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Voltage Regulation under Transient Condition in Wind Turbine using Boost Converter in MATLAB Simulink

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ABSTRACT

The performance of the wind turbine, is highly dependent on the power of wind. Regarding environmental conditions in India constant flow of wind is unexpected. During soft-start in wind turbine, fluctuation has occurred, and due to the change of wind flow, the rotational speed is changed. At the same time, the output voltage of generator connected to the turbine is directly proportional. Due to the fluctuation of the air flow, the output voltage is disrupted, so it is important to increase the voltage and maintain a constant speed. DC-DC boost converter are particularly useful for a better match of voltage to supply. In base paper DC generator is used now in this work Synchronous generator is used with proposed boost converter and obtain the output. With this switching and amplify the voltage higher than the conventional converter at the same frequency and in the same work cycle. Here, as the output will be used in the variable voltage state of the wind turbine. The simulation model generates and outputs are obtained using Matlab Simulink.

Keywords: Wind turbine, snubber capacitor, DC to DC Boost converter, Matlab Simulink.

1. INTRODUCTION

Energy crisis is nothing new, for India by the use of other resources like coal, nuclear energy etc. will harm the condition of environment. For that reason wind power is suitable answer for future energy generation, as wind turbine is a clean energy source, and unlike dirty fossil fuels, help us to protect our planet by reducing pollution and lowering the amount of harmful emissions that contribute the global warming. Above all, energy by means of wind is completely renewable, and is a domestic sources which we need not to depend on other non-renewable resources. Alternative energy sources such as solar and wind power have energy sources to produce energy on a large tightened Framework. However, a common drawback with solar and wind Energy is unpredictable. They are dependent on weather and Climate change. Autonomous photovoltaic (PV) or wind Energy systems are not possible to produce energy a substantial part of the time throughout the duration of Day. To use the efficient and economical renewable energy, adaptation optimal design Technique is needed and to use the power in the various Location of the transition period. In this article proposed introduces optimized boost converter with at least Losses and minimum ripple in the output circuit Voltage to the load.

High Power DC / DC converter is an important part of today emerging technologies such as vehicle electric battery, electric hybrid solar wind, and electrical equipment fuel cell. Typically, an increase in voltage is required to increase the low voltage, wind, fuel cell or battery to the high voltage required by the traction motor converter DC or constant voltage, Loads. In these applications, it is important that the size and Mass of the probe is reduced. In addition, the transducer is a simple design with a high-efficiency operation should have over the entire load range [1]. The huge passive High Power Components DC / DC

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boost converter used,particularly large inductance, constitute the majority of the size of the converter. It reduces the size of passive Components in the high frequency band. So, Because of this high specific power, high power density can be receive and may also be through this fast transient response, achieved. However, there are two important types. A high power high frequency operation (up to 10 kW) DC/DC Converters. First, the switching losses increase proportionally reduced with the increased frequency converter the efficiency and increases the cooling requirements. A bigger cooling system increases the overall cost and weight of the converter system. Second, and more problematic, high bipolar power insulated gate (IGBT) used in this Converters are hard switching operation is often limited to about 30 kHz or less, depending on the power level. The Cut-off frequency offset exists and avoid overheating The IGBT failure. When soft-switching is used, the switching Losses are reduced, the IGBTs allow the operation reduce the frequencies widely up to 70 kHz, which can the size of passive components in converter without Increasing the size of the heat sink[1]. Thus, a suitable soft switch is Circuit should be used in effective increase Converters for traction applications, so that the switching frequency can be increased, mass passive components may be reduced, and a high specific power can be obtained objectives.

In recent years, a number of circuits and control technology been proposed to reduce the switching losses in the Boost DC / DC Converters. In the resonant or quasi-resonant converter, the devices are cut and / or zero or zero-voltage on Current of a resonance mode. However resonance Converters require careful adjustment of the operating frequency.

In addition, it is difficult to filter and control circuits due to the wide range of switching frequency fluctuations. Furthermore, the addition of one or more high performance Inductances of the resonant circuit, which may have significant effects Mass is necessary because of the high current carrying capacity, may be partially or the advantage of using a higher switching frequency fully compensated. Passive soft switching techniques using only passive components to achieve zero voltage switching or zero current at a constant level the switching frequency[2]. The auxiliary circuits can be complicated and requires many additional components, comprising additional inductors, which in turn partially or totally Balance between the benefits of using a higher switching mass reduction Frequency. Many of the proposed methods are passive designed for low-power boost converter used metal field effect transistors (MOSFETs), and concentrate on Reduce

