A THREE STATE SWITCHING BOOST CONVERTER MIXED WITH MAGNETIC COUPLING AND VOLTAGE MULTIPLIER TECHNIQUES FOR HIGH GAIN CONVERSIONS

[1] M.Balamurugan, [2]R.Arun Kumar, [3]R.Sivakumar, [4]S.Ramachandran
[1]Assistant Professor, [2]Assistant Professor, [3]Associate Professor, [4]Asssitant Professor
[1,2,3,4]Department of EEE,
[1,2,3,4]V.S.B. Engineering College, Karur, Tamilnadu, India

Abstract : An asymmetrical three-state switching boost converter, combining the benefits of magnetic coupling and voltage multiplier techniques, is presented in this paper. The derivation procedure for the proposed topology is depicted. The new converter can achieve a very high-voltage gain and a very low-voltage stress on the power devices without high turn ratio and extreme duty cycles. Thus, the low-voltage-rated MOSFETs with low resistance can be selected to reduce the switching losses and cost. Moreover, the usage of voltage multiplier technique not only raises the voltage gain but also offers lossless passive clamp performance, so the voltage spikes across the main switches are alleviated and the leakage-inductor energy of the coupled inductors can be recycled. In addition, the interleaved structure is employed in the input side, which not only reduces the current stress through each power switch, but also constrains the input current ripple. In addition, the reverse-recovery problem of the diodes is alleviated, and the efficiency can be further improved. The operating principles and the steady-state analysis of the presented converter are discussed in detail. Finally, a prototype circuit with 400-W nominal rating is implemented in the laboratory to verify the performance of the proposed converter.

***IndexTerms* - SMPS, CUK, RDS,CM, DM, STFT**

I.LITERATURE SURVEY

Non isolated single-switch high step-up converters with low voltage stress are presented. The derivation and analysis are illustrated in this paper. The validity of the basic operational principle is verified by the experiment with 24 V input and 250 V/125W output prototype. The proposed converter features that the switch and diodes have the low voltage stress, so the low voltage-rated devices is used. From the experimental results, the proposed converter shows higher efficiency under entire load conditions due to the low conduction loss.

II.SYSTEM DESCRIPTION

In this paper, a high step-up dc–dc converter for fuel cell hydroid electric vehicle applications is clearly analyzed and successfully verified. By using technologies of three-winding coupled inductor, switched capacitor, and voltage doubler circuit, the high step-up conversion can be efficiently obtained. The leakage energy is recycled and large voltage spike is alleviated; thus, the voltage stress is limited and the efficiency is improved. The full-load efficiency is up to 91.32% and the maximum efficiency is up to 96.81%. The voltage stress on the main switch is clamped as 120 V at *D*max. The low- voltage-rated switch with low *R*DS-ON can be selected for the reduction of conduction losses. Thus, the proposed converter is suitable for high-power applications as fuel cell systems in hydroid electric vehicles.

In this paper, the voltage across the drain and source of the power switch is regarded as the voltage of generating the CM and DM noises, and its harmonic spectrum analyzed using STFT. Then, the harmonic spectra of the CM and DM noises are analyzed. The relationship between the harmonic amplitudes and the PK, QP, and AV values of the CM and DM noises is revealed, and the QP values are demonstrated to be very close to the PK values at the minimum switching frequency. As the EMI filter required for suppressing the QP spectra is larger than that for suppressing the AV spectra, the maximum boundaries of the QP spectra of the converter under all working conditions are derived, and the attenuation requirement of the EMI filter can be obtained by subtracting the QP limit from the maximum boundaries of the QP spectra. The EMI filter design for the CRM boost PFC converter is discussed based on the limit in EN55022 class B, which is specified from 150 kHz to 30MHz. It is demonstrated that, when the frequency range of the maximum boundary covers 150 kHz, the CM and DM noise spectra with the largest QP values at 150 kHz are the worst conducted EMI spectra of the converter, and they require the lowest corner frequencies of the CM and DM filters. The working conditions for the worst CM and DM noise spectra of the CRM boost PFC converter are derived, and the CM and DM filters can be directly designed according to the worst spectra, avoiding time consuming process of repetitive measurements and numerical calculations. A 90-W CRM boost PFC converter prototype is fabricated in the lab, and the evaluation of the measured conducted EMI spectra and the EMI filter design example verify the theoretical analysis.

