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AUTOMATIC MODE SHIFTING CONTROL STRATEGY WITH FULL BRIDGE DC SEPIC CONVERTER SUITABLE WIDE INPUT VOLTAGE RANGE

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Abstract:

In recent years the use of buck-boost converters are more when compared to other type of converters. When compared with the basic converters like cuk, zeta the two switch buck-boost converter (TSBB) presents less voltage losses on the switches. The two switch buck-boost converter requires fewer passive components can effectively reduce the conduction and switching losses, leading to high efficiency over a wide input voltage range. The TSBB converters has been extensively used in telecommunications, battery operated vehicles etc. with wide input voltage range. So it is thus important to improve the efficiency of TSBB converter over a high input voltage range. So in the telecommunications systems and fuel cells the TSBB converter input voltage fluctuates with output power, due to the input voltage response is not satisfactory. If the input transient voltage response is not satisfactory it creates problems on the output response of the system. so in addition to these TSBB converter we use input voltage feed forward method (IVFF) to improve the input transient response and reduces the effect of input voltage disturbances on the output of the system. These input voltage feed forward compensation is then proposed for two switch buck boost converter which realizes the automatic selections of operating modes and input voltage feed forward functions. The smooth switching between boost and buck modes is guaranteed with inverting mode of operation for the control of induction motor by representing its characteristics using matlab/simulink.

Index Terms—Input voltage feed-forward, small-signal model, two-mode control, two-switch buck-boost converter , induction motor,multi level inverter(MLI).

1. INTRODUCTION

THE two-switch buck-boost (TSBB) converter, as shown in Fig. 1, is a simplified cascade connection of buck and boost converters [1]. Compared with the basic converters, which have the ability of both voltage step- up and step-down, such as inverting buck-boost, Cuk, Zeta, and SEPIC converters, the TSBB

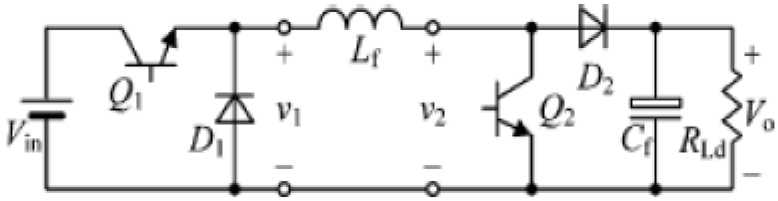

Fig.1. Two-switch buck-boost (TSBB) converter.

converter presents lower voltage stress of the power devices, fewer passive components, and positive output voltage [2]–[4], and it has been widely used in telecommunication systems [4], battery-powered power supplies [5], [6], fuel-cell power systems [7], [8], power factor correction (PFC) applications [9], [10], and raido frequency (RF) amplifier power supplies [11], all of which have wide input voltage range.

It is thus imperative for the TSBB converter to achieve high efficiency over the entire voltage range. Moreover, considering that the input voltages from battery and fuel cell fluctuate with the output power, and the input voltage in the PFC applications varies with the sinusoidal line voltage, a satisfactory input transient response preventing large output votlage variation in case of input voltage variation is also desired for the TSBB converter. There are two active switches in the TSBB converter, which provides the possibility of obtaining various control methods for this converter. If Q1 and Q2 are switched ON and OFF simultaneously, the TSBB converter behaves the same as the single switch buck-boost converter. This control method is called one mode control scheme [12], [13]. Q1 and Q2 can also be controlled in other manners. For example, when the input voltage is higher than the output voltage, Q2 is always kept OFF, and Q1 is controlled to regulate the output voltage, and as a result, the TSBB converter is equivalent to a buck converter, and is said to operate in buck mode. On the other hand, when the input voltage is lower than the output voltage, Q1 is always kept ON, and Q2 is controlled to regulate the output voltage, and in this case, the TSBB converter is equivalent to a boost converter, and is said to operate in boost mode. Such control method is called two-mode control scheme [3], [4]. Compared with one-mode control scheme, two-mode control scheme can reduce the conduction loss and switching loss effectively, leading to a high efficiency over a wide input voltage range, as explained in [4].

2. TWO-MODE CONTROL SCHEME

where d1 and d2 are the duty cycles of switches Q1 and Q2 , respectively. In the two-mode control scheme, d1 and d2 are controlled independently. When the input voltage is higher than the output voltage, the TSBB converter operates in buck mode, where d2 = 0, i.e., Q2 is always OFF, and d1 is controlled to regulate the output voltage; when the input voltage is lower than the output voltage, the TSBB converter operates in boost mode, where d1 = 1, i.e., Q1 is always ON, and d2 is controlled to regulate the output voltage.

