

ID40 - DESIGN, MANUFACTURING AND SET-UP TESTS OF A WAVE ENERGY CONVERTER PROTOTYPE IN THE CONTEXT OF THE EUROPEAN PROJECT LIFE-DEMOWAVE

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Abstract

LifeDemoWave Project is a real case of development of a R&D project, from the initial idea to the final construction and installation of a prototype for testing in operational environment. This project was born from an idea of the main researcher of the CIMA Group that finally led to two patents of two wave generation systems. Based on these patents, CIMA sought different ways for funding with the aim of developing prototypes with a high TRL and being able to test the operating principle of the patented systems. Finally, funding was obtained through the Life Program of the European Union and in collaboration with five other partners. The main objective of the LifeDemoWave project (<http://www.life-demowave.eu/en/>) is the demonstration of the feasibility of the use of wave power for electric generation in order to reduce greenhouse gases' emissions. For demonstration purposes, prototypes of wave power generation, reproducible and scalable at high level, are installed in the Galician coast. LifeDemoWave project considers, as well as its design and implementation, the environmental impact in the installation areas and its effect on biodiversity.

Keywords - wave energy converter, prototype, LIFE-Demowave.

I. LIFEDEMOWAVE OBJECTIVES

The main objective of the project Life-Demowave (<http://www.life-demowave.eu/en/>) is demonstrate the viability of systems for wave energy conversion through design, construction and testing of a prototype installation operating under real conditions environment. In this way, the benefits of this renewable energy, in particular wave energy, will be prove. The final propose is to contribute to European policies for the promotion of renewable energies [1].

II. LIFEDEMOWAVE BEGINNING AND PARTNERS

This project starts with the development of two patents for the conversion of the wave energy into electrical energy, defined by the main researcher from CIMA Group at University of Vigo. The researches of this group, in collaboration with other groups of the Institution and different companies, led by Quantum Innovative: Cetmar, Hercules Control, ACSM and Grupo Josmar. All the entities of the consortium are located in Galicia, in the Northwest of Spain. This region is one of the European area with the highest density of wave energy.

III. LIFEDEMOWAVE WORKING PRINCIPLE, DESIGN AND SIMULATION PHASES

The LifeDemoWave prototypes take advantage of the differential movement between two bodies, one of flotation, and the other of reaction (see Fig. 1). Between both, a PTO (Power Take Off) device is included that converts the resultant energy of the differential movement between those two bodies into useful energy.

This mechanical design was structurally simulated and the electronic devices were integrated (see Fig. 2).

The prototype working principle was tested using a wave simulation FEM software (ANSYS Aqwa) and also using a scale prototype tested in a wave tank (see Fig. 3).

IV. LIFEDEMOWAVE MANUFACTURING PHASE

The first prototype was finished assembling at the end of June 2018 (Fig.4). The components of the flotation bodies were designed to be transported by road without the need for special transports (bear in mind that the complete system measures 4 meters in maximum diameter and 17 meters in height). For this reason, once installed the equipment on board, the final assembly of these components was made in port in the vicinity of the installation area (Experimental Site located in the Puerto Exterior de A Coruña – Punta Langosteira, managed by INEGA – Xunta de Galicia).

V. CONCLUSIONS

The prototype was recently installed for real conditions works for the final test phase of the project. The results expected are: obtain information about the energy production of the system and the installation 'survival' under the extreme wave conditions in the Experimental Site selected.

REFERENCES

[1] European Commission. DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the promotion of the use of energy from renewable sources. COM/2016/0767 final/2 - 2016/0382 (COD)

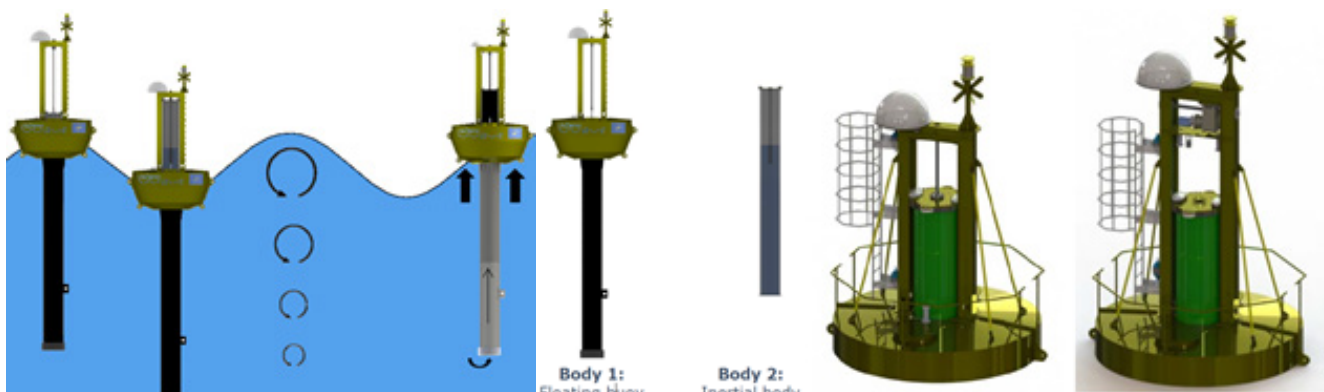


Fig 1. Prototype working principle and design

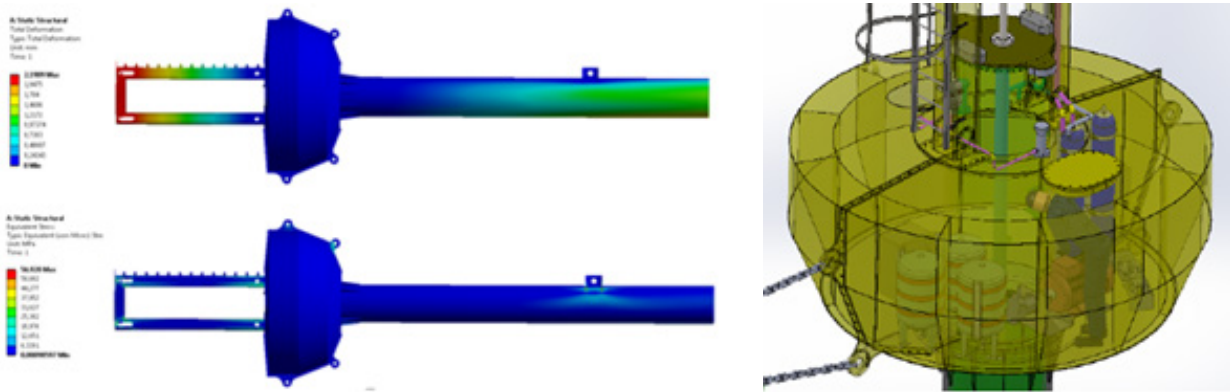


Fig 2. Mechanical validation FEM simulation and electronic design and integration Prototype working principle and design



Fig 3. FEM and scale test and simulations of the prototype



Fig 4. Manufacturing phase