

Abstract

The paper applies a maximum power point tracking (MPPT) technique for stand-alone photovoltaic water pumping system to improve the overall operating efficiency. This technique is based on golden section search (GSS) optimization method. To the authors' best knowledge, this is the first attempt to apply it to such a problem. Compared to MPPT tracking method such as perturb and observe (P&O), GSS technique offers two advantages, namely fastness and perturbation-free which both affect the overall and instantaneous efficiency of the solar water pumping system. The maximum power transfer from the photovoltaic panel to the centrifugal pump is ensured by optimal selection of induction motor's operating speed. This allows improving the global efficiency of the water pumping system that is maximum water flow rate with respect to the solar intensity. Modeling of solar water pumping system is presented then simulated using MATLAB/Simulink under variable irradiance to demonstrate the effectiveness of the proposed architecture. Results show that GSS-based MPPT offers better dynamic efficiency without altering much the easiness and simplicity of the implementation compared to the conventional P&O.