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MAXIMUM POWER POINT TRACKING OF A VARIABLE SPEED WIND TURBINE WITH A AFPM SYNCHRONOUS GENERATOR

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Abstract:

This project proposes a wind energy is one of the most promising and developed renewable energy resources. A power electronic interface is needed in order to connect a Wind Energy Conversion System (WECS) to the load or the utility grid. Control of this interface, that consists of generator- and grid facet converters, may be a vital and stern task. The main purpose of controlling the generator-side converter is implementing PID and Maximum Power Point Tracking (MPPT). In this project, MPPT algorithm is modified using PID in a way that its performance has been enhanced in terms of accuracy and speed. This changed algorithmic rule permits the system to unendingly extract the most energy from the wind by generating Associate in Nursing acceptable rotor speed reference. Verify the satisfactory performance of the management theme and therefore the changed MPPT algorithmic rule. A comparison is additionally created between MPPT and inflammatory disease managementlers relating to their speed control performance.

Keywords — **PID,Maximum Power Point Tracking, Speed Control, Wind Energy Conversion System.**

I. INTRODUCTION

A lot of attention is directed towards renewable energy resources. The rapidly decreasing amount of fossil fuels along with the increasing global demand for energy makes it very important to exploit new energy resources. Environmental issues also have become serious enough to increase the importance of using renewable energy resources. Wind energy is one of the most important and developed renewable energy resources. Among different types of generators, Permanent Magnet Synchronous Generator (PMSG) is a perfect choice for using in Wind Energy Conversion Systems (WECSs).

It has notable advantages such as high power density, high efficiency, low maintenance, high reliability and elimination of slip rings. PMSGs with large number of poles are available and are suitable for direct drive systems. In Doubly Fed Induction Generator (DFIG) has been utilized in a WECS, which has some major drawbacks comparing to PMSG such as lower efficiency and reliability, existence of slip rings and the corresponding problems, and the need for gear box for connecting the generator to the wind turbine. In order to connect the PMSG to the load or the power grid, a power electronic interface, consisted of two stages of rectification and inversion is needed. For the rectification stage, there are mainly two configurations used in PMSG-based WCESs.

II. EXISTING SYSTEM

In this project, a wind energy conversion system (WECS) using grid-connected wound rotor induction machine controlled from the rotor side is compared with both fixed speed and variable speed systems using cage rotor induction machine. The comparison is done on the basis of major hardware components required, operating region, and energy output due to a defined wind function using the characteristics of a practical wind turbine.

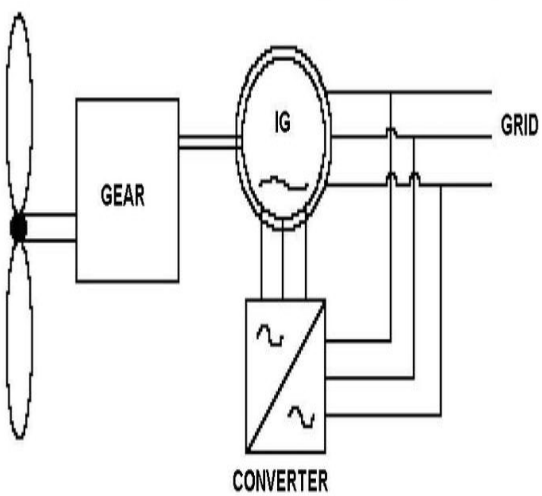


Fig.1. Wind energy conversion system (WECS) using grid-connected wound rotor induction machine controlled from the rotor side

Although a set speed system is a lot of straightforward and reliable, it severely limits the energy output of a turbine. just in case of variable speed systems, comparison shows that employing a wound rotor induction machine of comparable rating will considerably enhance energy capture.

III. PROPOSED SYSTEM

As one of the most commonly used renewable energy sources, wind is the most promising one for replacing the fossil fuel in the near future. To achieve high efficiency in a wind power conversion system, the maximum power point tracking (MPPT) in variable-speed operation systems permanent magnet synchronous generator systems, attracts a lot of attention. The studied PID and MPPT methods in the history include three strategies, namely:

1) Methods relying on wind speed;
2) Methods counting on output power mensuration and calculation.
3) Strategies counting on characteristic power curve.

