Implementation of Synchronous Buck Converter Based Multiple Output for Electric Vehicle

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Abstract

This project proposes a integrated synchronous buck converter to provide multiple output voltage for auxiliary power supply system of Electric vehicle .This circuit would operate with less number of switches with soft switching technique. So that overall conduction loss is reduced to very minimal compared to conventional system.Due to low conduction loss and less number of switches used, efficiency of system is improved and control circuit is also simple. Simulation and experiments are implemented to verify the performance of converter.

Keywords —— *Multiple Output, Synchronous,Buck Converter, Zero-voltage-switching (ZVS)*

I. INTRODUCTION

The battery management system [BMS] of the Clean Energy GmbH was developed for the diagnoses and the monitoring of lithium-iron-phosphate batteries. A special attribute of the BMS is that all components are being linked with a BUS wire for the communication with each other[1]. There are two different types to monitor the cells: with a central box or with cell boards. The system is mainly consisting of six different components: - the BMS control with display for the control, - a relay that is regulating the charging device, - a load shedding relay,[2] that is disconnecting the battery discharging circuit to prevent a total discharge, - the current sensor to measure the charging-/discharging-currents, - the BMS cell board or the central box that are monitoring and balancing the single cells, - the power supply for the energy supply of the BMS[3-4]. Moreover up to five temperature sensors and further BUS relays can be connected to the BMS. Important data, like the address of a disrupted battery, the voltage level of a single cell, temperatures or removed charging volumes can be shown in the display of the BMS control for battery diagnosis[5]. When further external components are connected to the BMS (e.g.: power contactor, charging device, battery heating and ventilation), it can be used as an automatic system to control the charging- and discharging circuits in electric vehicles. When connected to a PLC, the BMS is able to monitor the battery of a storage system and control the charging and discharging progress. The integration in the superior system control is possible through potential-free contacts and/or a communication interface adapter.Designs for heavy-duty electric and hybrid-electric vehicles (EV's) that have large electric drives will require advanced power electronic converter to meet the high power demands (250 kW) required of them. Development of large electric drive trains for these vehicles will result in increased fuel efficiency, lower emissions, and likely better vehicle Performance (acceleration and braking). Transformer less multi outputconverter is uniquely suited for this application because of the high volt-ampere ratings possible with these converter[6].

II . EXISTING SYSTEM

A multi-port dc-dc converter with simultaneous buck and boost outputs was proposed, which is not suitable for the EVs' auxiliary power system application with requirement of all buck outputs.

Although an integrated dual-output converter with both buck outputs was presented, current stresses of switches are increased, resulting in extra conduction losses.

