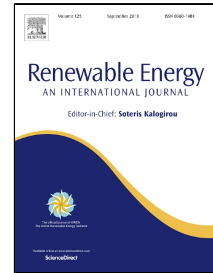


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A general methodology for performance prediction of Pumps-as-Turbines using Artificial Neural Networks

Mosè Rossi, Massimiliano Renzi



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

3 Mosè Rossi^{a,*}, Massimiliano Renzi^a

4 ^a Libera Università di Bolzano, Facoltà di Scienze e Tecnologie, Piazza Università 5, 39100, Bolzano, Italy

5 *Corresponding author: Mosè Rossi, PhD Student. Facoltà di Scienze e Tecnologie, Libera Università di Bolzano, Piazza
6 Università 5, 39100, Bolzano, Italy. E-mail: Mose.Rossi@natec.unibz.it; Tel: +39 0471 017701.

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8 **ABSTRACT**

9 Artificial Neural Networks (ANNs) are used in this work as a computational methodology to forecast
10 both Best Efficiency Point (BEP) and performance curves of Pumps-as-Turbines (PATs) operating
11 in reverse mode. Experimental data from literature are used to train the ANNs: their operating
12 conditions in both pump mode (Input) and turbine mode (Target) feed the ANNs in terms of non-
13 dimensional magnitudes. ANNs proved to be an interesting tool for this kind of evaluation and
14 allowed to evaluate both BEP and performance of PATs in an accurate way. Comparing the forecasted
15 data and the experimental ones, the worst achieved R^2 -value was found to be equal to 0.96152 and
16 0.98429 for BEP and performance curves, respectively. Finally, the prediction capability of the ANNs
17 was also tested by comparing the predicted data with the experimental results of a PAT that was not
18 used in the training process. Therefore, this work supplies a tool of general validity to determine the
19 BEP of PATs as well as their off-design performance, simply by introducing, as input of the ANNs,
20 the operating data in pump mode that are typically available in the datasheet provided by the pumps'
21 manufacturers.

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