High Boost Performance Dc-To- Dc With Power Electronics Converters For Fuel Cell

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Abstract- *Fuel cells are considered to be one of the most promising sources of distributed energy because of their high efficiency, low environmental impact scalability. Unfortunately, multiple complications exist in fuel cell operation. This paper examines a novel pulse width modulation (PWM) scheme for two-phase interleaved boost converter with voltage multiplier for fuel cell power system by combining alternating phase shift (APS) control and traditional interleaving PWM control. The APS control is used to reduce the voltage stress on switches in light load while the traditional interleaving control is used to keep better performance in heavy load. The boundary condition for swapping between APS and traditional interleaving PWM control is derived. Based on the aforementioned analysis, a full power range control combining APS and traditional interleaving control is proposed. Loss breakdown analysis is also given to explore the efficiency of the converter Taking into account the above investigation, a full power reach control joining APS and customary interleaving control is proposed.*

Keywords- Boost converter, Fuel cell, Interleaved, Loss breakdown, and Voltage Multiplier, Alternating phase shift.

I. INTRODUCTION

Power electronics belongs partly to power engineers and partly to Electronics engineers. This deals with an efficient conversion and flexible control of electrical power for various applications. A special type of power semi conductor devices are used for this purpose. Now a days, the need of conservation of energy has made it mandatory, that the energy in all the systems be utilized efficiently. Power-electronic systems offers the most cost-effective mean of achieving this goal.

Power electronics deals with conversion/control of electric power by wave-shaping of voltage, current (or) both using fast switching, power semiconductor devices The control techniques require the switching ON and switching OFF of these devices .A general power electronic device is as shown in Fig.1.1.

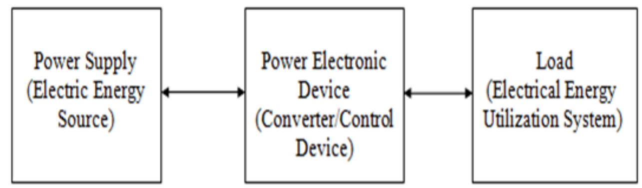

Figure 1.1: A General power Electronics System Configuration

In early 1950s,the semiconductor diode replaced by vacuum-tube rectifier due to improving the efficiency by reducing voltage drop from 30 volt (vacuum tube) to 1-2 volt (semiconductor diode).The Silicon controlled rectifier (SCR) was invented in 1956 and was commercially introduced by General Electric Company (USA) in 1957.Due to its invention, a new branch of engineering. i.e., Power Electronics has been created.

In mid-1960's, BJT based were used at high frequency (10-20 KHz).Hence, a practical efficient, light weight dc regulator became available. In late 1970s, the MOSFET was invented and these are operating high frequency (200 KHz-1MHz).

II. LITERATURE SURVEY

As energy units are prone to be utilized as a part of numerous future applications, committed force converters must be produced and improved. Exhaustive information of the energy unit operation is subsequently required for power electronics engineers. This paper proposes a hypothetical and test investigation of the conduct of power module stack subject to current music. The major part of the inside twofold layer capacitor is illustrated.

We portray a vitality proficient, energy unit power-molding framework (PCS) for stationary application, which lessens the varieties in the current drawn from the power device stack and can possibly meet the $40/kW cost target. The PCS comprises of a zero-swell support converter (ZRBC) trailed by a delicate exchanged and multilevel high-recurrence

(HF) inverter and a solitary stage cyclo converter. The ZRBC includes another zero-swell channel (ZRF), which fundamentally diminishes the info low-and high-recurrence current swells, along these lines possibly upgrading the toughness of the stack.

` Another stage moved sine wave tweak of the multilevel HF inverter is proposed, which results in the zero-voltage exchanging (ZVS) of each of the four switches without the utilization of any assistant circuit segments. For such a sine wave tweak strategy, >90% ZVS extent is gotten per line cycle for around 70% of the evaluated load. Further, the line-recurrence exchanging of the cyclo converter (at near solidarity power component) results in to a great degree low exchanging misfortunes. The middle of the road dc transport encourages the consideration of force frameworks in view of different types of option vitality systems (e.g., photovoltaic/high-voltage stack). A 5 kW model of the proposed PCS is constructed, which at present accomplishes a crest productivity of 92.4%. We show a nitty gritty depiction of the operation of the PCS alongside its key components and focal points. At long last, test results demonstrating the palatable execution and the operation of the PCS are illustrated.