A complete description of a robust controller design obtaining output voltage regulation in a high dc-gain quadratic boost converter involving a sliding-mode current loop has been presented in this paper. The results show that this control scheme has a satisfactory performance regulating the output voltage in its overall operational range of output power and input voltage. The stability of the complete system has been treated as local by using the Routh–Hurwitz test constraining a stability region in the $Kp-Ki$ plane, which has been subsequently used as a reference to synthesize the PI compensator using the RLS-MIGO method. The stability and robustness of the overall system has been tackled by considering the possible variations in the output load or in the input voltage as parametric uncertainty. Several MATLAB simulations have been used to verify the theoretical approach and the converter expected performance when coping with important disturbances in the uncertain parameters. Moreover, experimental results using simple electronic circuits are in good agreement with the theoretical predictions and simulation results. The experiments have validated not only the high dc gain capability of the quadratic boost converter operating with a hysteresis-based current controller but also the regulator robustness, ensured by the application of the loop shaping method in the PI synthesis. It can be concluded that the RLS-MIGO method is compatible with the sliding- mode approach providing an efficient solution to synthesize the proposed two-loop controller for a high-order topology such as the quadratic boost converter. Future works with the same converter will be devoted to the study of its possible discontinuous and critical conduction modes together with the associated design of an appropriate controller.

III.BLOCK DIAGRAM

The block diagram of the Boost converter for HVDC applications. In this system consists of Input DC supply, voltage and current fed boost converter, three state switching, PIC Controller, pulse driver, Lamp Load. Input is passes through 12V dc supply. The boost unit has taken 12v input. Power supply is passes through 5v supply is taken PIC controller 16F877A. The PIC controller controls the pulse driver. The pulse driver taken 12v input and given pulse to boost unit. The boost unit converts 12v to 230v dc supply output. The 230v dc supply passes through load.

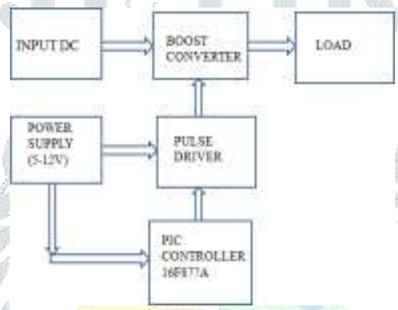

Fig: 3.1 Block Diagram

The power supply is passes through 12v dc supply. In this circuit they have two MOSFET circuit 1.master power circuit 2.slave power circuit. The each MOSFET circuit has four Mosfet. The PIC16F877A microcontroller used to generate pulse width modulation (PWM) signal. The pulse width modulation signal is passes through (IR2112) Pulse driver. This pulse driver deliver signal to MSP55NS06 MOSFET at corresponding switching time. The switching time regulator the energy stored inductor to boost the output voltage .Here 12V DC is converted into 230V DC with help of inductor and MOSFET driver unit by prototype.

