A Novel Variable Speed Wind Energy Using Dc Generator and Three Phase To Three Phase Converter

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Abstract – We know the electrical power is generated by using wind energy to drive a wind turbine .due to their tremendous applications and advantages. For example low volume, low weight, and elimination of gearbox. In this paper , a new wind energy conversion system(WECSs) with DC generator, MPPT, and a new six switch AC/DC/AC converter using power electronic devices and network is proposed. The main aim of this paper to offers sinusoidal outputs at the output side i.e. load and manufacturing cost. Finally, delivering the power to the grid. This configuration uses only six switches and diode among three phases to three phase AC/AC converter.

Index Terms – WECSs, MPPT, Ac/Ac converter, six switch, wind generator.

1. INTRODUCTION

As the name suggest "a novel variable speed wind energy using dc generator and ac to ac converter". There are two types of energy sources renewable energy source and non-renewable energy sources. Wind energy is the renewable energy source. This wind energy is play an important role to reduced the emission and impact of the climate changes. We know that wind energy has numerous advantages and applications, due to various technologies are developed for the for them .In this paper DC Generator are used for conversion of wind power. Generators are commonly used in AC drive. MPPT is used for extracting maximum power from the generator using P and O algorithm.

Now this configuration includes back to back PWM rectifier-inverter. This rectifier is controlled for maximum power point tracking and inverter under P and O algorithm and finally to deliver high quality power to the grid. This topology is proposed for (3ϕ-3ϕ) three phase –three phase so it required 12 active switches and 12 diodes. Recently, the nine switch converter topology is proposed, but we can reduce the active switches and diode without changes in the objective.

Now in this paper, a new SCDG based WECS with six switches three phase-three phase (3ϕ-3ϕ) AC/AC converter is proposed to delivering the power to the grid. This topology is most advantageous than the back-back WECS and Nine switch converter and 12 switch converter, therefore it reduces the switches so result reduction in cost without changes in the objectives of WECs.

2. PORPOSED MODELLING

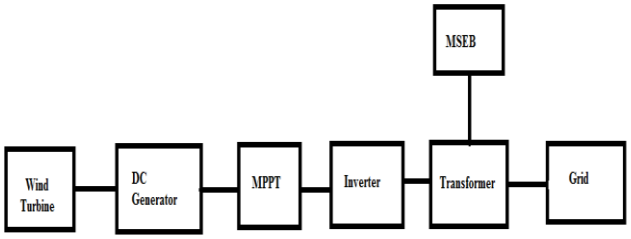

Fig: Block diagram of proposed methodology

In this paper, we did the wind conversion and the deliver the power to the grid. The proposed topology consist of wind turbine, DC generator, MPPT, inverter, Transformer and Grid. Wind conversion is done with the help of wind turbine, then using DC generator under the principle of faraday's low of electromagnetic induction. MPPT work as an extracting maximum power from the dc generator. This overall process is depends on the MPPT(maximum power point tracking).This MPPT work as a P and O algorithm. The chapter starts with a brief background of wind energy conversion system, then main MPPT control methods are presented.

2.1.Wind Energy Background

The power produces by wind turbine,

$$P_m=0.5\pi\rho C_p(\lambda, \beta)R^2V_\infty^3$$

Where,

R is turbine radius

V_∞ is the wind speed

ρ is air density

C_p is power coefficient

λ is the tip speed ratio

β is pitch angle

We know that, the tip ratio is,

$$\lambda=\frac{\omega R}{V\infty}$$

where,

ω is angular speed.

2.2. MPPT (Maximum power point tracking)

Due to incident wind speed, maximum output power of wind turbine is obtained in different speed of the turbine. The generator speed must be adjusted according to instantaneous wind speed to obtain incident maximum power. Optimum generator speed is determined by MPPT block of control system. Perturb and Observe (P & O) technique is used for MPPT. Optimum speed is used as reference speed. Now the MPPT work under the buck-boost converter.

Now the MPPT circuit is based around the buck-boost converter. The MPPT controller is more sophisticated and more expensive. It has several advantageous than the other converter. It has 30 to 40% more efficient at low temperature, but MPPT such a converter is little bit making complex in compare to PWM converter. It required basic knowledge of power electronics devices.

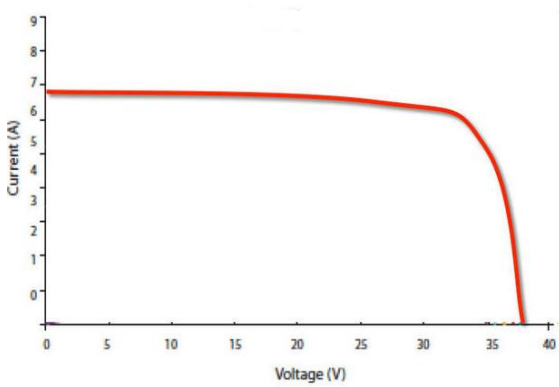

Fig: Design of MPPT

2.3. BUCK-BOOST CONVERTER

A Buck converter is a switch mode DC to DC converter in which the output voltage can be transformed to a level less than or greater than the input voltage. The magnitude of output voltage depends on the duty cycle of the switch. It is also called as step up/step down converter. The name step up/step down converter comes from the fact that analogous to step up/step down transformer the input voltage can be stepped up/down to a level greater than/less than the input voltage. By law of conservation of energy the input power has to be equal to output power (assuming no losses in the circuit).

Input power (Pin) = output power (Pout)

In step up mode Vin<Vout in a Buck Boost converter, it follows then that the output current will be less than the input current. Therefore for a Buck boost converter in step up mode,

Vin<Vout and Iin>Iout

In step down mode Vin>Vout in a Buck Boost converter, it follows then that the output current will be greater than the input current. Therefore for a Buck boost converter in step down mode.

Vin>Vout and Iin<Iout

2.2.1.MPPT Controlled Algorithm

The most part of the wind power MPPT system is the control algorithm. Decides to increase or decrease the duty cycle that drive transistor to find maximum power point.

P and O Algorithm

There are many algorithm that have been introduce literature. There are mainly 2 popular algorithm P and O algorithm. It is most used because of its simplicity .the wind power terminals voltages is perturbed, which means increasing or decreasing and compared with previous power point. The perturbation will move the operating point toward the maximum power point.

3. ADVANTAGES

1. Maintenance cost is low
2. It can be installed in small area.
3. It doesn't produces any emission.
4. It is distributed power generation application.
5. It has complete control of active and reactive power.

4. DISADVANTAGES

1. Installation cost is high.

2. In winter season there is small amount of wind is available.

5. APPLICATIONS

1. For the grid connection.

2. Domestic purpose.

3. In agricultural purpose.

6. CONCLUSION

In this way, discuss the basic terms used in the paper and its control using AC-DC-AC converter. In this paper a WECS with six switch AC/AC converter is proposed. Six switch converters is used for maximum power point tracking control. And delivering power to the grid. This proposed system has cost advantageous as compare to conventional WECs with back to back converter. because the no. of switches are reduced with this topology without changing the objectives of WECs.

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