Simulation of an Asynchronous Generator and PGS Modeling use RLCs by Converters

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Abstract: The objective of the project is to maintain a constant voltage profile at the load by injecting a capacitance or an inductance with respect to the change of frequency by maintaining a common coupling between source and load. From the characteristics of voltage generation in a SEASG, it is essential to have a variable capacitance at the machine terminals to maintain constant voltage with variable load has been developed by using MATLAB/SIMULINK

I.INTRODUCTION

At present, to decentralize the power generation system, attempts have been in the direction of generating small power and distributing it locally. This prompted the use of wind and solar energy to cope with the present day energy crises. The use of non-conventional energy sources has become eminent due to fast depletion of conventional energy sources. The recent trend to tap solar, wind and tidal energy are becoming popular amongst the renewable energy sources.Self-excited asynchronous generator has emerged as a possible alternative for isolated power generation from renewable energy sources because of its low cost, less maintenance and rugged construction. However, it requires a suitable controller to regulate the voltage due to variation of consumer loads. From the characteristics of voltage generation in a SEASG, it is essential to have a variable capacitance at the machine terminals to maintain constant voltage with variable load.

II. LITERATURE SURVEY

Self excitation of induction motor applications are taken from paper [1], induction motor application taken from paper [2], wind energy conversions and how we use wind energy in this project are taken from paper [3].A variable slacking sensitive volt-ampere (VAR) source/sink to keep up the generation voltage of SEASG consistent connected the above idea in a stand-alone system and verified it experimentally from paper [4].The consistent state dissection of energized toward oneself excited induction generators talked about the impedance controller of SEASG for voltage regulation. Paper [5] et al examined the handy usage of electronic load controller in his works. Since voltage and recurrence of an ASG is reliant on load and the pace of the prime mover, the creators made an endeavor to research the impact of series resonance circuit on info side of uncontrolled rectifier experimentally by keeping the prime mover speed steady from paper [6]-[7].R. Bonert [8]–[9] talked about the impedance controller of SEASG for voltage regulation. S.S. Murthy talked about the handy usage of electronic load controller in his works [10]–[11]. Since voltage and recurrence of an ASG is reliant on load and the rate of the prime mover, the creators made an endeavor to research the impact of series resonance circuit on info side of uncontrolled rectifier experimentally by keeping the prime mover speed constant [12]–[13].Toward the end of nineteenth century, Professor J. Arrillaga made an endeavor to change over static force from self-excited induction generators [17]. At that point after, the use of rectifier circuit is expanded progressively in induction generator applications either as d.c power supply or in controller circuits. R. Bonert [18] & [19] portray the impedance controller to control the yield force of the self-excited induction generators in hydro power generation. In their work 3-Ø rectifier circuit is utilized to change over a.c to d.c force and a basic d.c. chopper circuit is utilized to control dc power. This strategy could control the power that is squandered in the outside safety (Dump load safety). Thusly, the relentless state powerful impedance of the generator circuit has been controlled, henceforth called as impedance controller. S.S. Murthy [20] & [21] suggested a load controller (utilizing 3-Ø rectifier with a d.c. chopper circuit) in consistent force operation of induction generator. The rectifier and d.c. chopper circuits are utilized as force balancers between the heaps and dump stack in such way that, the induction generator thought to be completely in all conditions. Thus, it is known as load balancer or force balancer in stedy speed operations. The capacity of the heap/power balancer is to adjust the force devoured by loads and dump load.Bhim Singh [22] discussed about the outline, investigation and alteration of an electronic controller (ELC) in subtle element and the system is effectively executed in hydro power generation control. Transient examination of induction generator with ELC has been reported by same creators as of late[23]. In view of this point, this project made an endeavor to study the exhibitions of SEASG conjoint with AC/DC/AC converter fed series RLC circuit. This work is essentially an augmentation of electronic load controller circuit.In this extend, a Simulink model of AC/DC/AC converter fed RLC series circuit (connected at PCC of the SEASG) and SEASG fed RLE are configured using power system tool box in Matlab/Simulink software.