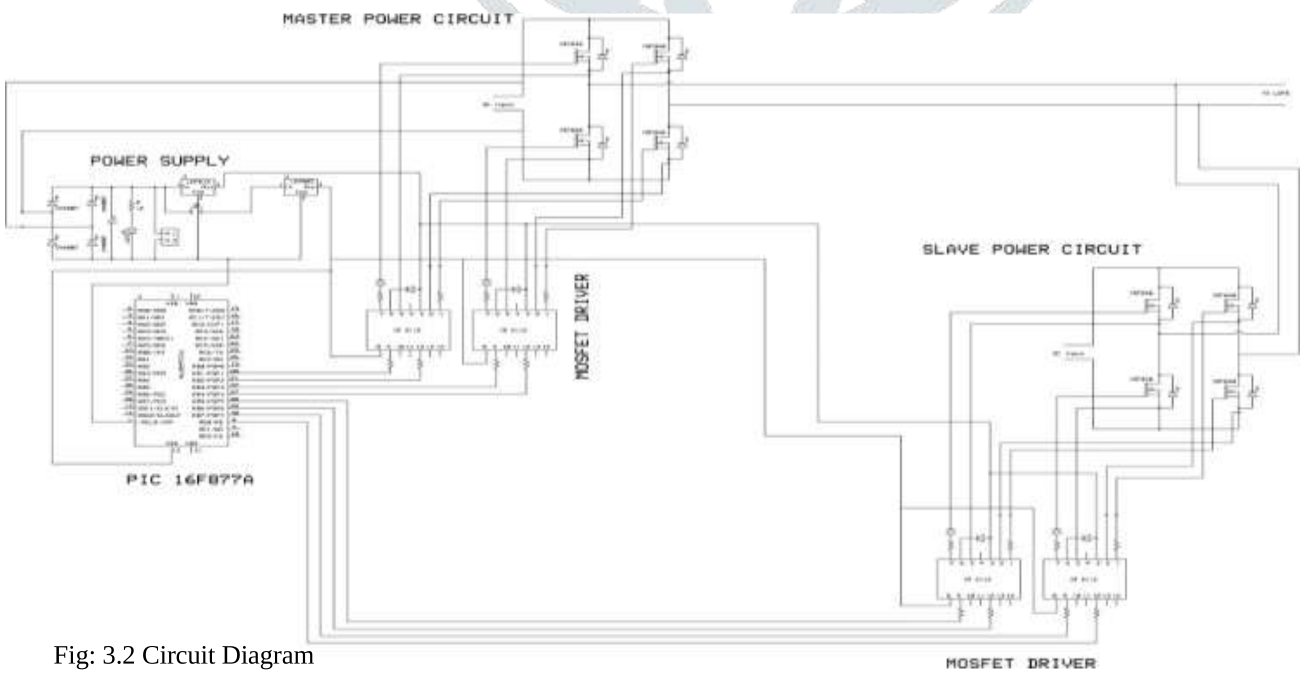

Fig: 3.2 Circuit Diagram

IV.SIMULATION AND RESULTS

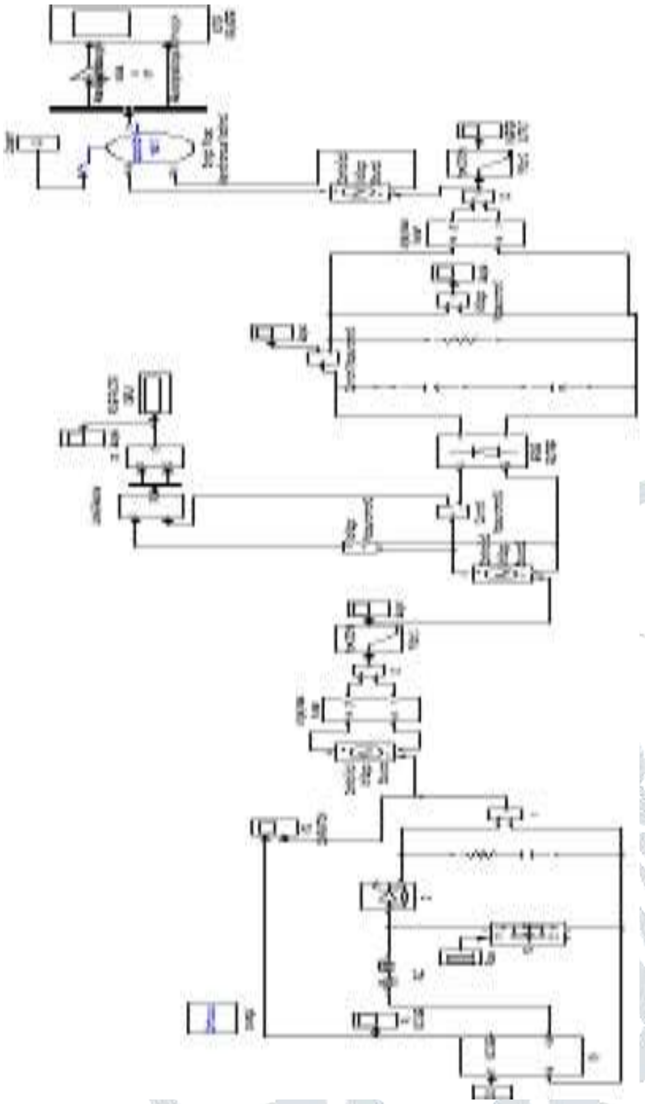

Fig: 4.1 Diagram

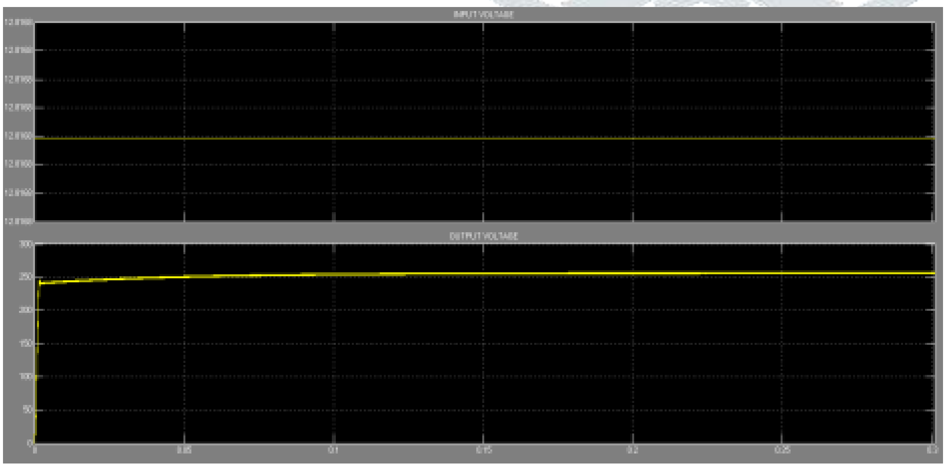

Fig: 4.3 Waveform

The input dc supply are passes through 12.9v supply in straight line. Using boost converter converts 12v to 230v dc supply. The output voltage is increases step by step at 0 to 250.

V.CONCLUSION

The design of three state switching boost converters using soft switching technique used for High step up applications. It overcomes the problem of change in the output voltage when input supply gets varied. Using PIC controller of closed loop system the DC output voltage get constant. The use of three state switching with reduces the switching loss and the diode reverse-recovery loss. The utilization of MOSFETs switches with lower conduction losses. The output current worked in continuous conduction mode without ripple. The input current is continuous with low operating duty cycles. Furthermore, regulated dc power supplies control is utilized for the output voltage regulation. The system efficiency is improved over wide range of loads.

VI.REFERENCE

1. F.Musavi, M.Edington, W.Eberle, and W.G.Dunford, "Control loop design for a PFC boost converter with ripple steering," *IEEE Trans. Ind.Appl.*, vol. 49, no. 1, pp. 118–126, Jan./Feb. 2013.

2. A.Burak, "An Improved ZVT–ZCT PWM DC–DC Boost Converter with Increased Efficiency," *IEEE Trans. Power Electron.*, vol. 29, no. 4,pp. 1919– 1926, Apr. 2014.

3. H.L.Do, "Improved ZVS DC-DC converter with a high voltage gain and a ripple-free input current," *IEEE Trans. Circuits Syst. I, Reg. Papers*,vol. 59, no. 4, pp. 846–853, Apr. 2012.