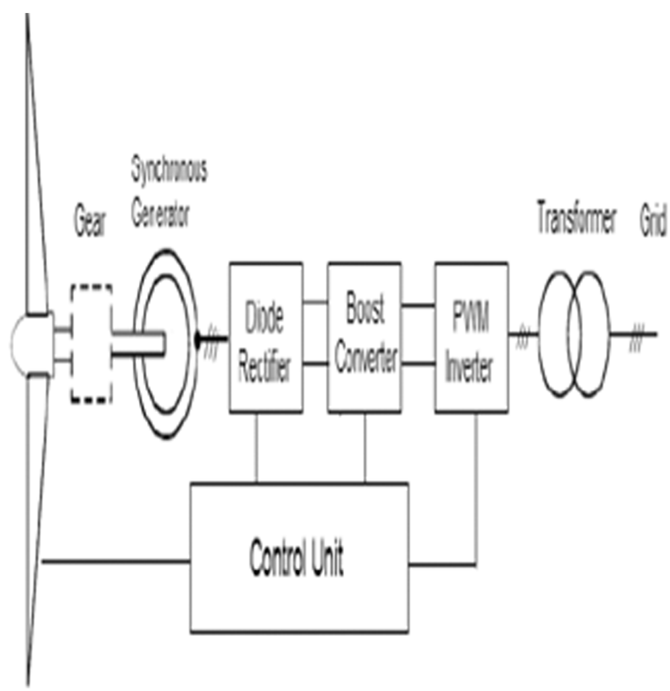

Figure 1: Proposed Wind generator with novel boost converter

the reverse recovery losses (due to the boost diode) when setting the switch instead of the largest Off losses found in high power converter with IGBT.

2. PROPOSED WIND SYSTEM STRUCTURE

A schematic representation of an autonomous wind system in Fig l. Wind generator connected directly to the Boost converter without connecting the batteries. Boost-converter is the pulse voltage during theTransition period, like the speed of light wind maintaining the voltage to the load or inverter is constant. It is connected between the turbine and the load.

Controller is connected across the output voltage to generate respective command to pulse generator in order to maintain the voltage to be constant during transient period. Pulse generator is connected with the output from the control section and to generate respective width of the pulses. These pulses are triggering the switching devices of the converter.Normally the switching losses play a major role in converters. But in this proposed novel boost converter using the snubber capacitor the switching losses reduced significantly.

3. RESULT

Without any converter the output is different and after the boost converter is used the output is different.

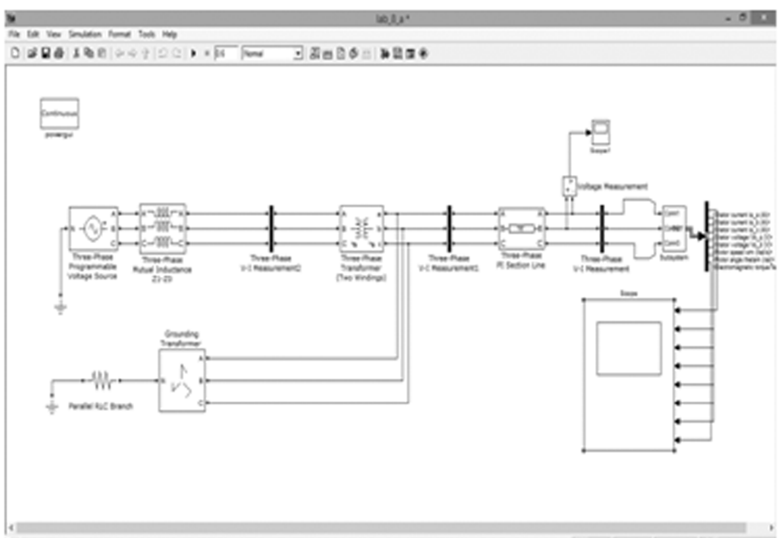

Figure 2: Simulation model without any converter

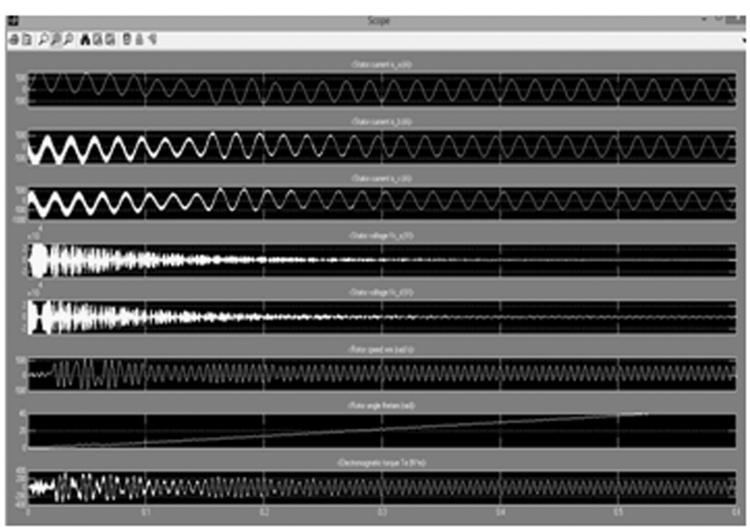

Figure 3: Output with synchronous generator

Simplified model is shown below in Fig 4 this paper across wind turbine Synchronous generator is used

