Effects of ripple factor of a Fly-Back Converter with Buck-Boost Regulator for DC Motor used in Electric Vehicle

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Abstract : This paper presents structure and advancement of fly-back converter with buck-boost regulator for DC motor utilized in electric vehicle for sustainable power source application. An electric vehicle working with DC motor stimulated from fly-back converter with buck-boost regulator, the vitality produced by sustainable sources like sun based vitality and wind vitality. The present work portrays five-phase generator to create the power from wind fans, and five phase converter (rectifier) is utilized to convert AC to DC. The fly-back converter is used in the power transformation frame work, also voltage can be regulated and used to drive the electric vehicle. In this paper the 5-phase generator is used to obtain the renewable energy with minimum ripples and good efficiency.

Key words **- Fly-back converter, Five-phase generator, Five-Phase converter, Buck-Boost regulator.**

I. INTRODUCTION

Power is a valuable energy in power electronic converter system, the world confronting an excess of a dangerous atmospheric deviation, this is because of utilization of vitality over 25% of overall ozone depleting substance (GHG-Green House Gas), to avoid a dangerous atmospheric deviation we need to cut GHG emanations and expand sustainable power source selection, we need to supplant the renewable energy for ICE (Internal Combustion Engine) with half and half framework and the cross breed controlled vehicles (hybrid powered vehicles).

Electric vehicles are cleaner than oil fuel vehicles and by all accounts fitting answer for an unnatural weather change. In future vehicles with sustainable power source on the planet will end up promising item for transportation framework to limit an unnatural weather change. The sustainable power source framework offers vitality free of cost and dependable activity towards the development of electrical vitality framework. Wind turbines convert the mechanical power into electrical vitality. Subsequently, wellspring of mechanical power can broadly use in interior ignition motor.

II. PROPOSED ALGORITHM

The figure 1. shows the block diagram of fly-back converter with buck-boost regulator for DC motor drive utilized in electric vehicle for the use of sustainable power source. The blocks in the diagram consists of five-phase wind turbine, five phase converter, buck boost converter, fly back converter, charge controller, and DC motor.

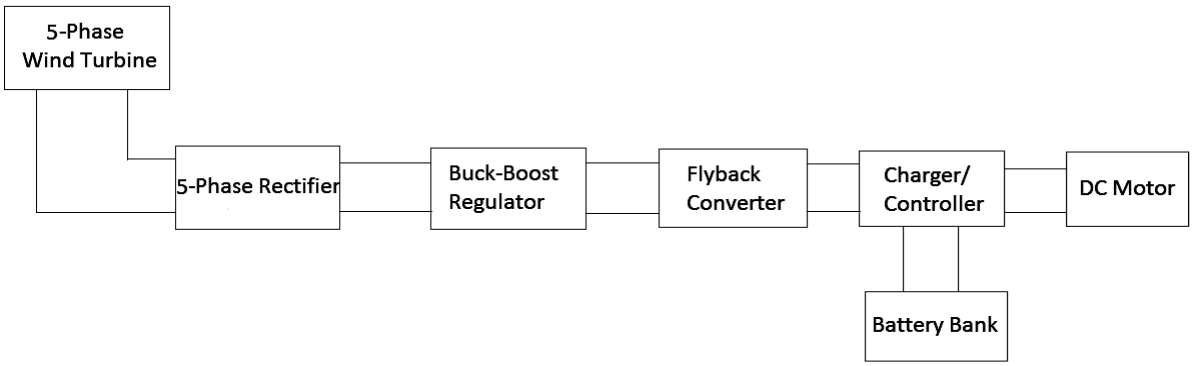

Figure 1. Block diagram of fly-back converter with buck-boost regulator to drive dc motor used in electric vehicle for the application of renewable energy.

III. CONSTRUCTION OF FIVE-PHASE CONVERTER

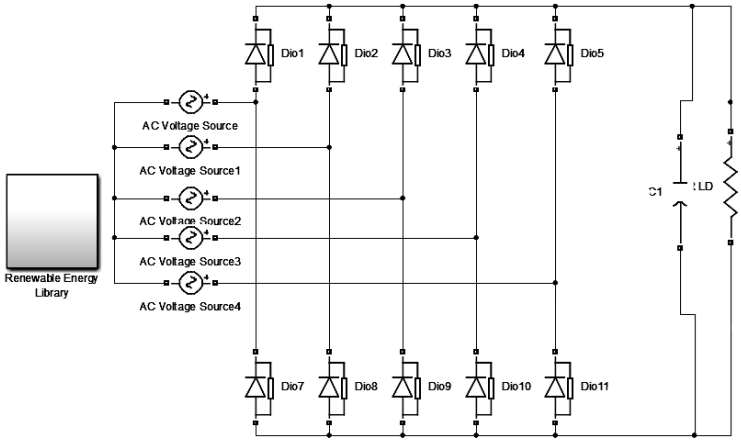

Figure 2. Five phase wind energy generator system with rectifier circuit.