Dc-Dc Converters for Electric Vehicles

The diverse designs of EV force supply demonstrate that no less than one DC/DC converter is important to interface the FC, the Battery or the Super capacitors module to the DC-join. In electric designing, a DC-DC converter is a class of force converters and it is an electric circuit which changes over a wellspring of direct present (DC) starting with one voltage level then onto the next, by putting away the info vitality briefly and afterward discharging that vitality to the yield at an alternate voltage.

The capacity might be in either attractive field stockpiling segments (inductors, transformers) or electric field stockpiling segments (capacitors).

DC-DC converters can be intended to move power in one and only bearing, from the contribution to the yield. Be that as it may, all DC-DC converter topologies can be made bi-directional. A bi-directional converter can move power in either course, which is helpful in applications requiring regenerative braking. The measure of force stream between the info and the yield can be controlled by conforming the obligation cycle (proportion of on/off time of the switch). As a rule, this is done to control the yield voltage, the info current, the yield current, or to keep up a steady power. Transformer based converters may give disconnection between the information and the yield.

III. BOOST DC-DC CONVERTER

A support DC-DC converter (venture up converter appeared in Fig. 2.1.) is a force converter with a yield DC voltage more noteworthy than its information DC voltage. It is a class of exchanging mode power supply containing no less than two semiconductor switches (a diode and a switch) and no less than one vitality stockpiling component (capacitor and/or inductor). Channels made of capacitors are regularly added to the yield of the converter to decrease yield voltage swell and the inductor associated in arrangement with the information DC source so as to diminish the present swell.

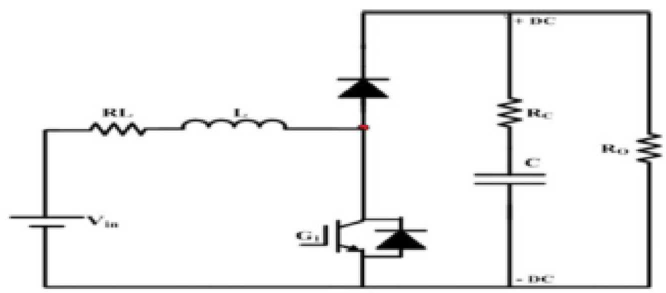

Figure. 2.1. Standard step-up DC-DC converter.

The smoothing inductor L is used to limit the current ripple. The filter capacitor C can restrict the output voltage ripples. The ripple current in the inductor is calculated by neglecting the output voltage ripple. The inductance value is given by the following equation:

$$L = \frac{V_{out}}{4 \times F \times IL_{max}} = 400\mu H \quad 2.5$$

The capacitor must be able to keep the current supply at peak power. The output voltage ripple is a result of alternative current in the capacitor.

$$C = \frac{IL_{max}}{4 \times F \times \Delta V_{out\_max}} \quad 2.6$$

The inductor current swell worth is coveted to be fewer than 5% of the most extreme information current on account of interfacing a Fuel Cell.

IV. RESULTS

Electric Vehicle (EV) and Hybrid Electric Vehicle (HEV)

Usually AC motors are used in HEVs or EVs for traction and they are fed by ***inverter*** and this inverter is fed by

DC-DC converter (Figure5.1). The most commonly DC-DC converters used in an HEV or an EV are:

Unidirectional Converters: They cater to various onboard loads such as sensors, controls, entertainment, utility and safety equipments.

Bidirectional Converters: They are used in places where battery charging and regenerative braking is required. The power flow in a bi-directional converter is usually from a low voltage end such as battery or a super capacitor to a high voltage side and is referred to operation**.**

In Figure 5.1 the general configuration of the EV and HEV is shown. Upon examination of the general configurations it can be seen that there are two major power electronic units.

