Dual Fed Induction Generator For Windenergy Conversion Systems With Synthesized Active Filter Capabilities

V. Mahendar
Asst.prof , Dept of EEE, SVS Institute of Technology, Hanamkonda, T.S, INDIA.
D.Kumara Swamy
Assoc. Prof, H.O.D, Dept of EEE, SVS Institute of Technology, Hanamkonda, T.S, INDIA.
S.Soumya , P.Sravani , B.Supriya , P.Hari Chandra Prasad Rao
B.Tech scholars, Dept of EEE, SVS Institute of Technology, Hanamkonda, T.S, INDIA.

Abstract

This project deals with the exercise of a dual-feed Induction generator (DFIG) with open operational penetrate capabilities using the GSK. The most grant concerning work strike the rule of the world Service Center for the afford of the composition to the slippery management delivery. The rotor facet electrical device (RSK) is acclimated widen the pedigree of strength and to cater the suggested strength prescribed to DFIG. The WEC technique performs a passive compensator to cater unity even once wind diesel inclines. The administer knowledge of GSK and RSK are created rigorously. The WIX-based DFIG is sham adopting Mat work / Simulink. A precursor of the DVIX-based WEFX strategy comes out applying Digital SignalProcessor (DSP). The replica results are documented with the take a look at results of progressive DFG for original treat surroundings, within the manner that fickle wind more and unbalanced loads/mono section.

Keywords: Doubly fed induction generator (DFIG), integrated active filter, nonlinear load, power quality, wind energy conversion system (WECS).

Introduction

With the rise in population and industry, the energy demand has exaggerated considerably. However, the traditional energy sources like coal, oil, and gas are restricted in nature. Now, there's a desire for renewable energy sources for the long run energy demand. The opposite main blessings of this renewable supply are eco-friendliness and unlimited in nature as a result of technical advancements, the value of the alternative energy created is admire that of typical power plants. Therefore, the wind energy is that the most popular out of all renewable energy sources

Victimization fashionable power electronic converters, the machine is in a position to run at adjustable speeds. Therefore, these variable speed wind turbines are ready to improve the wind energy production. Out of all variable speed wind turbines, doubly fed induction generators (DFIGs) are most popular thanks to their low value

These DFIGs additionally offer smart damping performance for the weak grid. This vector management of such system is typically accomplished in synchronously rotating arrangement familiarized in either voltage axis or flux axis. during this work, the management of rotor-side convertor (RSC) is enforced in voltage-oriented arrangement. Grid code necessities for the grid affiliation and operation of wind farms are mentioned in . Response of DFIG-based

Circuit Diagram

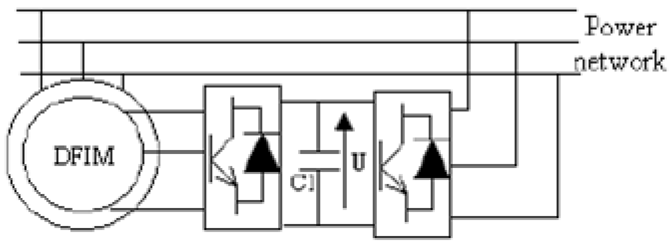
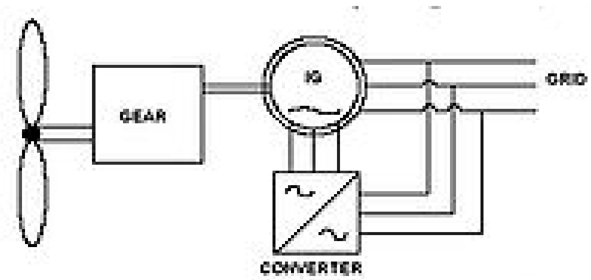


Fig. Doubly-fed induction generator

The principle of the DFIG is that rotor windings are connected to the grid via slip rings and succeeding voltage supply convertor that controls each the rotor and therefore the grid currents. therefore rotor frequency will freely disagree from the grid frequency (50 or sixty Hz). By victimization the convertor to regulate the rotor currents, it's potential to regulate the active and reactive power fed to the grid from the mechanical device severally of the generator's turning speed. The management principle used is either the two-axis current vector management or direct torsion management (DTC). DTC has clothed to possess higher stability than current vector management particularly once high reactive currents are needed from the generator.



