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SPEED RANGE IMPROVEMENT OF DWIG IN WIND POWER SYSTEMS USING BOOST CONVERTER

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ABSTRACT: In this paper the seed range improvement of DWIG in wind power systems using boost converter is implemented. Earlier Dual-Stator Winding Induction Generator is implemented, but this system does not increase the speed of wind power system. To overcome this DWIG is implemented using boost converter. Based on the speed of rotor the voltage of DWIG will be saturated. High DC voltage is obtained by using boost converter. Hence DWIG will operate at maximum power tracking. The proposed system is simulated in the platform of MATLAB platform. The simulation results optimize the speed range and voltage variations in effective way.
Keywords: dual-stator wind in induction generator (DWIG), boost converter, speed wind power, Semiconductor excitation controller (SEC), control-winding voltage.

I. INTRODUCTION

The principle reason for wind turbines is to produce vitality utilizing the breeze. Henceforth, the optimal design is a significant piece of wind turbines. The breeze turbine streamlined and drive train square contains both the whole mechanical portrayal of the breeze turbine including the pitch drive and the streamlined model that depicts the change of wind speed to mechanical force [1]. As indicated by the applications, there are a few DC to DC converters that are utilized to balance the information voltage. For the most part, there are two kinds of DC to DC converters which are confined DC to DC converter and non-segregated DC to DC converter. The information and yield of detached DC to DC converter are confined additionally relying upon the electrical hindrance. This is finished by utilizing high recurrence transformer. Ensuring the touchy burden is the significant bit of leeway of disengaged DC to DC converter [2].

Either positive or negative extremity can be utilized for designing the converter yield. The issue is it has high impedance commotion capacity. The electrical obstruction is missing if there should arise an occurrence of non-secluded DC to DC converter. The non-segregated DC to DC converters are ease and basic structure contrast with the secluded DC to DC converters. Five sorts of non-disconnected DC to DC converters are introduced in this paper. To concerning solid exchanging procedures control, higher efficiencies and issue open minded arrangements, various topologies of DC to DC converters are created and they dependent on sustainable power source applications [3-4].

In this area a short correlation between the distinctive non disconnected DC to DC converters dependent on hypothetical execution utilizing MATLAB. There are diverse trademark properties for every converter in different angles. With most extreme force point following calculation, buck lift, Cuk and SEPIC DC to DC converters are read for photograph voltaic frameworks. In this area, singular exhibitions of DC to DC converters are introduced for ideal working point [5]. The examination shows that the buck support DC to DC converter gives ideal MPPT activity in any heap condition and sun based illumination.

There is a little variety between various DC to DC converters when considering just yield power. For specific information and yield power rating, the Buck help converter productivity is sensible on the grounds that the effectiveness decreases is low with power expanding when contrasting it and other non-disconnected DC to DC converters. At higher force, Ultra-lift Luo converter gives higher proficiency. For medium force applications, the Cuk, SEPIC and super lifts Luo are most reasonable converters. For low force, the Buck support is the best one.

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Ultra-lift Luo converter is the more fitting one for high force sustainable power source frameworks since it offer higher proficiency than different sorts. The issues with Ultra lift Luo converter is it produces altered yield of info voltage. At the point when the obligation proportion is expanding, the voltage stress is increased on the switch; this will build the semiconductor switch power appraisals and the expense. Non detached DC to DC converters exchanging power misfortune are concentrated well. In the base loss of components that is utilizing exchanging converters, it is seen that the effective vitality conversional is so lies.

Propelled devices like brilliant homes, iPads, workstations and Personal Computers have become practically universal nowadays. Thus, these gadgets are outfitted with numerous sight and sound capacities. It is important to consolidate PMIC which can be extended as force Management Integrated Circuits to deliver flexibly voltages. From a brought together battery the squares of assorted interactive media requires gracefully voltage since they for the most part work on a diminished limit. A powerful exchanging DC-DC buck help converter with CMOS viability consolidated for expanding time taken for running in cell phones.

The expansion in thickness of chip and decrease in the size of chip and confusion escalates issues to recognize an expanded exhibition low force utilization conspire on a chip. The most critical plan parameter in VLSI circuits is the force scattering since it has huge influence estimating execution of gadgets which are battery actuated that are used to a huge degree for uses of the portable. The plan chain of importance of VLSI circuit includes separating the circuit structure into little undertakings until it arrives at basic levels. This procedure is generally reasonable for portable applications as the plan gets more straightforward; assembling such circuits for a huge scope turns out to be a lot simpler and financially savvy.

