

Self-Excited Induction Generator: A Review

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ABSTRACT: The expanding utilization of environmentally friendly power sources, for example, wind energy, bio gas energy, sun oriented energy and hydro potential have become to receive an ease producing framework, which are fit for working in the far off territories, and in formation with the assortment of main players. With wind turbine and miniature/small scale hydro generators as another option fuel source, the enlistment generators are being considered as an elective decision to very much created simultaneous generator due to their straightforwardness, roughness, little upkeep, cost, brushless (in squirrel confine development), nonattendance of isolated dc source, self-assurance against extreme overburdens and short circuits. In secluded frameworks, squirrel confine enlistment generators with capacitor excitation, known as self-energized acceptance generators (SEIGs), are very well known. This paper presents a thorough study of writing of exploration on self-energized acceptance generator (SEIG) in the course of recent years talking about the characterization of acceptance generator, consistent state and transient investigation, voltage control angles and equal activity of SEIG

KEYWORDS: Self excited induction generator, self-excitation & voltage buildup, steady state analysis, transient analysis, parallel operation of SEIG.

INTRODUCTION

An induction machine can be operated as an isolated generator with no connection to the utility supply. When connected to the utility, the reactive power needed by the induction generator is supplied by the utility. For an isolated operation, the reactive power needed by the induction generator must be compensated by a local source such as a three-phase AC capacitor or solid-state excitation. While the solid-state excitation provides a variable size of reactive power, the application of solid-state excitation is generally accompanied by harmonics generated by the converter and additional switching losses. The physical diagram and per phase equivalent circuit of an induction generator in an isolated operation is presented in Fig. 1. Delta connection can also be implemented; however, for the simplicity of the analysis, a wye connected system is considered.

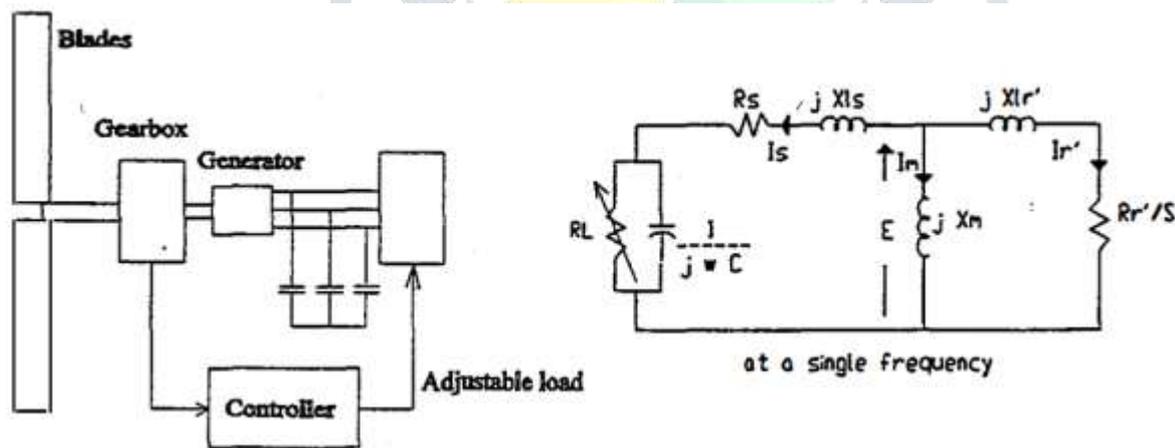


Fig. 1: Self -excited induction generator

CLASSIFICATION OF INDUCTION GENERATOR:

Based on rotor development, enlistment generators are two sorts i) the injury rotor enlistment generator and ii) squirrel confine enlistment generator. Contingent on the main players utilized (consistent speed or variable speed) and their areas (close to the force organization or at separated places)[1], producing plans can be comprehensively named under. Customarily, simultaneous generator has been utilized for power age however acceptance ages are expanding being utilized nowadays as a result of their relative beneficial element over customary simultaneous generators. Self-energized acceptance generator has been a subject of significant research over most recent couple of many years due to its discernment as the least complex energy change gadget to deliver power in off-lattice[2], remain solitary mode utilizing extraordinary kinds

of central players and utilizing unique ordinary and sustainable power assets, for example, oil, bio fuel, wind and little hydro .The significant disadvantages in the utilization of self-energized enlistment generators are poor people voltage and recurrence guidelines under central player speed and burden annoyances. The created terminal voltage and the yield recurrence, rely upon the excitation capacitance, the three-stage acceptance machine boundaries, the electrical detached burden and the prime mover speed[3].