A five phase converter is constructed with power diodes with 5 legs. In every leg the two diodes connected in series, the five phase voltage obtained by wind turbine is converted to DC component. The DC power produced by five phase converter is less ripple content. Therefore, this work is suitable for inverter drive applications, since the harmonic content in the inverter are suppressed to a desired level, which may harmful to the motor loads.

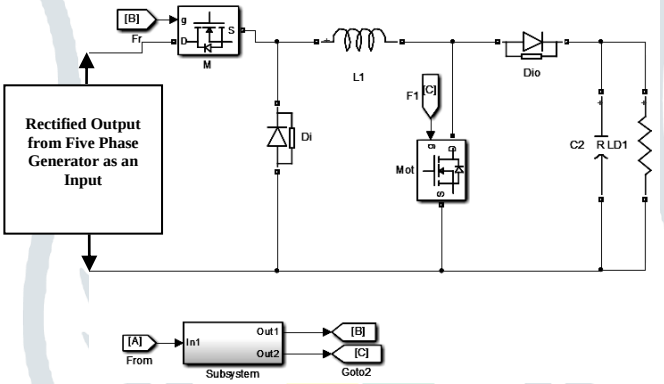

Figure 3. Buck-boost converter circuit.

The wind turbine produces energy accordingly the presence of wind. If the wind produced is less the speed of rotation of turbine decreases which intern reduced the production of energy, similarly the production of the energy is high with increase in rotation of wind turbine. The power electronic loads require constant and reliable power to operate smoothly, the variation of this power can be overcome by buck boost regulator, during low energy production the energy is required to boost for desired level, during high production of power it is required to regulate the power. This can be maintained by using buck-boost regulator circuit.

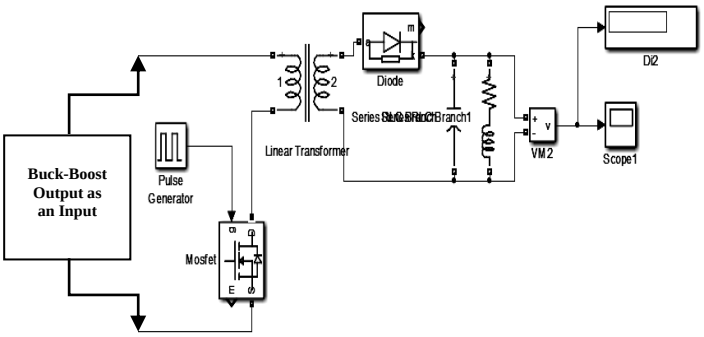

Figure 4. Fly-back converter circuit.

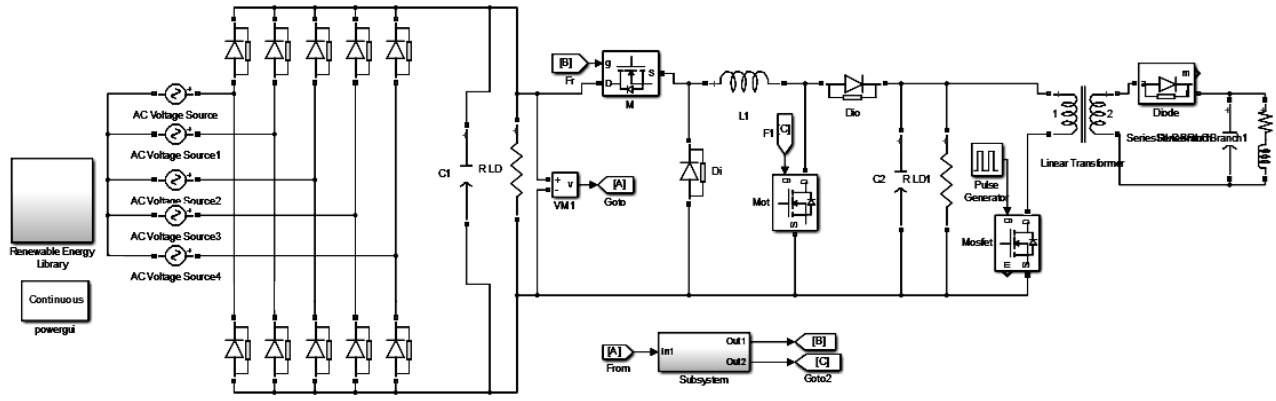

Figure 5. Five phase generator with buck-boost regulator and fly-back converter for dc motor.

