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Wave-to-wire Modelling of Wave Energy Converters

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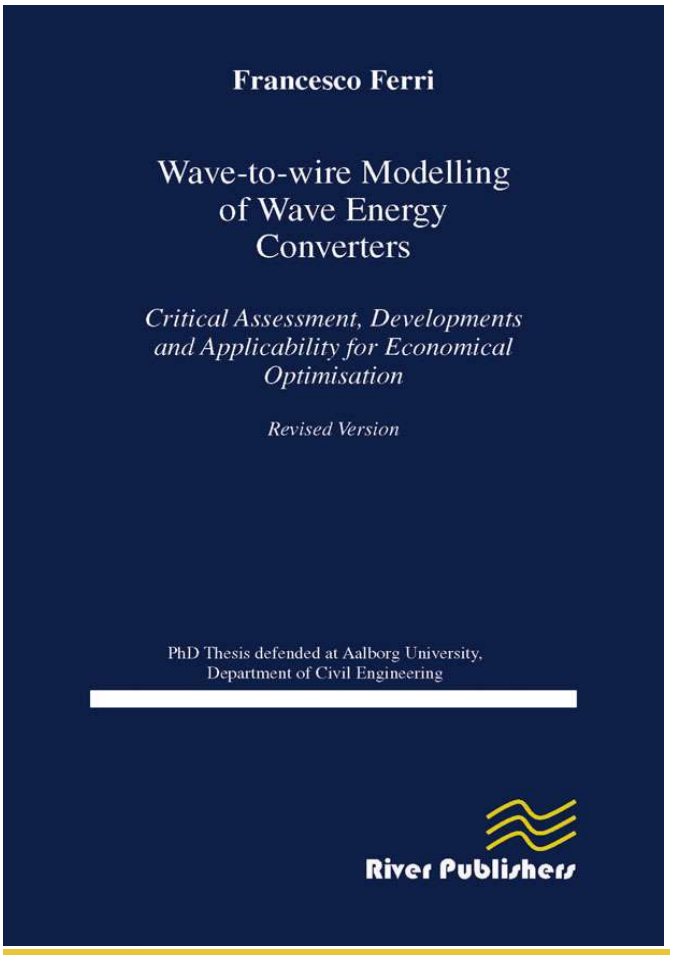
The idea to use the motion of a wavy sea surface to produce electricity was investigate in the seventies, in a time when the earliest wave energy converters were conceived and developed. But nowadays still none of the patented devices reached a commercial stage. Wave energy is a large, mostly untapped, renewable energy resource that has the potential to contribute significantly to the future energy mix, especially in an environmental friendly future scenario. What is bounding the sector to roll off into the market is the cost of the produced energy: too high if compared with other renewable energy sources. Generally speaking, the devices have a low efficiency and a high structural cost. The aim of the thesis is to push the research toward a cost minimisation algorithm, based on numerical simulation, which account for both efficiency and structural cost of the device. In order to achieve this goal a reliable wave-to-wire (numerical) model is needed and a validation procedure based on experimental data sets have been used through the work.



e-ISBN: 9788793237247
Available From: November 2014
Price:

KEYWORDS:
Keywords: Wave energy, Wave energy converters, Optimisation, Wave-to-wire modelling, Numerical simulation, Laboratory experiment, Advance Control, Control, Cost reductions

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