

Mathematical Modelling Based Solar PV Module and its Simulation in comparison with data sheet of JAPG-72-320/4BB Solar Module

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ABSTRACT

The generation of power has become an important parameter for running the industries efficiently. Nowadays, the focus has been given by every country to use and to produce more energy from renewable energy sources like solar, wind, biomass, tidal and various other means. This leads to the design and modelling of this system for using in various aspects. In this paper, the representation of the solar PV model is done mathematically. As the prime focus is on power extraction, so the parameters that are dependent on its production are varied and a model of solar PV cell is created, running at maximum efficiency. Basically, single diode representation is used to formulate the parameters. The model is created in MATLAB and its characteristics plot are designed which is exactly like an ideal PV cell. For testing the performance of the model, a test-case is taken, that is a practical solar PV module named JAPG-72-320/4BB. The specification prescribed in its data sheet is taken as an input in the mathematical model PV design and the parameters such as power generated, S.C current and O.C voltage are determined. There is less deviation of maximum 12.10% is seen which gives a clear performance of the designed model. Further, to correlate with an ideal solar PV cell, the parameters like temperature and irradiance are varied one at a time, and the current and the power are measured, and plotted, which are exactly similar to an ideal PV module. A brief introduction of the model along with the percentage of power production in India, followed by the methodology, mathematical design, and finally the results and simulation are explained to show a clear comparison between the existing PV module and the model designed.

Keywords: Modelling, Single Diode Equivalent Circuit, P.V cell, Steps of Designing, Performance Analysis.