The simulation circuit diagram of five-phase generator with Buck-boost regulator and fly back converter for DC motor is shown in fig.5. The buck-boost regulator is designed to work for the voltage between DC 150V to DC 250V.

IV. RESULTS

For the fly-back converter with buck-boost regulator, voltage v/s time has been estimated utilizing Simulink appeared in figure 6. Here x-axis shows the time and y-axis shows the voltage. The rectified output from the five-phase rectifier has imbalanced output voltage, to get the constant and stabilized output we are using buck-boost regulator and fly-back converter at the output of five-phase rectifier. By the simulation we are getting DC 205.9V settled output for AC 100V, 50Hz (from wind turbines).

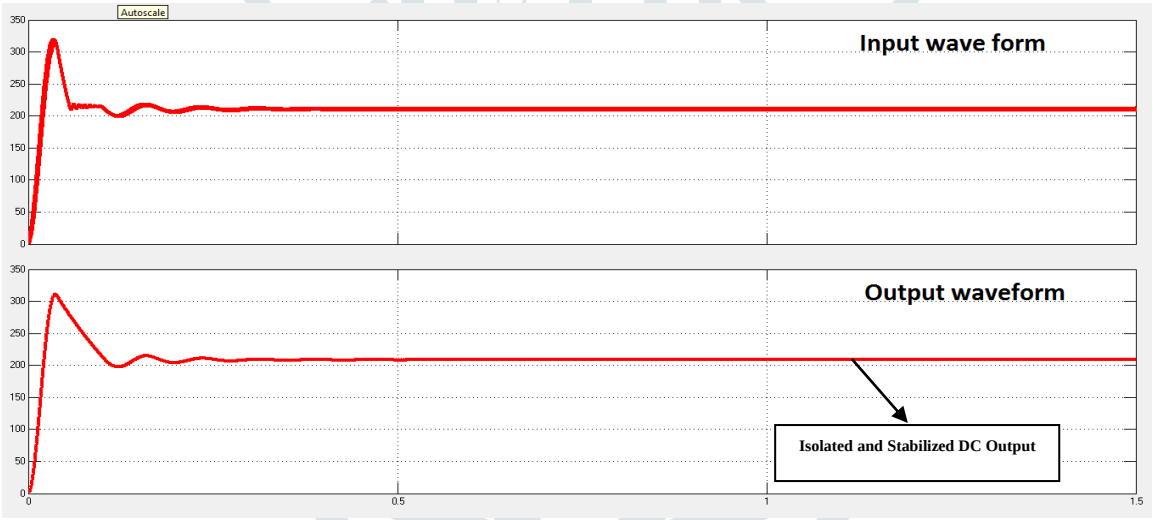

Figure 6. Input and output voltage waveform of fly back converter.

Ripple Factor is a certain percentage of AC input waves present in the rectifier's DC output, which causes noise in the electrical circuits. It's a dimensionless measurement unit, generally represented in percentage, used to measure how smooth the DC output is.

Formula

$$\text{Ripple Factor} = \frac{\text{RMS Voltage}}{\text{DC Voltage}} * 100$$

$$\text{Vrms} = \frac{1}{\sqrt{2}} * \text{Vp} = 0.707 * \text{Vp}$$

Here Vp = 100

$$Vrms = 0.707 * 100$$

$$Vrms = 70.71V$$

and Vp = 100, Vrms = 70.71V & DC Output Voltage = 205.9V then the RF can be calculated as

$$\text{Ripple Factor} = \frac{70.71}{205.9} * 100$$

$$\textbf{Ripple Factor} = 34.34\%$$

The ripple factor of fly-back converter is obtained, the value of ripple factor in percentage is 34.34% of smooth DC output.

V. CONCLUSION

The output response of a fly-back converter with buck-boost regulator for DC motor application has been recreated by making a power source of 5-phase generator. The results obtained from the simulation are considered and this work is proposed to make power source for electric vehicles for high and low wind energy generation system. By using fly-back converter, the ripple voltage at the output has been slightly minimized, these ripple cause noise in the DC motor load power electronic system.

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