PRINCIPLE OF DFIG CONNECTED TO A WIND TURBINE

The doubly-fed generator rotors are usually wound with two to three times the quantity of turns of the mechanical device. this implies that the rotor voltages are going to be higher and currents severally lower. therefore within the typical ± 30 % operational speed vary round the synchronous speed, the rated current of the convertor is consequently lower that ends up in a lower value of the convertor. the disadvantage is that controlled operation outside the operational speed vary is not possible thanks to the upper than rated rotor voltage. Further, the voltage transients as a result of the grid disturbances (three- and two-phase voltage dips, especially) also will be enlarged. so as to stop high rotor voltages - and high currents ensuing from these voltages - from destroying the IGBTs and diodes of the convertor, a protection circuit (called crowbar) is employed.

Control of GSC

The novelty of this work lies within the management of this GSC for mitigating the harmonics made by the nonlinear hundreds.

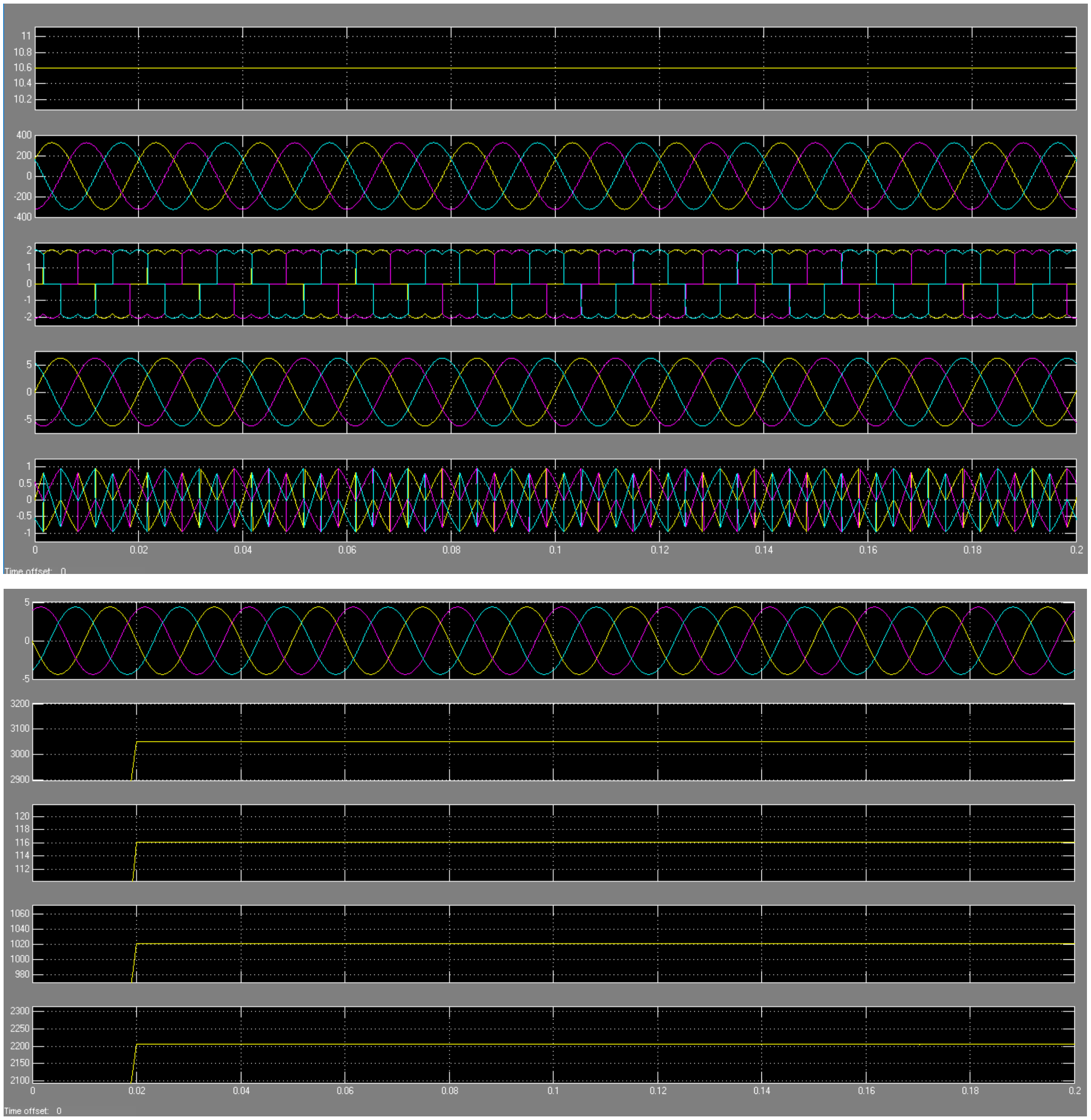


Fig: Simulated performance of the planned DFIG-based WECS at mounted wind speed of ten.6 m/s (rotor speed of 1750rpm).

The management diagram of GSC is shown in Fig. 7.2. Here, AN indirect current management is applied on the grid currents for creating them curving and balanced. Therefore, this GSC provides the harmonics for creating grid currents curving and balanced. These grid currents square measure calculated by subtracting the load currents from the summation of mechanical device currents and GSC currents. Active power part of GSC current is obtained by process the dc-link voltage error (vdce) between reference and calculable dc-link voltage (Vdc∗ and Vdc) through PI controller as

$$i_{\mathrm{gsc}}^{*}(k) = i_{\mathrm{gsc}}^{*}(k-1) + k_{\mathrm{pdc}}\left\{v_{\mathrm{dce}}(k) - v_{\mathrm{dce}}\,(k-1)\right\} + k_{\mathrm{idc}}v_{\mathrm{dce}}\,(k)$$

Result

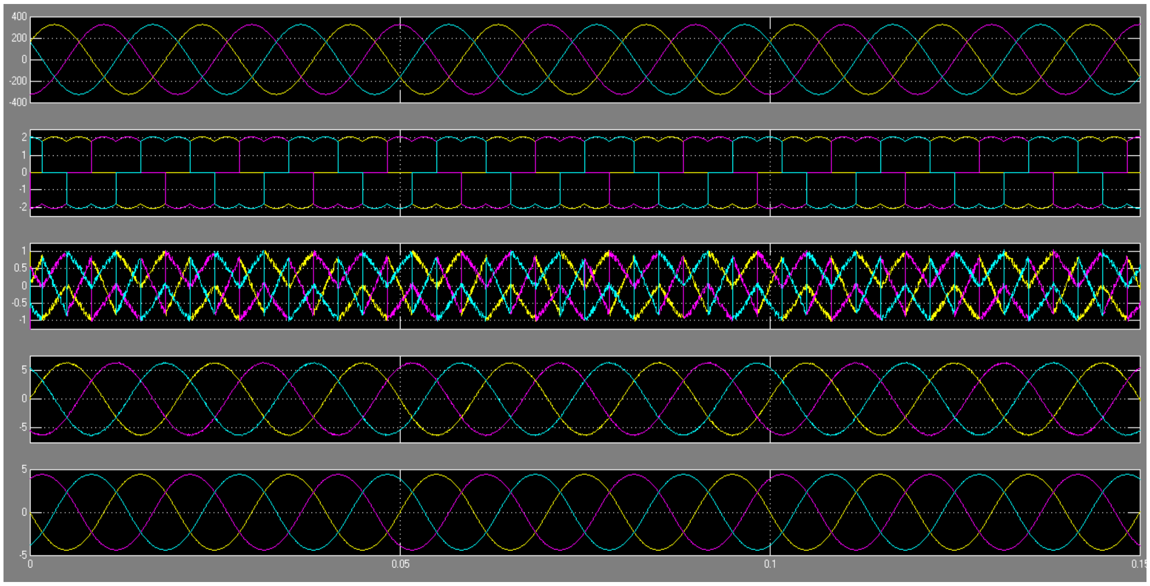


Fig: Dynamic performance of DFIG-based WECS for the sudden removal and application of local load