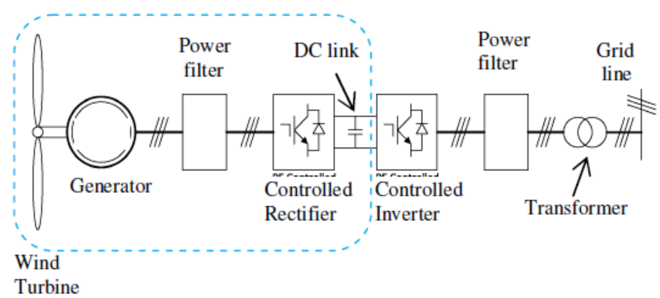
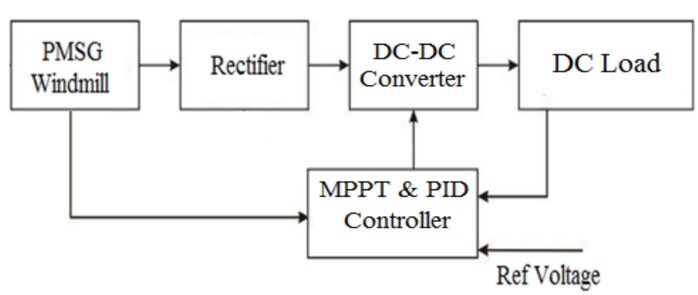


Fig.2.Block diagram distributed generated system

IV. BLOCK DIAGRAM

Fig.3.Block diagram



A proportional-integral-derivative managementler (PID managementler) may be a control loop feedback mechanism (controller) wide employed in industrial control systems. A pelvic inflammatory disease controller calculates miscalculation worth because the distinction between a measured method variable and a desired point. The controller makes an attempt to reduce the error by adjusting the method through use of a manipulated variable.

The pelvic inflammatory disease controller rule involves 3 separate constant parameters, and is consequently generally referred to as three-term control: the proportional, the integral and spinoff values, denoted P, I, and D.Simply put, these values may be understood in terms of time: P depends on this error, I on the buildup of past errors, and D may be a prediction of future errors, supported current rate of amendment. The weighted total of those 3 actions is employed to regulate the method via an impression component like the position of an impression valve, a damper, or the facility equipped to a component.

In the absence of information of the underlying method, a pelvic inflammatory disease controller has traditionally been thought-about to be the simplest controller.[2] By standardisation the 3 parameters within the pelvic inflammatory disease controller rule, the managementler will offer control action designed for specific method needs. The response of the controller may be delineated in terms of the responsiveness of the controller to miscalculation, the degree to that the controller overshoots the setpoint, and also the degree of system oscillation. Note that the utilization of the pelvic inflammatory disease rule for management doesn't guarantee optimum management of the system or system stability.

Some applications could need mistreatment just one or 2 actions to produce the acceptable system management. this is often achieved by setting the opposite parameters to zero. A pelvic inflammatory disease controller are going to be referred to as a PI, PD, P or I managementler within the absence of the individual control actions. PI controllers area unit fairly common, since spinoff action is sensitive to measuring noise, whereas the absence of associate integral term could stop the system from reaching its target worth thanks to the management action.

Maximum power point tracking (MPPT) is a technique that grid connected inverters, solar battery chargers and similar devices use to get the maximum possible power from one or more photovoltaic devices, typically solar panels, though optical power transmission systems can benefit from similar technology.Solar cells have a complex relationship between solar irradiation, temperature and total resistance that produces a non-linear output efficiency which can be analyzed based on the I-V curve.

It is the aim of the MPPT system to sample the output of the cells and apply the correct resistance (load) to get most power for any given environmental conditions.

MPPT devices area unit generally integrated into an electrical system that has voltage or current conversion, filtering, and regulation for driving varied hundreds, as well as power grids, batteries, or motors.

