dependent on only one type of fuel, they have many benefits like increase in the efficiency and drivability and at the same time reducing the emissions. It is very unlike conventional vehicles which solely depend on an ICE engine for the traction power.The integration of the electrical storage system also makes the provision for the regeneration during braking which can further boost up the efficiency of the overall system.

II. Literature Review

Reference [1] has discussed the use of bidirectional dc-dc converters which is increased for various applications such as battery charging- discharging, electrical vehicles and UPS system. This can be applied in Hybrid Electrical Vehicle (HEV) with a battery as an energy storage element to provide desired management of power flow. This paper deals with the use of a bidirectional dc-dc converter for a battery fed electrical vehicle drive system. A closed loop speed control technique of the proposed battery fed electrical vehicle is designed and implemented using PI controller. It is concluded in this paper as the overall drive system reduces the system complication, price and extent of a purely electric based vehicle drive**.**

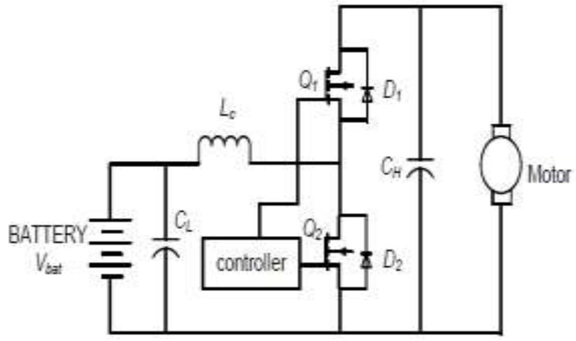

Fig. Bi-directional DC-DC Converter with battery and dc motor

In [2] has presented state-of-the-art energy-storage topologies for HEVs and plug-in HEVs (PHEVs). Battery, UC, and FC technologies are discussed and compared . In addition, it gives briefing about various hybrid ESSs that combine two or more storage devices. As it is very well known that the fuel economy and all-electric range (AER) of hybrid electric vehicles (HEVs) are highly dependent on the onboard energy-storage system (ESS) of the vehicle. But if we increase the AER of vehicles by 15% then there is rise in incremental cost of the ESS almost two times.This is due to the fact that the ESS of HEVs requires higher peak power while preserving high energy density. Hence, Ultracapacitors (UCs) are used which have higher power densities in comparison with batteries. A hybrid ESS is made up of batteries, UCs, and/or fuel cells (FCs) could be a more appropriate option for advanced hybrid vehicular ESSs

Fig. Hybrid ESS.

This is hybrid energy storage system that has been presented in the paper.

Reference [3] has reviewed and compared several non-isolated bidirectional DC-DC converters suited for charge station applications. Half bridge converter is also a option but in that, it is difficult to maintain high efficiency in wide battery pack voltage range. This problem can be solved by a variable frequency pulse width modulation (VFPWM) scheme. Finally, three-level bi-directional DC-DC converter is suggested to be employed. As, Today's scenario is on plug-in hybrid electric vehicles (PHEV's) due to energy security and greenhouse gas emission issues, as well as the low electricity fuel cost.A charge station architecture for municipal parking decks has been proposed, which has a DC microgrid to interface with multiple DC-DC chargers, distributed renewable power generations and energy storage.

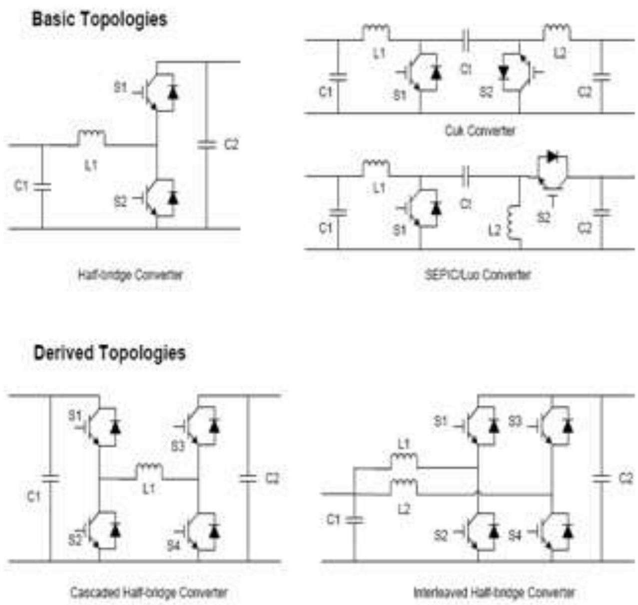

Fig. Several Non-isolated Bi-directional DC-DC Converters.

