ABSTRACT

This work presents the model of a Fuzzy Logic controller for a renewable energy system based on multi-string solar photovoltaic (PV) in stand-alone operation, to extract the maximum energy of this power source. The system consists of PV modules, DC-DC converter (Boost), a battery set, three-phase inverter and three-phase variable load. The photovoltaic system was modeled in MATLAB / Simulink in order to represent the V-I characteristic of the PV module, and which is based on the data provided by the manufacturer *data-sheet*. Other studies, such as the calculation of the RMS currents of the DC-DC converter components for evaluation of the losses, which are essential for the system design were accomplished. The conventional Perturb and Observe method for the Maximum Power Point Tracking (MPPT) of PV modules was tested and compared with methods that use Fuzzy Logic control. Due to its performance, it was adopted the Fuzzy method that performs the MPPT by inference of duty cycle of a Pulse Width Modulation (PWM) through the variation of PV power divided by the variation of the PV current. The Fuzzy model considered in this work was successfully tested. The results showed that it can be robust and suitable to the proposed application. According to some accomplished tests, the controller can perform the MPPT of a multi-string configuration of the solar PV system, in which several PV arrays are used. Moreover, it can also be easily adapted to perform the MPPT of other energy power sources based on the same control principle, as it is in the case of aerogenerators.

Keywords: Photovoltaic system, Fuzzy Logic, Perturb and Observe, maximum power point tracking, MPPT.