Circuit Diagram

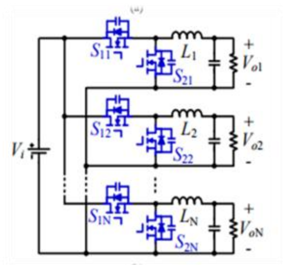

Fig.1Equivalent circuit

A. Simulation Of Existing System

Existing Simulation Diagram

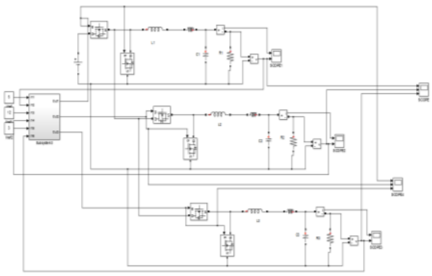

Fig.2 Simulink Diagram Of Existing Diagram

B. Simulation Results

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Existing Output Voltage

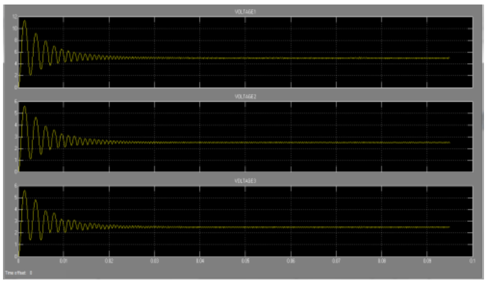

Fig.3 Output Voltage

C. Simulation Pulse

Existing Pulse

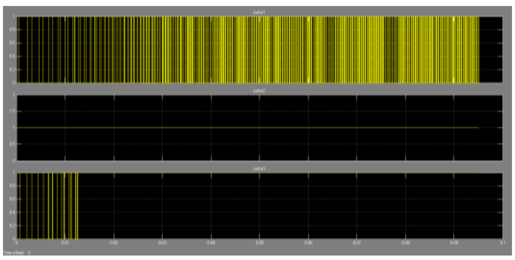

Fig.4 Existing Puls

III. PROPOSED SYSTEM

The simplified integrated dual-output synchronous buck converter are analysed.

Compared with the conventional separate dual-output synchronous buck converters with four switches, only three switches are required, contributing to reduced switches and lower cost.

ZVS turn-on as well as turn-off of one switch and lower conduction losses also could be attained.

Therefore, both cost and losses are satisfactorily decreased in the proposed converter.

Closed-loop controller of the conventional buck converter can directly applied to the proposed converter since their dynamic behaviours are similar, and thus the control system is also simple.

Proposed circuit

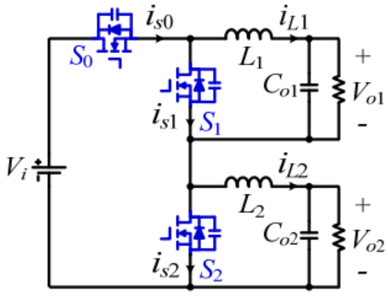

Fig 5. Proposed Circiut

A. Simulation Of Proposed System

Proposed Simulation Diagram

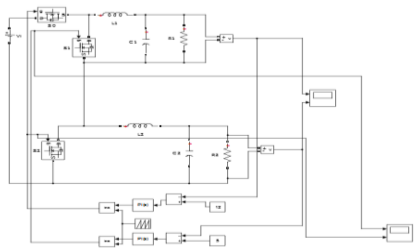

Fig.6 Simulink Diagram

B. Simulation results

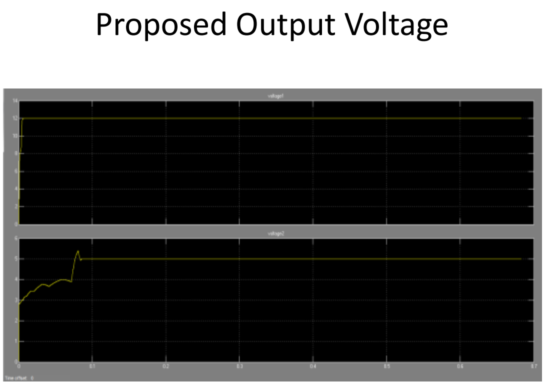

Fig.7 Simulink Output

C. Simulation pulse

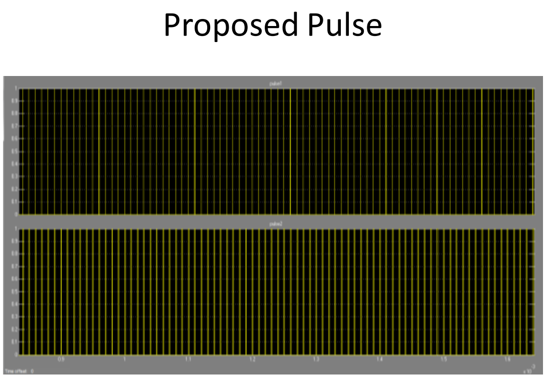

Fig.8 Simulink Pulse

IV. CONCLUSION

The proposed converter operates similarly but achieves the advantage of reduced switches. Analyses based on the simplified dual-output synchronous buck converter show that ZVS operation and possible lower conduction losses could be attained

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