These basic topologies and derived topologies of bidirectional DC-DC converters have been discussed and compared.

In [4] has illustrated, Power and energy design of the electric propulsion systems of the two LEVs as well as description of the energetic devices. And this also paper suggest that, depending on the type of the motor used for the propulsion, a suitable motor drive needs to be designed so as to interface the motor with the high voltage dc bus. So, Brushless dc (BLDC) motors when used they are interfaced with the battery packs through an inverter. The traction drive employing the PMDC motors generally consists of battery packs connected to motor through the boost converter circuit.

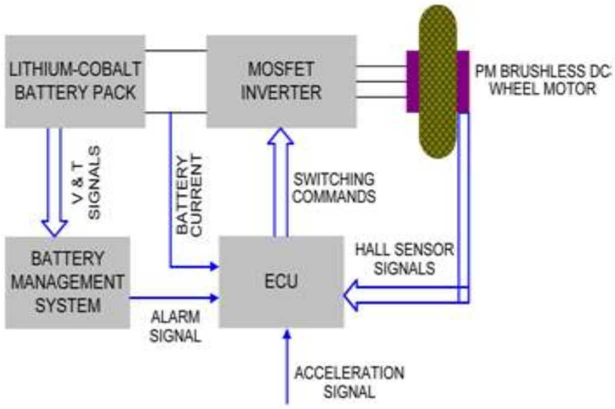

Fig. Electric propulsion system scheme.

Reference [4] has shown two LEVs furnished with different electric propulsion systems. One system which is made by a battery pack and a wheel motor, and ithas been fitted in a city scooter. The second system is a FC system is made up from a super capacitor bank and it has been fitted in an electric bicycle. Descriptions of various techniques used to determine the requirements meetingthe design specifications and of the technologies used to set upthe electric propulsion systems can be regarded as a training ground for the development of LEVs. Under this outlook,particular kindness has been given to plan the electric propulsion systems in terms of power and energy and to illustratethe energetic devices. Road tests executed on the two LEVs have substantiated the results obtained in the design stage.

Reference [5] has suggested, the use of unified current controller for a bidirectional dc-dc converter which employs complementary switching between upper and lower switches.The Unified current controller is to use one controller for both buck and boost modes. Such a controller may be designed with analog implementation that adopts current injection control method, which is difficult to be implemented in high power applications. So, averaged current mode is proposed in this paper for avoiding the current sensing related issues. Additional advantage with the unified digital controller is also found in smooth mode transition between battery charging and discharging modes where conventional analog controller tends to saturate and take a long delay to get out of saturation. The unified controller has been designed based on a proposed novel third order bidirectional charging/discharging model.

Reference [5] has concluded that a third-order average model for the bidirectional dc-dc converter is developed. The model contains voltage sources on both high- and low-sides and passive components. It is considered as a general-purposed model. If both ends are constant voltage source, the complete model becomes a first- order system. If one of the voltage sources is replaced with a resistive load, the transfer function becomes a second-order system.

In [5] A unified averaged current mode controller has been designed for controlling only one duty cycle for both buck and boost modes, which is based on the derived general-purposed model. For avoiding mode transition discontinuity controller is realized with a digital signal processor. The complete system has been simulated with a circuit simulator and verified with hardware experiments. Both simulation and experimental results reveals that the proposed unified controller performs exceptionally good in a high power bidirectional dc-dc converter. Stable operation is verified with load step up and down tests under both buck charging and boost discharging modes. The results indicate that the derived model is valid and can be used to for the unified controller design to achieve constant current charging and discharging.

III. CONCLUSION

For increasing efficiency of HEV there is a requirement of high voltage of ESS. This requirement of high voltage can be fulfilled by various methods like addition of the more number of the cells in the battery back of the ESS of the HEV, but this is not suggested because this leads to increase in the size of the system, hence use of DC-DC bidirectional converter beneficial so as to increase the efficiency.

Many of the literature reviewed above has evaluated performance of variousHybrid Electric Vehicles (HEV) by using many platforms. The main consideration for the HEV drive train is to improve the efficiency of the motor drive and this is suggested by the above literatures and results are obtained, analyzed and compared which shows that DC-DC bidirectional converter is best suited for good performance of HEV's.

Design and simulation Bidirectional DC-DC Converter Fed Permanent Magnet DC Motor for Hybrid Electric Vehicles (HEV) to make HEV more efficient so as to reduce the stress on petroleum product for commercial use.

IV. REFERENCES

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