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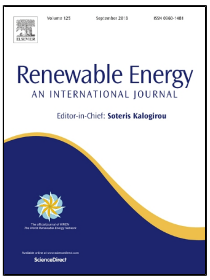

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A general methodology for performance prediction of Pumps-as-Turbines using Artificial Neural Networks

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ABSTRACT

Artificial Neural Networks (ANNs) are used in this work as a computational methodology to forecast both Best Efficiency Point (BEP) and performance curves of Pumps-as-Turbines (PATs) operating in reverse mode. Experimental data from literature are used to train the ANNs: their operating conditions in both pump mode (Input) and turbine mode (Target) feed the ANNs in terms of non-dimensional magnitudes. ANNs proved to be an interesting tool for this kind of evaluation and allowed to evaluate both BEP and performance of PATs in an accurate way. Comparing the forecasted data and the experimental ones, the worst achieved R^2-value was found to be equal to 0.96152 and 0.98429 for BEP and performance curves, respectively. Finally, the prediction capability of the ANNs was also tested by comparing the predicted data with the experimental results of a PAT that was not used in the training process. Therefore, this work supplies a tool of general validity to determine the BEP of PATs as well as their off-design performance, simply by introducing, as input of the ANNs, the operating data in pump mode that are typically available in the datasheet provided by the pumps' manufacturers.