Constant-Speed Constant Frequency:

Acceptance generators are less complex than coordinated generators. They are simpler to work, control, and keep up, don't have any synchronization issues, and are affordable. In this plan, the central player speed is held steady by consistently changing the edge pitch as well as generator qualities. An enlistment generator can work on an endless transport bar at a slip of 1% to 5% over the simultaneous speed[4]

Variable-Speed Constant Frequency:

The variable-speed operation of wind electric system yields higher output for both low and high wind speeds this results in higher annual energy yields per rate installed kW capacity. Both horizontal and vertical axis wind turbines exhibit this gain under variable-speed operation[5].

It is clear that, an induction machine needs reactive power for excitation, regardless whether it is operating as a generator or a motor. When an induction generator is connected to a grid, it takes reactive power from the grid. But what if we want to use an induction generator to supply a load without using an external source (e.g. grid)?

A capacitor bank can be connected across the stator terminals to supply reactive power to the machine as well as to the load. When the rotor is rotated at an enough speed, a small voltage is generated across the stator terminals due to residual magnetism. Due to this small generated voltage, capacitor current is produced which provides further reactive power for magnetization.

REVIEW OF LITERATURE

There have been many paper published in the field of induction generator among all the papers a paper titled "Self excited induction generator: A review" by R. K. Kumawat, Seemant Chourasiya, Seema Agrawal, Dr. D.K.Paliwalia discusses With the expanding pattern toward the utilization of inexhaustible fuel hotspots for power age, for example, the following: miniature hydro, wind energy, biogas, and sun oriented energy, a more prominent accentuation is being laid on the advancement of a minimal effort, least upkeep, straightforward and durable generator unit for independent separated applications. Since little hydro and wind energy sources are accessible in bounty, their use was felt stop promising to achieve the future energy Prerequisites[6]. Saddling smaller than expected/miniture hydro and wind energy for electric power age is a territory of exploration interest and at present, the accentuation is being given to the savvy usage of these energy assets for quality and dependable force supply. Customarily, simultaneous generator has been utilized for power age however acceptance ages are expanding being utilized nowadays as a result of their relative beneficial element over customary simultaneous generators. Self-energized acceptance generator has been a subject of significant research over most recent couple of many years due to its discernment as the least complex energy change gadget to deliver power in off-lattice, remain solitary mode utilizing extraordinary kinds of central players and utilizing unique ordinary and sustainable power assets, for example, oil, bio fuel, wind and little hydro .The significant disadvantages in the utilization of self-energized enlistment generators are poor people voltage and recurrence guidelines under central player speed and burden annoyances. The created terminal voltage and the yield recurrence, rely upon the excitation capacitance, the three-stage acceptance machine boundaries, the electrical detached burden and the prime mover speed[7].

CONCLUSION

The investigations spread over the last three decade indicate the technical and economic viability of using enlistment generator for electric force age to bridle the environmentally friendly power sources, especially

in far off and remote where expansion of matrix isn't monetarily plausible. The enlistment generator's capacity to produce power at different speed encourages its application in different modes, for example, self-energized independent (confined) mode; in corresponding with coordinated generator to supplement the neighborhood load, and in lattice associated mode. Utilization of SEIG contrasted with the coordinated generator can diminished the framework cost extensively. This article have introduced an exhaustive writing study on significant part of SEIG, for example, the cycle of self-excitation, consistent state and transient investigation, voltage control, and equal activity of SEIG, so that further work can be done for better outcomes.

Using a self-excited induction generator it is possible to operate the generator across a wider range of rotor speeds. The power can be modulated according to the cube law given in equation 8. Thus with self-excited induction generators, the power can be controlled as such that the maximum C_p operation can be maintained. The core loss (which is omitted in the model) shows a significant effect on the higher frequency. The increase in capacitor size is shown to increase the flux level. Thus it is possible to parallel a second set of capacitors to make the range of operation in the lower frequency wider.

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