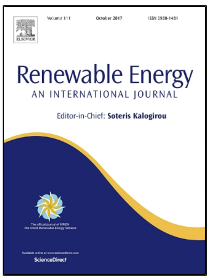
Accepted Manuscript



Enhancement of performance of Wave Turbine during Stall Using Passive Flow Control: First and Second Law Analysis

Ahmed.S. Shehata, Qing Xiao, Mohamed.M. Selim, A.H. Elbatran, Day Alexander

PII:	S0960-1481(17)30509-8
DOI:	10.1016/j.renene.2017.06.008
Reference:	RENE 8872
To appear in:	*Renewable Energy*
Received Date:	26 August 2016
Revised Date:	07 May 2017
Accepted Date:	01 June 2017

Please cite this article as: Ahmed.S. Shehata, Qing Xiao, Mohamed.M. Selim, A.H. Elbatran, Day Alexander, Enhancement of performance of Wave Turbine during Stall Using Passive Flow Control: First and Second Law Analysis, *Renewable Energy* (2017), doi: 10.1016/j.renene.2017.06.008

Enhancement of performance of Wave Turbine during Stall Using Passive Flow Control: First and Second Law Analysis

Ahmed S. Shehata[1, 2*], Qing Xiao [1], Mohamed M. Selim[2], A. H. Elbatran[2], Day Alexander [1]

1) Department of Naval Architecture, Ocean and Marine Engineering, University of Strathclyde, Glasgow G4 0LZ, U.K

2) College of Engineering and Technology, Arab Academy for Science Technology and Maritime Transport, P.O. 1029 AbuQir, Alexandria, EGYPT

**** Corresponding Author**: Ahmed S. Shehata,*

***E-mail address**: ahmed.mohamed-ahmed-shehata@strath.ac.uk*

ABSTRACT

Wells turbine is the most common type of self-rectifying air turbine employed by Oscillating Water Column (OWC) wave energy devices due to its technical simplicity, reliability, and design robustness. Because it subjected to early stall, there were many endeavors to improve the energy extraction performance of Wells turbine within the stall regime. Using the multi suction slots as a passive flow control can help obtaining a delayed stall. Two, three and four suction slots were investigated to improve the performance of Wells turbine in the stall regime. In addition the commonly used first law analysis, the present study utilized an entropy generation minimization method to examine the impact of the multi suction slots method on the entropy generation characteristics around the turbine blade. The turbine blade with optimum suction slots number and location was investigated using the oscillating water system based on the real data from the site. To achieve this purpose, two-dimension numerical models for Wells turbine airfoils under sinusoidal wave flow conditions were built and analyze using (ANSYS FLUENT) solver. It is found that the airfoil with three suction slots located at 40%, 55% and 90% from leading edge in chord percentage give the highest torque coefficient by 26.7% before the stall and 51% after the stall.

Keywords: Oscillating flow; Wells turbine; Flow control method; Entropy generation; Egyptian Coasts.