

The Pico OWC - a status outline

The wave energy pilot plant on the Island of Pico/Azores, based on the Oscillating Water Column Technology (OWC), was conceived in the nineties by researchers at IST (Instituto Superior Técnico, Lisbon), and built with the collaboration of the companies Profabril, PROET (EDP group), A.R.T. and Efacec by 1998. The total cost of the plant design and construction (including R&D) was approximately 4 M€, being equally shared by European Commission, the Portuguese state, EDP and EDA (Azores utility). After the initial commissioning of trials in 1999, accidents and lack of resources led to destruction, re-installation and ultimately degradation of the first grid-connected European wave energy pilot plant, without having operated over significant periods.

The 400kW plant was owned until 2003/04 by EDA, who transferred the responsibility to the newly created Wave Energy Centre (WavEC). Almost simultaneously, a recovery project involving Portuguese public funds (600k€) and private investment from WavEC associates in the same order of magnitude was initiated.

The plant was successfully refurbished and has operated on a regular basis since late 2006, however with strong limitations due to original design and installation errors. Nevertheless the conditions have consistently been improved, albeit the minimalist resources of WavEC, and with the technical collaboration of Kymaner it is now possible to run the OWC at its rated speed.

Ten years after conclusion of the original project, and after finally yielding a reasonably working wave power plant, it suits to make an appraisal of the experience gained. It can be taken as certain that the project suffered substantially from the lack of experience of the responsible entities (IST, EDP, EDA) and with the demanding maritime environment. Mainly the lack of contingency funds and budgeting plant maintenance after the public funded project led to irreversible difficulties. For a pilot plant of a new technology, in a demanding and not well-known environment, technical difficulties and unexpected challenges are normal and defensible, but they have to be considered in an early phase of planning.

Further, there was no sufficient understanding to which extent the choice and commitment of the suppliers for such a project are crucial in its success. In the case of Pico OWC, both the insufficient quality of some supplied services and components, as well as the non-existent identification of suppliers of key components with the project, as a show case for their own capacities, were chief factors in the difficulties that the project has encountered until today.

Nevertheless, the most noteworthy conclusion is that despite some still visible vulnerabilities of the plant, it has been possible to correct most of the technical problems and improve the equipments' function substantially over recent years, since some basic and regular maintenance has been implemented. In the meantime, the measured results indicate that the original (hydrodynamic and aerodynamic) design of the plant has been well succeeded.

The operational experience acquired by WavEC and Kymaner contributed to accumulating the essential know-how for the creation of a national competence centre for OWC technology, which is why WavEC continues to insist in maintaining and improving the conditions of Pico OWC. Consuming large parts of its own financial means, WavEC invested approximately 150k€ into the project, and yielded several noteworthy milestones, in particular its continuous operation longer than 24h (48h in spring), operation at full rated speed (up to 1500rpm) in September, and 100h continuous operation in early October.

Meanwhile, what are the future perspectives of the Pico OWC?

On the one hand, the further exploration of the existing equipment represents a unique case for wave energy, offering lessons to be learnt with equipment parts which have resisted the marine environment for over 10 years. Aside from being an important proof

for OWC technology itself, these learning steps are fundamental for feeding into future design processes, including floating systems.

On the other hand, now that the owners have a reasonable command of this infrastructure, and at the same time several industrial players see OWC technology as one of the potential future players on the wave energy market, the time has come for utilizing the full potential of the Pico OWC: the building, was prepared from the beginning for a second full-sized turbo-generation set alongside the existing one. Due to the technical difficulties and the lack of funding, this space was left unused to date. Plans are under way to prepare a proposal for equipping the building a second air duct hosting a flexible turbine test bed, in order to enable variable air turbine testing at industrially relevant sizes (100-700kW). This undertaking would offer world-wide unique conditions for testing OWC turbo-generation groups, as it combines real-sea environment with a semi-controlled testing environment.

The main obstacle for the near-future plans with the Pico OWC is the existence of physical damage (holes in uncritical parts of the structure and erosion of the foundation), which needs to be repaired in the short term, without which the structural integrity of the building cannot be guaranteed another few years. A total investment of approximately 1M€ is estimated, in order to create conditions for the envisaged test infrastructure, including improvements of the exterior (in particular control and transformer station). WavEC is presently scoping potential ways of financing this undertaking, including foreign private investment.

Whatever the outcome of the present orientation phase for the future use of the Pico OWC, the potential partners have the opportunity to associate themselves to the only wave power plant in Europe (or world-wide?) with industrially relevant rated power that has been operating for several years (even though not continuous), and has its best chapter still to come.