UDC 620.92+502.173

Photovoltaic Station Maximum Power Point Tracking Methods Evaluation

Elzein I.A., Petrenko Y.N.
Belarusian National Technical University

As known from a (P-V) curve of a solar panel, there is an optimum operating point such that the PV delivers the maximum possible power to the load. The optimum operating point changes with the solar irradiation, and cell temperature. Therefore, on line tracking of the maximum power point of a PV array is an essential part of any successful PV system.

A variety of maximum power point tracking (MPPT) methods are developed. The methods vary in implementation complexity, sensed parameters, and required number of sensors, convergence speed, and cost.

Many researchers have been dividing the different MPPT methods into three categories as follows:

(i) Offline methods, which are those that require information regarding the panel I-V curve, and also temperature and irradiation levels; among these methods it is possible to find:

(a) Open-circuit voltage and short-circuit current methods, which define the MPP, respectively, as a fraction of the panel open-circuit voltage, Voc, or the short-circuit current, Isc;

(b) Artificial intelligence methods, such as those based on neural networks or fuzzy logic;

(ii) online methods, which are those that require instantaneous measurements of the photovoltaic panel output current and output voltage; the main advantage of these methods is that no information on the panel I-V curve or regarding irradiation or temperature levels is required; some examples of these methods could be:

(a) Perturbation and observation methods;

(b) Incremental conductance methods;

(c) power peak seeking methods;

(iii) Hybrid methods, which are those that combine two different methods, each one from one of the above categories; the offline method is used to get a quick approximation to the MPP whereas the online method is used to improve the result. Nevertheless, it should also be pointed out that this evaluation does not include all possible methods.

A more extensive description and classification of MPPT methods can be found at numerous references. As expected, the high scientific production regarding MPPT methods makes periodical benchmarking necessary, in order to be able to select the best method for every photovoltaic system.