II. DUAL-STATOR WINDING INDUCTION GENERATOR IN WIND POWER SYSTEM

The below figure (1) shows the block diagram of Dual-Stator Winding Induction Generator. In this dual stator winding inductor generator in wind turbine system consists of Blade (Turbine), Turbine shaft, Generator, Tailrace and Yaw mechanism. Based on the length of the blade the wind turbine will rotate. Here, the obtained energy is converted in the form of kinetic energy to mechanical energy. The wind blade surface will blow the wind.

Assortments of big turbines, known as wind farms, are transforming into an evidently noteworthy wellspring of irregular feasible force source and are used by various countries as a significant part of a strategy to decrease their reliance on oil based goods.

The Wind is simply moving air, and is made by the sun, which warms the outside of the earth at different rates. During the day, the air over the land heats up more quickly than the air over water. The warm air over the land broadens and rises, and the heavier, cooler air floods in to have its spot, making winds. Around night time, the breezes are turned around considering the way that the air cools more rapidly over land than over water. For whatever length of time that the Sun continues warming the Earth and as long as this procedure keeps on happening, there will be wind. The breeze has been utilized by humankind as a wellspring of vitality for quite a while.

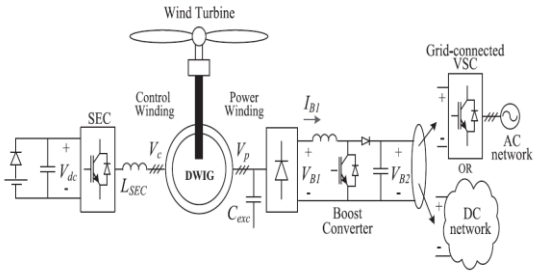

Fig. 1: Block diagram of Dual-Stator Winding Induction Generator

Wind power was utilized as a wellspring of mechanical vitality on the land for a large number of years. The Babylonians built windmills for water system as right on time as 1700 BC and Europeans were utilizing windmills by 1000 AD. The Dutch utilized windmills to deplete the land and utilized eight essential sorts. Dutch pilgrims

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acquainted windmills with the United States in the mid 1600's. Daniel Halliday designed another style of windmill, which many accept energized the quick settling of the American West.

More than 6.5 million windmills were sold in the US somewhere in the range of 1880 and 1935. They were utilized to siphon water, pound grain and cut wood. Some little electrical creating frameworks were utilized to deliver direct flow by 1900. Modest power was presented in the 1940's and a large portion of the breeze fueled producing frameworks in rustic territories were viewed as outdated and fell into neglect.

III. DWIG IN WIND POWER SYSTEMS USING BOOST CONVERTER

The below figure (2) shows the block diagram of DWIG in wind power systems using boost converter. Initially this gives an overview about the 12 Volt battery charge and switching operation of AC load. The blade or turbine is rotated with the speed of velocity in the range of 4.0 m/s to 5.0 m/s. This will convert the obtained energy from kinetic energy to mechanical energy. Based on the pitch curve of the turbine the mechanical energy is obtained. Now by using this mechanical energy the shaft is rotated.

Now this shaft is connected in two sends. In one end shaft is connected to turbine and another end shaft is connected to generator. Here generator is nothing but DWSIG. Now electric power is produced when the rotator is coupled to generator shaft.

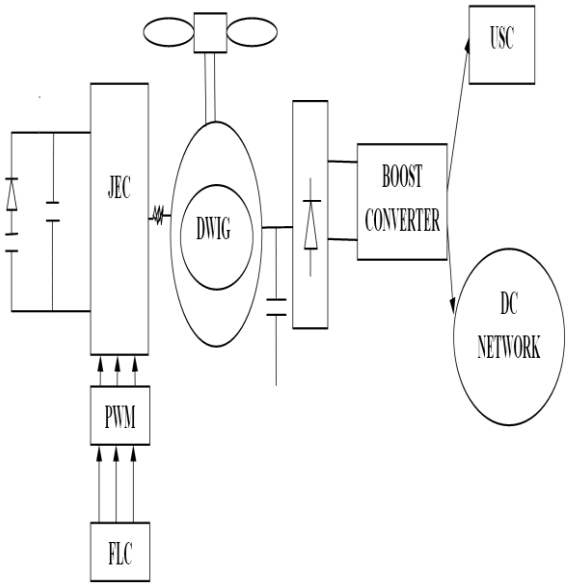

Fig. 2: Block diagram of DWIG in wind power systems using boost converter

Basically to generate the electric power rotor or blade is very important. Mainly Aluminum, steel, metal alloy are used to implement the rotor. As the sector of Wind Energy continues to grow, more ways of making use of this non-conventional energy source are being chalked up. Wind farms are being developed worldwide for continuous energy extraction with huge success; however as wind turbines get bigger so do some of the problems related to them. Problems of Unwanted Noise, excessive space, Effect on birds in the vicinity of wind farms are some of the problems which need attention. As a result a shift of perspective towards smaller, efficient versions of the wind turbine seems necessary.

