

Development of a mechanical device to harvest energy from marine waves

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1 Extended Abstract

One of the most promising renewable energy sources is the seas and oceans waves' motion. The main issue to harvest energy from waves is to transform the motion (oscillating motion) into a rotating motion, in order to be able to put the electricity generator in rotation. In the last years several devices have been developed to harvest energy from the seas, in general they focus the attention on the way to get energy from waves using different types of floater and ways to fix it. However, the transformation of floater motion in kinetic energy suitable for energy generation is obtained by "standard" systems not designed ad-hoc; the most of them consist in hydraulic systems, which show many issues, among the others, complexity and the risk of marine pollution because of the presence of oil.

In this work, a novel mechanism allowing the transformation of wave motion (alternative motion) into unidirectional rotating motion is presented. The mechanism faces the following issues: direct transformation of wave's motion in rotating unidirectional motion, absence of oil lubricant, higher efficiency (compared to already used systems), reliability.

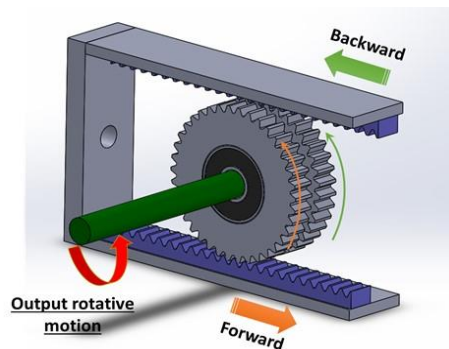


Fig. 1. Working principle of the Motion Transformation Device.

The Motion Transformation Device MTD, consists in a kinematic chain composed of gear rack system to transform linear motion into rotating motion and a series of free wheels used as mechanical diode, to make the rotation motion continuous and unidirectional. A general schematic example of the device is shown in Fig 1.

In this work, the kinematic and dynamic models of the device have been developed allowing to investigate its performance.

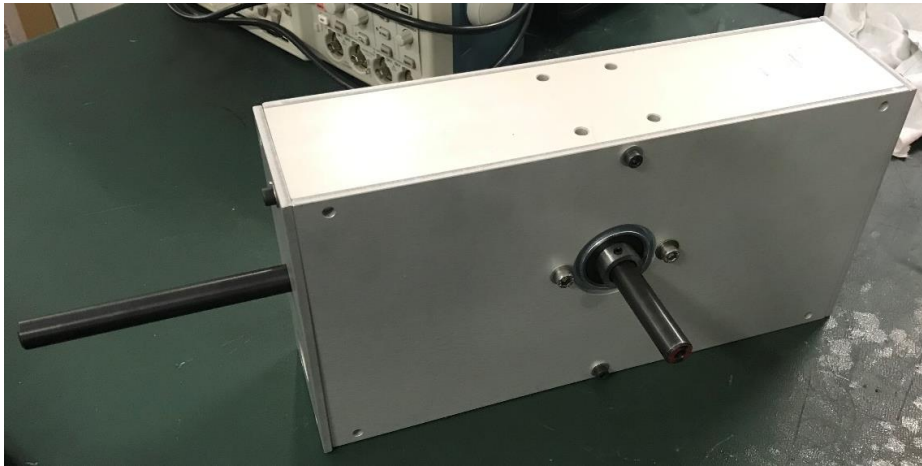


Fig. 2. Prototype of the Motion Transformation Device.

Theoretical models results have been benchmarked against those obtained from a reduced scale prototype (Fig. 2) showing very good agreement.

Tests have also been performed to evaluate the actual mechanical efficiency of the device.

References

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