Title: Artificial Neural Network-Based Capacitance Prediction Model for Optimal Voltage Control of Stand-alone Wind-Driven Self-Excited Reluctance Generator

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Year: 2018

Abstract: This paper presents an Artificial Neural Network (ANN) model to predict the excitation capacitance value necessary to sustain the generated voltage of a wind-driven self-excited reluctance generator (WDSERG) within preferred limits. The network was trained, validated and tested with input data which comprises load impedances, power factor and wind speed values and a corresponding output data consisting of the excitation capacitance for each input condition. A mean square error value of less than 0.11 and an R-value of more than 0.999 were obtained for the network. These indicate a very accurate ANN training. The network was then utilized in the complete model of WDSERG under diverse input states of wind speed and load variation. The predicted capacitance value obtained from the network provides the required excitation to keep the generated phase voltage at a preferred constant level of 220±5 V under each input condition. The results depict the effectiveness of the neural network application to provide excitation capacitance control for the WDSERG output voltage when varying wind speed and load profile are considered. The method proposed in this work can provide a basis for the design of a variable capacitor to keep the generated voltage of wind-driven SERG within desired limits despite wind speed and load variation.

Conference: 2018 IEEE PES/IAS PowerAfrica

Publisher: IEEE

Conference Location: Cape Town, South Africa, South Africa

DOI: 10.1109/PowerAfrica.2018.8520996

Date of Conference: 28-29 June 2018

URL: http://dx.doi.org/10.1109/PowerAfrica.2018.8520996