III. PROPOSED METHOD

The ultimate aim is to provide conditions for stable operation of an isolated power system. This requires a satisfactory control of active and reactive power flow in the system. In other words the balance for generation and demand and consequently voltage and frequency in the system should be kept constant. This chapter discusses how different DGs interact and contribute to meet the requirements of the loads in both grid -connected and islanded operations. General ideas concerning generation control in small isolated power systems as well as the description.Isolated power systems and interconnected power systems exhibit different features. Isolated systems are much smaller than interconnected systems. In addition, they cannot count with the support of the neighbour systems. That is, the size and the lack of external support make isolated systems more vulnerable than interconnected systems. It is especially true in case of disturbances. Hence, the system stability is at risk.Power system stability is concerned with the ability of the generators to run in synchronism and to supply the loads at acceptable frequency and voltage ranges in case of normal (load variations) and abnormal disturbances(faults, generator tripping) that may occur in power systems. The power system stability problem is a very difficult one. Its study is facilitated by separating it into three sub problems like angle, frequency and voltage stability. We will concentrate on the frequency stability problem since it will be present in all isolated power systems not matter how strong the power network is precisely, frequency stability analyzes the capability of generators to supply load at acceptable frequency ranges in case of generator tripping. Frequency results from the generator rotor speeds. Generator rotor speeds result from the equilibrium between the power supplied by their prime movers (either turbines or engines) and the power consumed by the loads. A high effectiveness can be accomplished at an extremely positive cost.The use of energized toward oneself pen instigation generator (SECIG) has been expanding because of quick exhaustion of non-customary vitality sources in specifically Mini/Micro/Pico hydropower generation. Squirrel confine impelling generator (SCIG) has risen as a conceivable option to customary generator in an secluded force generation in light of its minimal effort, less upkeep and tough development. Utilization of an impelling machine as a generator is getting to be more prevalent for the renewable sources. Sensitive force utilization and poor voltage regulation under differing velocity are the real disadvantages of the instigation generators, however the improvement of static force converters has encouraged the control of the yield voltage of impelling generators.

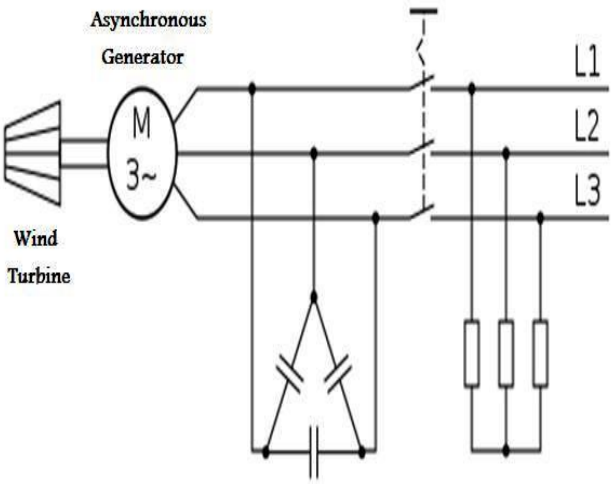

Fig.1. Asynchronous Generator Generator

In generator operation a prime mover (turbine, engine) drives the rotor above the synchronous rate. The stator flux still incites flows in the rotor, yet since the restricting rotor flux is currently cutting the stator curls, a dynamic current is created in stator loops, and the engine now works as a generator, sending power again to the electrical lattice. The generator is the unit of the wind turbine that changes mechanical vitality into electrical vitality. The sharpened pieces of steels exchange the dynamic energy from the wind into rotational vitality in the transmission framework, and the generator is the following venture in the supply of vitality from the wind turbine to the electrical network.