- DC-DC converter
- DC-AC inverter

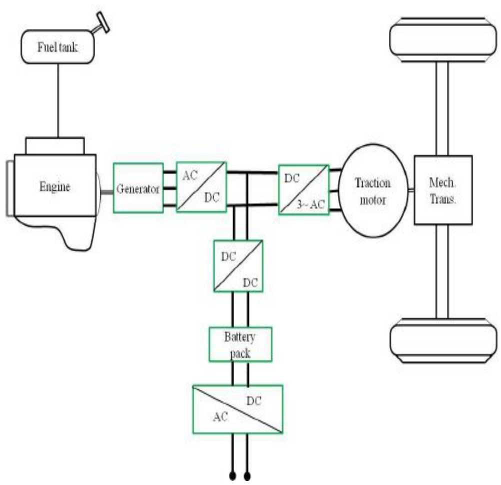

Figure: General Configuration of an Electrical Vehicle

During regenerative braking, the power flows back to the low voltage bus to recharge the batteries know as buck mode operation. Both the unidirectional and bi-directional DC-DC converters are preferred to be isolated to provide safety for the lading devices. In this view, most of the DC-DC converters incorporate a high frequency transformer.

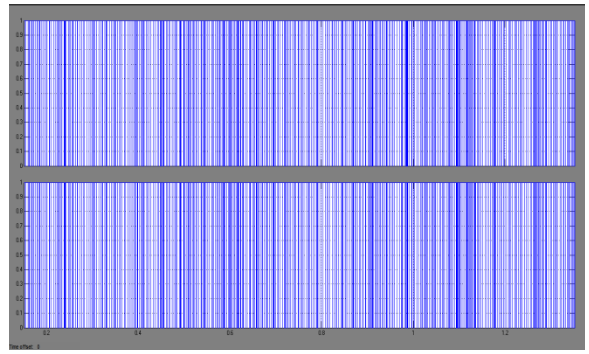

Fig: Pulse Width Modulation for APS controlling at converters

V. CONCLUSION

The boundary condition is derived after stage analysis in thispaper. The boundary condition classifies the operating states intotwo zones, i.e., Zone A and Zone B. The traditional interleavingcontrol is used in Zone A while APS control is used in ZoneB. And the swapping function is achieved by a logic unit. Withthe proposed control scheme, the converter can achieve lowvoltagestress on switches in all power range of the load, whichis verified by experimental results.

REFERENCES

[1] H. Yi-Ping, C. Jiann-Fuh, L. Tsorng-Juu, and Y. Lung-Sheng, “A novel high step-up DC–DC converter for a microgrid system,” IEEE Trans.Power Electron., vol. 26, no. 4, pp.1127–1136, Apr. 2011.

[2] L. Wuhua, F. Lingli, Z. Yi, H. Xiangning, X. Dewei, and W. Bin, “Highstep-up and high-efficiency fuel-cell power-generation system with active clamp fly back-forward converter,” IEEE Trans. Ind. Electron., vol. 59,no. 1, pp. 599–610, Jan. 2012.

[3] A. Fardoun and E. H. Ismail, “Ultra step-up DC–DC converter with reduced switch stress,” IEEE Trans. Ind. Appl., vol. 46, no. 5, pp. 2025–2034, Sep./Oct. 2010.

[4] A. Shahin, M. Hinaje, J. Martin, S. Pierfederici, X. Rae, S. L. Rael, and B. Davat, “High voltage ratio DC–DC converter for fuel-cell applications,”IEEE Trans. Ind. Electron., vol. 57, no. 12, pp. 3944–3955, Dec. 2010.

[5] P. Thounthong, P. Sethakul, X. Rae, S. L. Rael, and B. Davat, “Fuel cell current ripple mitigation by interleaved technique for high power applications,” in Proc. IEEE Ind. Appl.Soc. Annu. Meeting, Houston, TX, USA,2009, pp. 1–8.

[6] X. Wu, L. Zhang, G. Shen, D. Xu, and A. Ioinovici, “A novel control method for light-

loaded multiphase boost converter with voltage multiplier used as a front-end of a grid- connected fuel-cell generation," in Proc. IEEE Energy Convers. Congr.Expo., Phoenix, AZ, USA, 2011, pp. 413–420.

[7] L. Zhang, G. Shen, M. Chen, A. Ioinovici, and Dehong Xu, "Two-phase interleaved boost converter with voltage multiplier under APS control method for fuel cell power system," inProc. 7th Int. Power Electron.Motion Control Conf., Jun. 2–5, 2012, vol. 2, pp. 963–967.