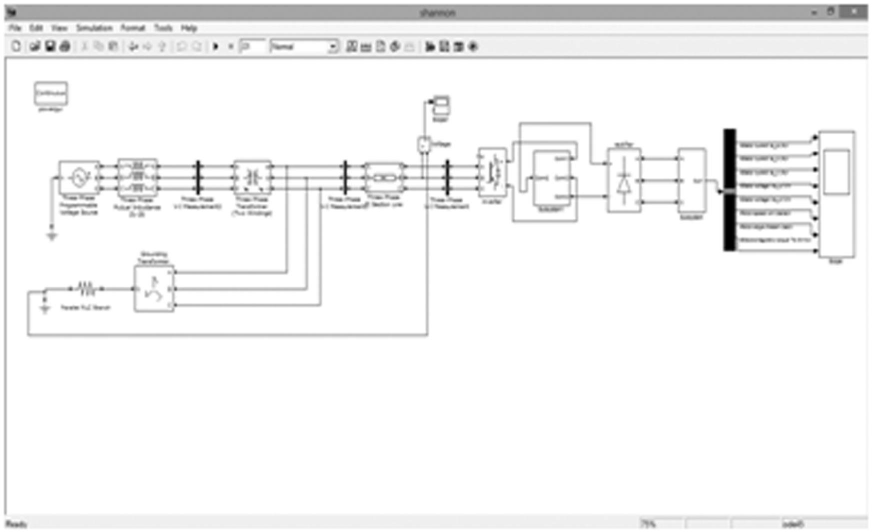

Figure 4: Simulation model of turbine with converter

To obtain output after synchronous generator boost converter is used and with different different speed and output is obtained.

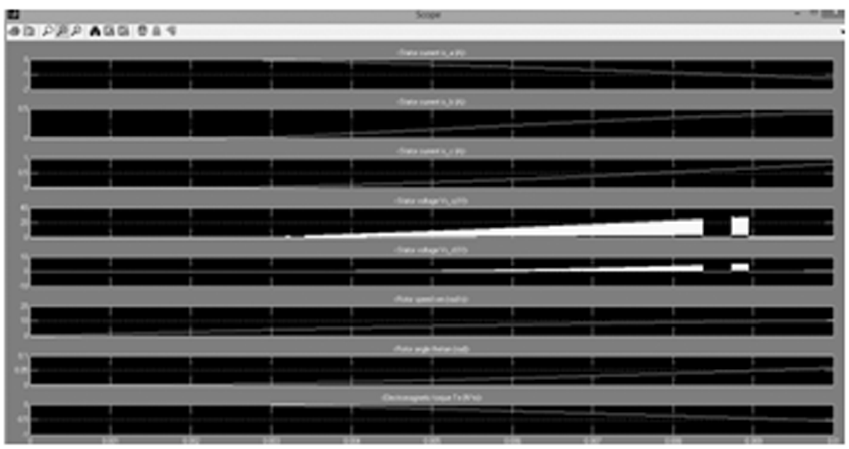

Figure 5: Output with wind speed 30m/s

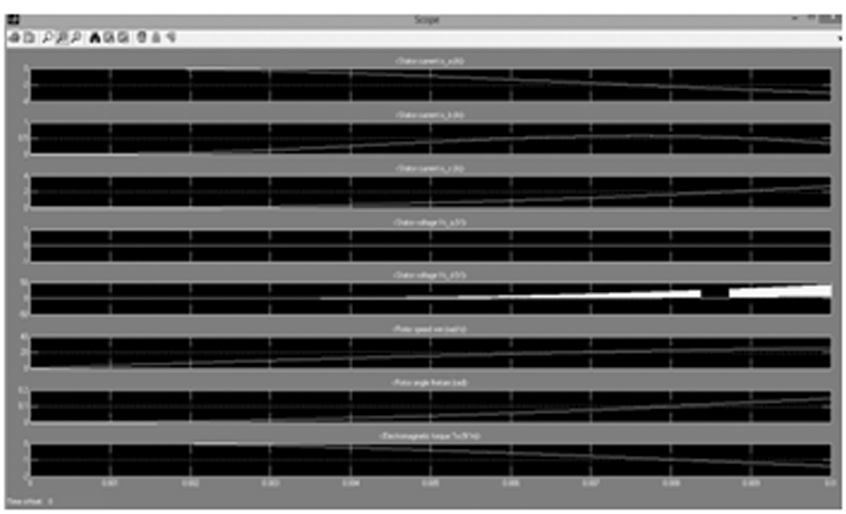

Figure 6: Output with wind speed 35m/s

4. CONCLUSION

The soft switching is used, the switching losses are reduced, enabling these IGBTs to operate at frequencies up to 70 kHz, which can extensively reduce the size of passive components in the converter without increasing the size of the heat sink. Thus, a suitable soft switching circuit should be employed in high-power boost converters. By varying the wind speed almost constant output is obtained.

5. REFERENCES

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