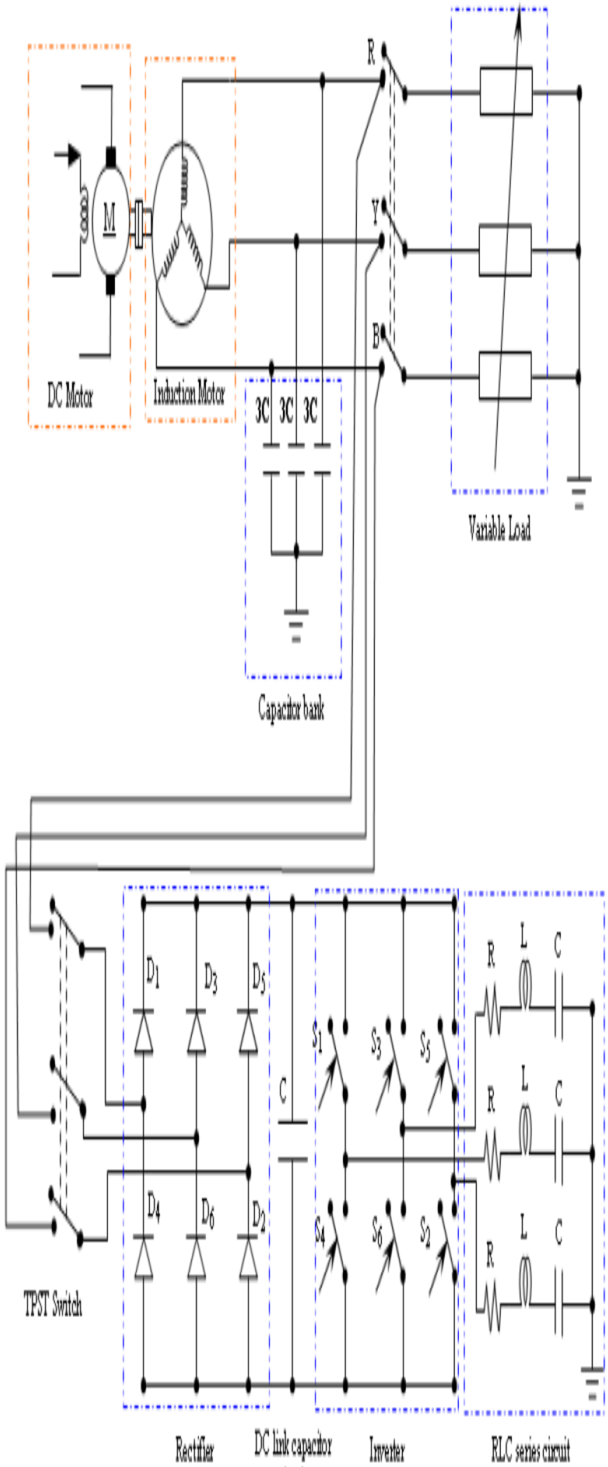

Fig.2.Proposed power system

V.RESULTS&DISCUSSION

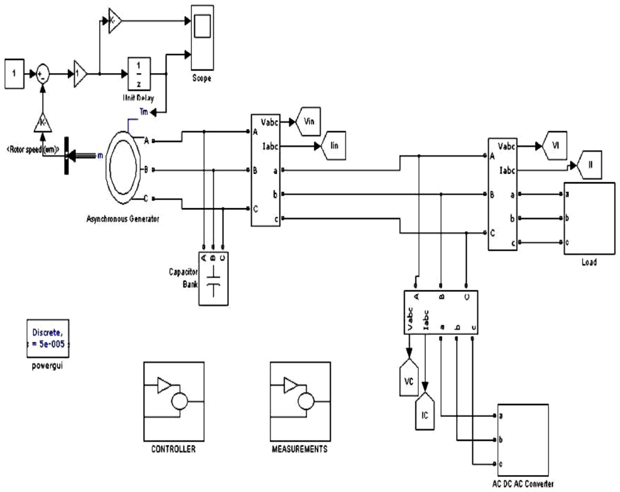

Fig.3. Simulink Model of AC-DC-AC Converter

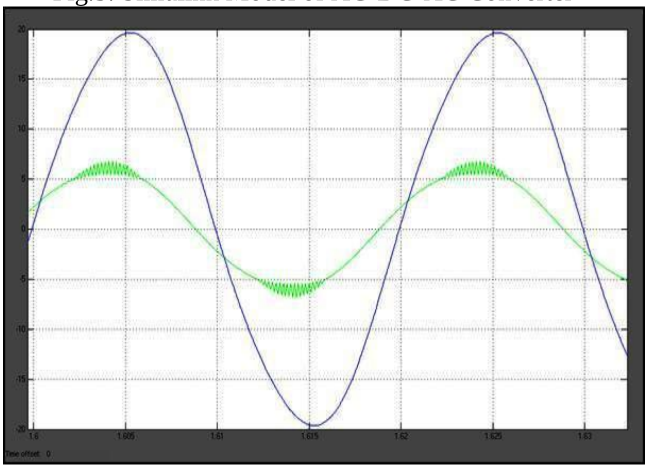

Fig.4.Voltage and Current wave form

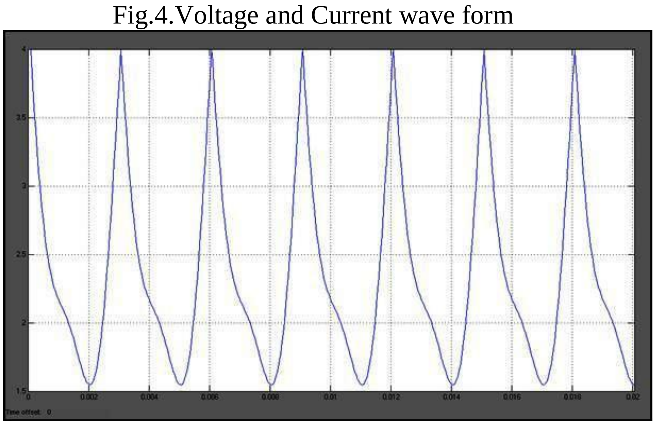

Fig.5.d.c current waveform

Simulation of the proposed system with AC/DC/AC inverter fed RLC series circuit in open loop has been studied. This concludes that the characteristics impedances of series circuit changes due to frequency changes that reflect into the system at PCC. This reveals that the power factor has been changed. Therefore a conclusion is made that impedance changes at PCC is a similar to the phenomenon of capacitive VAR injection or consumption. Since, the rectifier circuit has been constructed using diodes; it is not possible to make the current to lead the voltage at PCC. But it is possible to adjust the power factor of the system up to certain limits.From the simulation results of currents at the input side of the inverter and at PCC as shown in above figures it is evident that the RLC series circuit when operated either at a frequency lower or higher than the resonance frequency the system power factor gets affected. This characteristics phenomenon can be implemented in controlling the leading VAR requirements for constant voltage operations of the SEASG.Control strategy of the proposed system can be strengthened by artificial intelligence technology for further development of operating process.

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