

## **Adapting perturbation voltage for variable speed micro-hydro using particle swarm optimization (PSO)**

### **ABSTRACT**

The aim of this research is to explore a technique that can be implemented to the Variable Speed Micro-hydro Power Generation (VS-MHPG) system to search the optimum operating point for the maximum power extraction. MicroHydro that operates in variable speed mode are sensitive to the changes of flow rate and proved to have wide operating point. The Perturb and Observe (P&O) based maximum power point tracking (MPPT) was applied to the VS-MH and based on simulation. However, oscillation occur at maximum point due to the large perturbation speed. The existing Micro-hydro Power Generation (MHPG) system commonly suffers from the nonoptimal input control as the controller estimate the changes of flow rate without anticipating the global maximum power curve. Hence the implementation of P&O based MPPT is expected to improve the efficiency of MHPG system while reducing the fluctuation of output power. Results show that the value of perturbation speed affects the performance of MPPT algorithm to search the maximum operating point. Low perturbation signal requires many numbers of iteration before it reaches the steady state. Meanwhile, high perturbation signal will cause the fluctuation that led to unstable power production. Thus, new method was introduced which is Particle Swarm Optimization (PSO) that is expected to improve the performance of conventional MPPT. Simulation result shows that PSO based MPPT was able to track the global maximum point under extreme condition with no power fluctuation compared to P&O MPPT. Also, PSO based MPPT provides adaptive perturbation speed that show improvement in maximum power tracking by 20.88%.