In this section, the operating of this planned GSC is bestowed as an energetic filter even once the turbine is in ending condition. The ability that's coming back into the PCC through GSC is taken into account as positive during this paper.

Conclusion

The GSC management formula of the projected DFIG has been changed for activity the harmonics and reactive power of the native masses. During this projected DFIG, the reactive power for the induction machine has been equipped from the RSC and therefore the load reactive power has been equipped from the GSC. The decoupled management of each active and reactive power has been achieved by RSC management. The projected DFIG has conjointly been verified at turbine obstruction condition for compensating harmonics and reactive power of native masses. This projected DFIG-based WECS with AN integrated active filter has been simulated victimization MATLAB/Simulink surroundings, and therefore the simulated results are verified with check results of the developed image of this WECS. Steady-state performance of the projected DFIG has been incontestable for a wind speed. Dynamic performance of this projected GSC management formula has conjointly been verified for the variation within the wind speeds and for native nonlinear load.

References

1. D. M. Tagare, power Generation the ever-changing Dimensions. Piscataway, NJ, USA: IEEE Press, 2011.
2. G. M. Joselin Victor Herbert, S. Iniyan, and D. Amutha, “A review of technical problems on the event of wind farms,” Renew. Sustain. Energy Rev., vol. 32, pp. 619–641, 2014.
3. I. Munteanu, A. I. Bratcu, N.-A. Cutululis, and E. Ceang, optimum management of Wind Energy Systems Towards a world Approach. Berlin, Germany: Springer-Verlag, 2008.

4. A. A. B. Mohd Zin, H. A. Mahmoud Pesaran, A. B. Khairuddin, L. Jahanshaloo, and O. Shariati, "An summary on doubly fed induction generators controls and contributions to wind primarily based electricity generation," Renew. Sustain. Energy Rev., vol. 27, pp. 692–708, Nov. 2013.
5. S. S. Murthy, B. Singh, P. K. Goel, and S. K. Tiwari, "A comparative study of mounted speed and variable speed wind energy conversion systems feeding the grid," in Proc. IEEE Conf. Power lepton. Drive Syst. (PEDS'07), Nov. 27–30, 2007, pp. 736–743.
6. D. S. comment and E. Muljadi, "Annualized wind energy improvement victimization variable speeds," IEEE Trans. Ind. Appl., vol. 33, no. 6, pp. 1444– 1447, Nov./Dec. 1997.
7. H. Polinder, F. F. A. van der Pijl, G. J. de Vilder, and P. J. Tavner, "Comparison of direct-drive and double-geared generator ideas for wind turbines," IEEE Trans. Energy Convers., vol. 21, no. 3, pp. 725–733, Sep. 2006.
8. R. Datta and V. T. Ranganathan, "Variable-speed alternative energy generation victimization doubly fed wound rotor induction machine—A comparison with different schemes," IEEE Trans. Energy Convers., vol. 17, no. 3, pp. 414–421, Sep. 2002.
9. E. Muljadi, C. P. designer, B. Parsons, and A Ellis, "Effect of variable speed turbine generator on stability of a weak grid," IEEE Trans. Energy Convers., vol. 22, no. 1, pp. 29–36, Mar. 2007.
10. R. Pena, J. C. Clare, and G. M. Asher, "Doubly fed induction generator victimization succeeding PWM converters and its application to variable-speed wind-energy generation," IEE Proc. Elect. Power Appl., vol. 143, no. 3, pp. 231–241, May 1996.