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Title: Steady state analysis of a self excited single phase reluctance generator

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Abstract:

This paper presents an analytical method for predicting the steady-state performance of a self excited single phase reluctance generator (SESPRG), which supplies R-L load. The proposed analysis is based on the d-q axis model and phasor diagram of such a generator in the steady state condition. Excitation capacitors are connected across both the main and auxiliary windings. Magnetic saturation is taken into account and is assumed to be confined to the direct axis, and is accounted for a variable direct-axis magnetizing reactance. Conditions of self-excitation and the minimum value of the capacitance required to achieve self-excitation are also given. Special attention is focused on the machine performance when it operates as a pure single-phase reluctance generator (PSPRG), A fixed capacitor (FC) thyristor controlled reactor (TCR) scheme is used to regulate the generator terminal voltage by controlling the thyristor conduction angle. Further stability limits are investigated by developing the active reactive (P-Q) power diagram. Reasonably close agreement between the measured and predicted results is observed confirming the validity of the proposed analysis.

Key words:

Reluctance generators, self-excitation, single-phase, steady-state.