V.SIMULATION DIAGRAMS WITH WAVEFORM

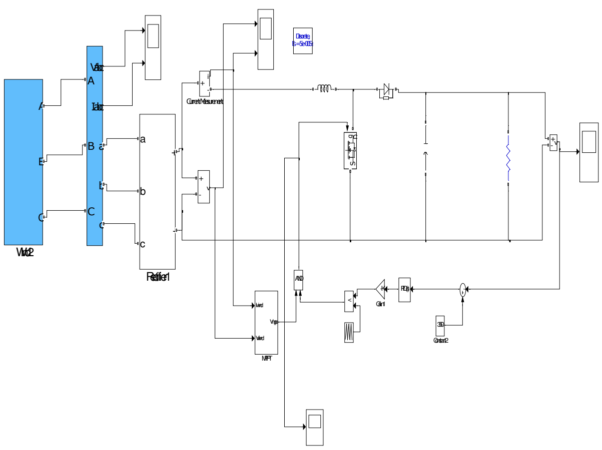


Fig.4 . Simulation Diagram of maximum power point tracking with a variable speed wind turbine with a AFPM synchronous generator

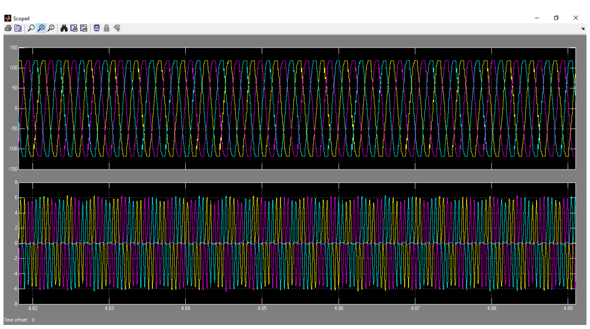


Fig.5. wind voltage and current

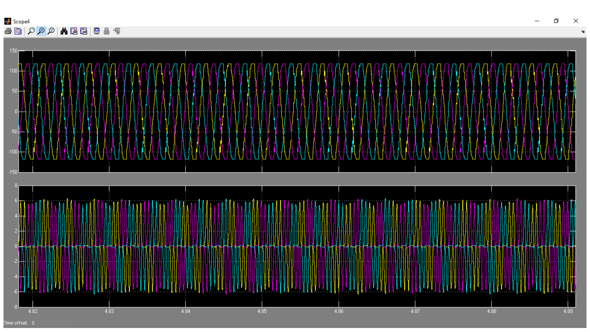


Fig.6. DC voltage and current

VI. CONCLUSION

The proposed system is suitable for a small scale variable speed wind turbine for rural area. The simulation results demonstrates the proper operation of control system in selection of reference rotor speed and than the following of maximum power point 50watt according to change in wind speed 200-300 rpm.

REFERENCE:

[1] A. G. Abo-Khalil and D. C. Lee, "MPPT control of wind generation systems based on estimated wind speed using SVR," IEEE Trans. Ind.Electron., vol. 55, no. 3, pp. 1489–1490, Mar. 2008.

[2] J. A. Baroudi, V. Dinavahi, and A. M. Knight, "A review of power converter topologies for wind generators," in Proc. IEEE Int. Conf. Elect. Mach. Drives, San Antonio, TX, USA, May 2005, pp. 458–465.

[3] P. Guo, "Research of a new MPPT strategy based on gray wind speed prediction," in Proc. 2nd Int. Symp. Knowl. Acquis. Model., Wuhan, China,Nov. 2009, pp. 120–123.

[4] X. Gong, X. Yang, andW. Qiao, "Wind speed and rotor position sensorless control for direct-drive PMG wind turbine," in Conf. Rec. IEEE IAS Annu.Meeting, Houston, TX, USA, Oct. 2010, pp. 1–8.

[5] Y. Jia, Z. Yang, and B. Cao, "A new maximum power point tracking control scheme for wind generation," in Proc. Int. Conf. Power Syst. Technol., Kunming, China, Oct. 2002, pp. 144–148.

[6]H. Li and Z. Chen, “Overview of different wind generator systems and their comparisons,” IET Renew. Power Gen., vol. 2, no. 2, pp. 123–138, Jun. 2008.

[7] S. Soter and R. Wegener, “Development of induction machines in wind power technology,” in Proc. IEEE Int. Elect. Mach. Drives Conf., Antalya, Turkey, May 2007, pp. 1490–1495.

[8] K. Tan and S. Islam, “Optimum control strategies in energy conversion of PMSG wind turbine system without mechanical sensors,” IEEE Trans.Energy Convers., vol. 19, no. 2, pp. 392–399, Jun. 2004.