



## PI-Fuzzy Control Applied to the Hybrid PV / Wind Pumping System with Energy Storage

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**Abstract:** The aim of this paper is to develop an autonomous hybrid energy management algorithm method with storage (lead-acid type battery bank), applied to the hybrid pumping system capable of ensuring the level regulation of water in the tank. The designed system is composed of a photovoltaic generator, connected to a booster chopper, a DC bus and a wind power system driving a permanent magnet synchronous generator. Two control strategies were implemented. The first, based on P and O, ensures the operation of the GPV with its maximum power via the control of a booster chopper. The second was applied to the turbine to extract the maximum power from the wind (MPPT). Two PI and fuzzy controllers to drive the operation of the asynchronous motor driving the centrifugal pump controlled the mechanical speed and the magnetic flux. In addition, we have established an explicit relation making it possible to adopt the set point rotation speed of the asynchronous machine and consequently, the pump output according to various climatic conditions. The results obtained show the validity, efficiency and robustness of the various techniques developed.

**Keywords:** *centrifugal pump; hybrid energy; fuzzy logic control; PMSG.*

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