Air-Conditioners are widely used on a global scale; they alter the temperature of a confined volume which they are subjected to by the user. This happens by releasing air in the surroundings, thus maintaining the equilibrium. It is this released air from the air conditioner which will be the pith of the Following work. Compressor, Condenser and the Evaporator are the three key parts which make any air-conditioning unit function. Out of this the compressor and the condenser are located in the outside unit of the air conditioner and we will be focusing mainly on those parts.

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The evaporator emits the conditioned air and the condenser releases the hot air into the surroundings. This hot air is released with the help of certain fins which run on the provided energy. This released air is of high pressure, high velocity and the idea is to make use of a small scale wind turbine which can make use of the released air and produce energy from it. Hence, The idea of production of minimal yet significant units of electricity, from electricity itself, might feel rather disruptive and is significantly edgy to begin with, however it can be shown to be highly useful as well as sustainable. The below figure (3) shows schematic of DWIG using Boost Converter.

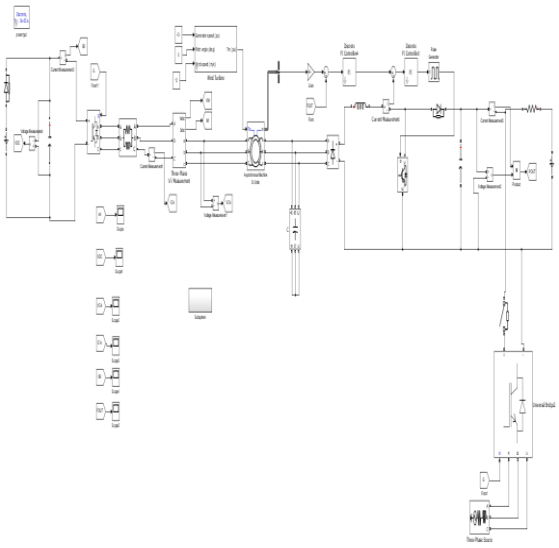

Fig. 3: Schematic of DWIG using Boost Converter

IV. RESULTS

result analysis no=matter

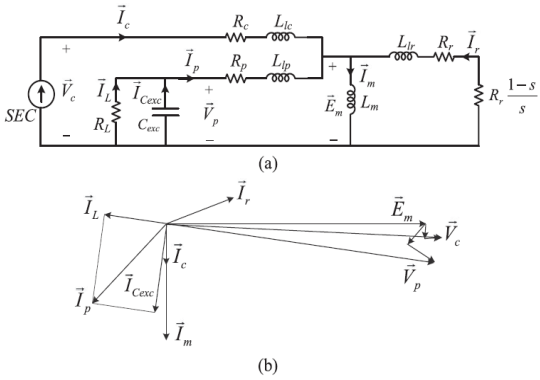

Fig. 4: (a) Pre phase circuit diagram of DWIG. (b) DWIG phasor diagram

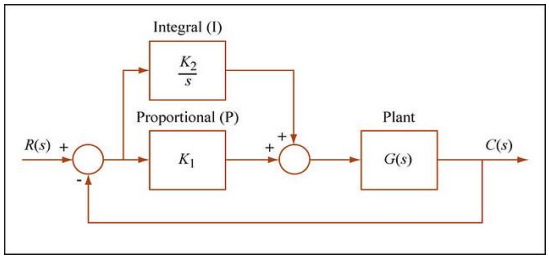

Fig. 5: Block diagram of the PI controller

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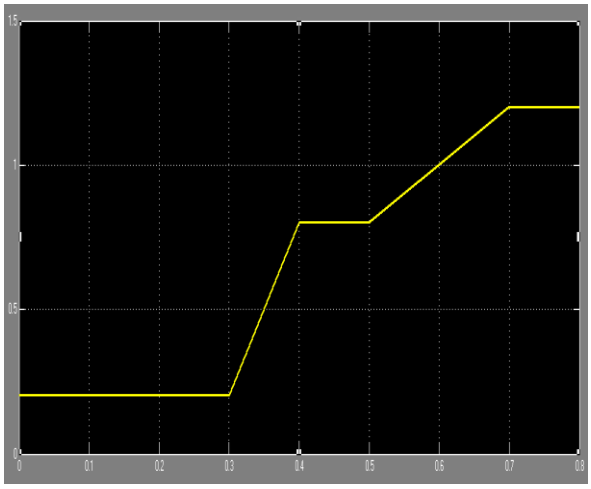

Fig. 6: At t= 0.3 s and t = 0.5 s, the prime mover starts to increase the rotor speed from 0.2 to0.8 p.u.

