A High Step Bidirectional Isolated Active Bridge Converter With Modified DC Coverter For Energy Storage Application

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***Abstract*—normally the power source that we obtain has several harmonics which reduces the overall efficiency.In this project we will be using a SEPIC converter in the secondary end so as to reduce the harmonics and obtain high efficiency of power. With the help of mutual inductance in the SEPIC we can boost the supply voltage with fewer harmonic.**

I. INTRODUCTION

Through the increasingly serious ecological pollution and energy scarcity, renewable energy, like solar, wind, and tide energy, have involved more and more awareness and are considered as brilliant alternatives for conformist electrical power generation which use fossil fuels as the main source. Since the renewable energy source have the feature of intermittence and arbitrariness, energy storage devices are always included with the renewable energy generation units to supply stable and incessant power. In all-purpose, a high step-up bidirectional DC-DC converter is required to control bidirectional power transport of the energy storage devices.

Thus, high effectiveness bidirectional DC-DC converters have attracted much interest in energy storage systems. A dual active-bridge (DAB) converter is good-looking for isolated bidirectional power change due to its symmetric arrangement and zero voltage switching presentation. However, this converter has a incomplete ZVS range and high circulating current under wide voltage difference Many advanced intonation strategies for the full-bridge DAB converter have be presented to overcome these problems .

Since the voltages of energy storage fundamentals, such as batteries and super-capacitors, are comparatively low while the voltage of DC bus is more often than not high to interface with AC-grid, elevated step-up ratio is required to interface the low voltage battery with high voltage DC-bus. In this holder, a half-bridge before voltage-doublers type rectifier is additional suitable to be used on the high-voltage side of a DAB converter .

Conversely, since the duty cycle of the switches in the half-bridge rectifier is steady to be 0.5, the advanced modulation strategy for the full-bridge DAB converter cannot be used. As a result, the harms of limited ZVS range and high circulating current of conventional DAB converters cannot be solved. If a zero-voltage level can be formed by the half-bridge circuit, then optimized modulations can be applied and problems can be solved.

II. OPERATING PRINCIPLE

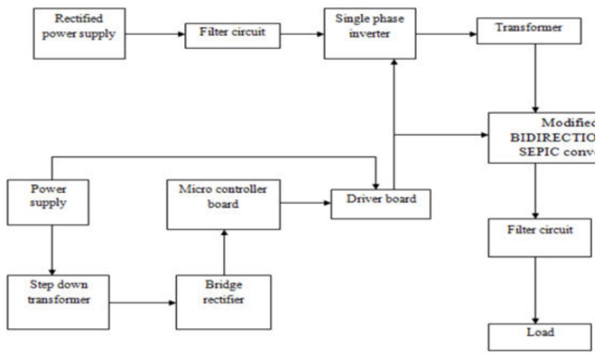
a. Proposed Topology

The simplified key waveforms of the future converter, while the equal model of the converter, where AB is the voltage generates by the full-bridge side and CD is the voltage generated by the TL-VDR side. In Dy1 and Dy2 are the duty ratio of AB and CD in that order and D is the equivalent phase shift angle flanked by u AB and CD. In the bidirectional converter, D can also be greater than 0 or be less than 0. If D>0, the power flow from the full bridge side to the TL-VDR side and if D<0, the power flows from the TL-VDR side to the full-bridge side.

b. operating Analysis

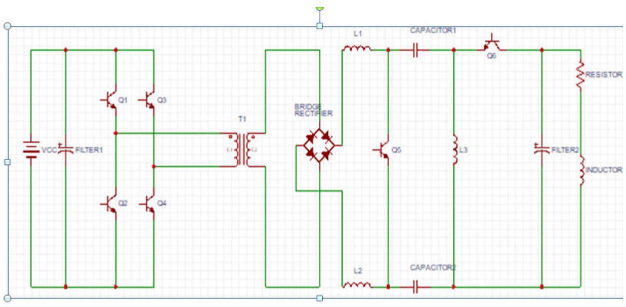
while the process principles of these operational modes are like, this document takes the Forward-Boost mode as an instance to analyze the operation principle. In the Forward-Boost mode, since the PWM is functional to the TL-VDR side, so Dy1=1, Dy2<1. With the phase shift angle flanked by AB and CD increasing, the Forward-Boost mode can be divided into three cases

III. BLOCK DIAGRAM



A full-bridge circuit is employed on the low-voltage side while a modified DC converter is employed on the high-voltage side. In the primary side we will be using a inverter to convert the DC supply to AC in the secondary side In the secondary side we will be using a bridge rectifier to convert the AC to DC The converted DC is then fed into the SEPIC converter. The SEPIC converter not only boosts the supply the supply voltage but also acts as filter.

III. CIRCUIT DIAGRAM



Bidirectional DAB converter is shown in Fig. 1, where a full-bridge circuit is employed on the low-voltage side while a three-level voltage-doublers-rectifier (TL-VDR) is employed on the high-voltage side. The switches, S7 and S8, in the TL-VDR can provide a power flow path for the current of inductor Lf and generate a zero-voltage on the high-voltage side. Therefore, it is possible to generate three voltage-levels with the TL-VDR. As a result, optimized PWM plus PSM control strategies can be applied to both sides of the bidirectional converter, which is similar to the traditional full bridge DAB converter.

Reference

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