Performance evaluation of directly photovoltaic powered DC PM (direct current permanent magnet) motor – propeller thrust system

- Ozcan Atlam
- Mohan Kolhe

Abstract
Photovoltaic (PV) powered directly coupled electro-mechanical system has wide applications (e.g. PV powered cooling fans in green houses, PV water pumping system, solar vehicles). The objective of this work is to analyse the operation of directly PV powered DC PM (direct current permanent magnet) motor – propeller system for selection of motor parameters. The performance of such system mainly depends on the incident solar radiation, operating cell temperature, DC motor and propeller load parameters. It is observed that the operating points of the PV DC PM motor – propeller system matches very closely with the maximum power points (MPPs) of the PV array, if the DC PM motor – propeller parameters have been properly selected. It is found that for a specific application of such type of system, matching of torque–speed operating points with respect to the maximum power points of PV array are very important. It is ascertained through results that the DC PM motor's armature resistance, magnetic field constant, starting current to overcome the starting torque and torque coefficient are the main parameters. In designing a PV powered DC PM motor for a specific
application, selection of these parameters are important for maximum utilization of the PV array output. The results of this system are useful for designing of directly PV powered DC PM motor's for aerodynamic applications.

Keywords

- PV (Photovoltaic);
- PV electro-mechanical system;
- DC PM (direct current permanent magnet) motor – propeller thrust system