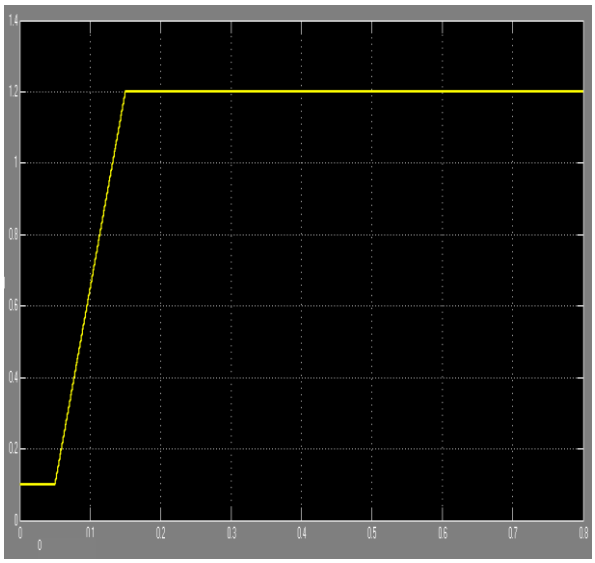

Fig. 7: The Vdc follows its reference signal to reach its nominal value of 1.2 p.u.

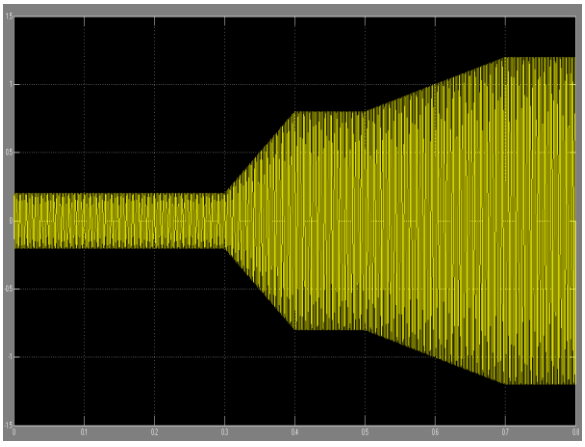

Fig. 8: The phase-A voltage of the control winding (V_{ca})

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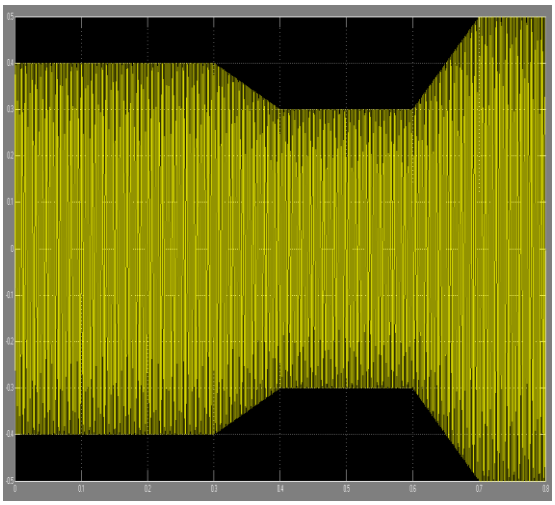

Fig. 9: The phase-A current of the DWIG control winding(i_{ca})