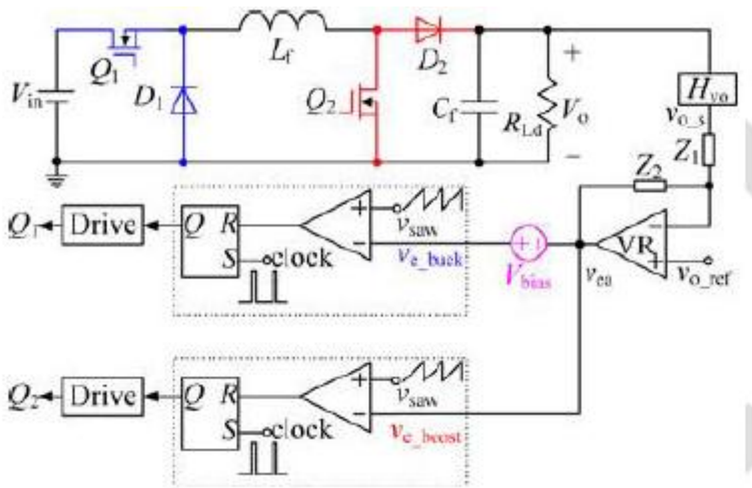

Fig.2. TSBB converter under the two-mode control scheme

Thus, the voltage conversion of the TSBB converter with two- mode control scheme can be written as Fig. 2 shows the TSBB converter under the two-mode control scheme based model of a dc–dc converter, the switch is modeled by a controlled current source with the value equaling to the average current flowing through the switch, and the diode is modeled by a controlled voltage source with the value equaling to the average voltage across the diode. With this method, the averaged switch model of the TSBB converter can be obtained, as shown in Fig. 4(a), where iQ1 = d1 iL and iQ2 = d2 iL , which are the average currents flowing through switches Q1 and Q2 , respectively, and vD1 = d1vin and vD2 = d2vo , which are the average voltages across diodes D1 and D2 , respectively.

3. COMPARISONS OF SIGNALS

The main feature of the voltage source inverter supply is that the inverter supplying DC voltage is nearly constant, relatively high capacitance capacitor energy storage is built in, to filter the transient load change. To achieve the field oriented control, the switching elements of the inverter constrain voltage to the motor Simulink is a software package for modeling, simulating, and analyzing dynamical systems.

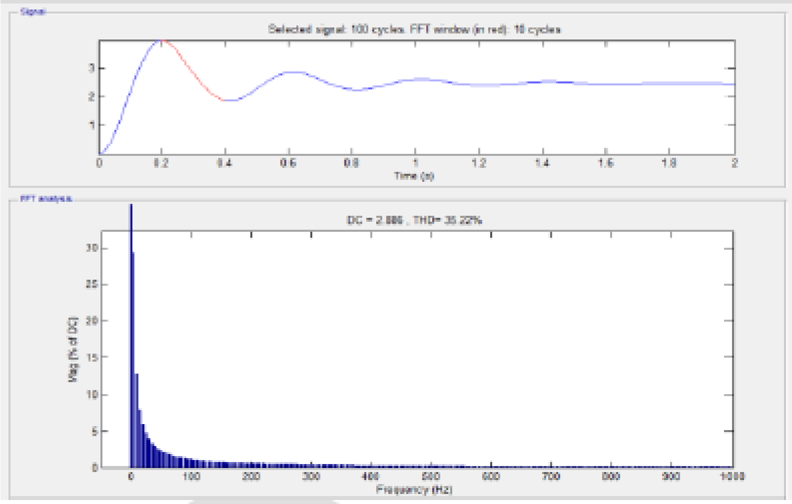

Fig.3.Result analysis

It supports linear and nonlinear systems, modeled in continuous time, sampled time, or a hybrid of the two. Systems can be also multi-rate, i.e., have different parts that are sampled or updated at different rates. For modeling, Simulink provides a graphical user interface (GUI) for building models as block diagrams, using click-and-drag mouse operations. With this interface, you can draw the models just as you would with pencil and paper (or as most textbooks depict them). This is a far cry from previous simulation packages that require you to formulate differential equations and difference equations in a language or program. Simulink includes a comprehensive blocklibrary of sinks, sources, linear and nonlinear components, and connectors. You can also customize and create your own blocks.

CONCLUSION

So my present work is about the 250-500V input and 360V output and 6kw rated power prototype is designed to validate the effectiveness of the proposed control scheme in the matlab software and the results of the TSSB converter has an improved input transient response and more efficiency over a wide input range. My present work is extended by giving two switch buck boost converter (TSSB) to an inverter and then to an induction motor. So by varying the input voltage of an inverter we can vary the speed of an induction motor and the results for currents, speed and torque.is shown in my extension work.

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