

# DEVELOPMENT OF A SELF EXCITED INDUCTION GENERATOR WITH VOLTAGE AND FREQUENCY REGULATION

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## ABSTRACT

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Self-excited single phase induction generator (**SPIG**) is a low power machine that required high accuracy of expected voltage and frequency to generate constant output power. The induction motor that used to make the generator is common for different kinds of operation as it required with the features such as low cost, brushless, low maintenance and suitable operates under stand-alone power mode which commonly used for domestic and commercial applications. With these advantageous features, it makes the induction generator become reliable and tough to generate power in remote places. As consider that some places that locate far from the town which is lack of professional skilled people and the technical support is hard to reach, the single phase induction generator thus become the priority option to create the power sources. Therefore the single phase induction generator is getting popular and increasingly being used these days by people.

Although single phase induction generator is an ideal way to generate power, anyway there is a weakness behavior of this system. The problem with the SPIG is that it provides unstable voltage if the load varies, as normally the user will vary the load according to different of usage purpose. If without the controller to distribute the amount of voltage to the load and dummy load, the motor will become unstable and vibrate.

To overcome this issue that occur to the single phase induction generator, we need to ensure that the total power is equal to the consumer load power and the dump load power. The formula is

$$P_{total} = P_{consumer} + P_{dummy}$$

which the  $P_{total}$  should remain constant when different of consumer loads applied.

This report represents the creation of a self-excited single phase induction generator (SPIG) with the voltage and frequency regulation. As required, the output voltage is regulated at 219+/-1V and the frequency is 49.9+/-0.3Hz. As long as the load is maintained constant at its terminal, the constant voltage and frequency can be produced. To achieve desired operation, SPIG is connected with capacitors both in main and auxiliary windings to produce capacitance for excitation purpose which resulting in a fixed- point operation.

A new strategy for controlling voltage and frequency of a self-excited single phase induction generator (SPIG) is presented. The SPIG had been simulated out through the Matlab Simulink software with the output waveforms. The SPIG operates in the linear region of the core magnetizing curve, so generally efficiency and performance are upgraded with constant output voltage maintained at 240V. An external excitation circuit, comprising permanently capacitors had connected parallel on both main and auxiliary winding to produce the rated terminal voltage at certain loads. For the output of SPIG, a voltage amplitude monitoring system had created to measure the output voltage thus compare them with the reference voltage. With the output from comparator, it creates the gate pulse signal to the PWM block. Within the PWM block, pulse width modulation

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technique is used to derive switching sequence for the inverter system thus modulate the pulse width and determine the time for the IGBT to on or off. As the result, the output voltage and frequency thus able to be maintained and the SPIG able to work under stable condition.