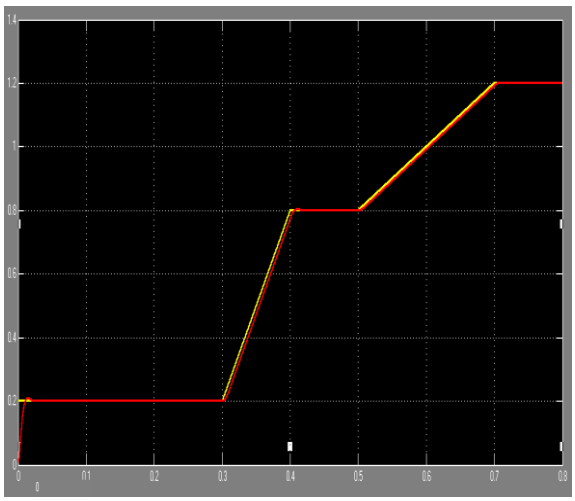

Fig. 10: The input current of the boost converter

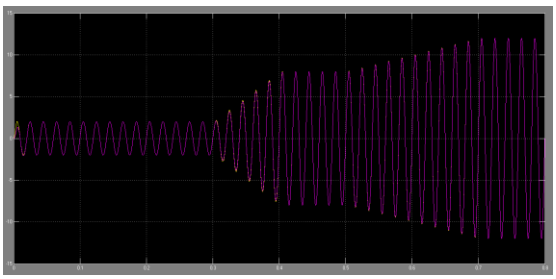

Fig. 11: The power injected into the grid by the voltage source converter

V. CONCLUSION

Hence paper concludes the seed range improvement of DWIG in wind power systems using boost converter. Dual-Stator Winding Induction Generator does not increase the speed of wind power system. By using DWIG based on boost converter the speed range will be increased. Hence DWIG will operate at maximum power tracking. The DWIG in wind power systems using boost converter is simulated in the platform of MATLAB platform. The simulation results optimize the speed range and voltage variations in effective way.

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VI. REFERENCES

[1] Juan I. Talpone, Paul F. Puleston , Marcelo G. Cendoya and José. A. Barrado-Rodrigo, "A Dual-Stator Winding Induction Generator Based Wind-Turbine Controlled via Super-Twisting Sliding Mode", Energies 2019, 12, 4478; doi:10.3390/en12234478.

[2] C Surya Prakash, "Performance of Boost Converter with Fuzzy Logic Controller to Increase the DWIG Speed Range in Wind Power System", Retrieval Number A4474119119/2019©BEIESP DOI: 10.35940/ijitee.A4474.119119.

[3] Mrs. Sushma Sonawane , Mr. K Susharshan, "Application Of Boost Converter To Increase The Speed Range Of Dual-Stator Winding Induction Generator In Wind Power Systems", Vol 08 Issue12, Dec 2019 ISSN 2456 – 5083.

[4] Liuying Li, B.Sc.(Eng.), "Maximum Power Control of Permanent Magnet Synchronous Generator Based Wind Power Generation Systems", September 2016 Electrical Engineering and Electronics.

[5] Arunava Chatterjee and Debashis Chatterjee, "A Novel Hybrid Wind Generation Scheme Suitable for Varied Speed Grid Isolated Installations", 978-1-4799-5141-3/14/$31.00 ©2016 IEEE.

[6] K. Shi et al., "Grid-connected dual stator-winding induction generator wind power system for wide wind speed ranges," J. Power Electron., vol. 16, no. 4, pp. 1455–1468, Jul. 2016.

[7] Anant Deogaonkar1 Prof. Radharaman Shaha, "Auxiliary Parallel Gridside Converter Based Power Quality Improvement In Pmsg Wind Mill System", ISSN (PRINT): 2393-8374, (ONLINE): 2394-0697, volume-3, ISSUE-7, 2016

[8] Safiullah Faqirzay, H. D. Patel, "Maximum Power Extraction from Wind Generation System Using MPPT Control Scheme through Power Electronics Converters", DOI 10.17148/IJIREEICE.2015.3332.

[9] feifei, wenxin haung, kais hi, "Wide-Speed-Range-Operation Dual Stator-Winding Induction Generator DC Generating System for Wind Power Applications", Article in IEEE Transactions on Power Electronics · February 2015

[10] Vinay Kumar Dwivedi, Mohit Bajaj and Abhishek Kumar, "Power Electronics Converters for a Wind", International Journal of Scientific & Engineering Research, Volume 4, Issue 6, June-2013 2686 ISSN 2229-5518 Energy Conversion System: Review.

[11] R. Sharma, T. W. Rasmussen, and B. B. Jensen, "Application of a synchronous generator with a boost converter in wind turbines: An experimental overview," IET Renewable Power Gener., vol. 6, no. 6, pp. 414–423, Nov. 2012.

[12] M. E. Haque, M. Negnevitsky, and K. M. Muttaqi, "A novel control strategy for a variable-speed wind turbine with a permanent-magnet synchronous generator," IEEE Trans. Ind. Appl., vol. 46, no. 1, pp. 331–339, Jan./Feb. 2010.