METHODOLOGY FOR CONSIDERATION OF AGEING IN THE DESIGN OF TIDAL TURBINE BLADES

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Abstract
Due to a huge potential, more and more tidal turbine projects are developed in the world. The market study, performed by SEENEOH [1], shows that the majority of projects are horizontal axis turbines with composite materials blades. To assess the design of blades, some guidance notes and standards have been issued by Classification Societies as Bureau Veritas [2] or DNVGL. In addition, the Technical Specification IEC62600-2 [3], within the International Electrotechnical Commission (IEC) Technical Committee TC 114 “Marine energy - Wave, tidal and other water current converters”, has been published in August 2016. These documents give the process for the design evaluation of blades in composite materials and associated safety coefficients however the influence of sea water environment on the material is not controlled.

The aim of this paper is to propose a methodology, developed in the framework of the research project VICOMTE [4], to consider the ageing effect of the sea water on the tidal blade composite material. The goal of this methodology is the design optimisation of tidal blades by considering the ageing mechanical properties of the material instead of inclusive safety coefficient. This approach allows not only the design optimisation but also to increase the reliability of the blade structure. The methodology is based on accelerated tests, static and cyclic, to elaborate master curves and evaluate the influence of sea water aggression on the mechanical properties. The aged mechanical properties will be used for the design assessment and the certification of blades.

1. Introduction
Tidal turbines have a tremendous potential worldwide. The market study, performed by SEENEOH [1], shows that the majority of projects are horizontal axis turbines with composite materials blades and estimates a cumulating available power of 150TWh/year in the world. To assess the design of blades, some guidance notes and standards have been issued by Classification Societies as Bureau Veritas [2] or DNVGL. In addition, the Technical Specification IEC62600-2 [3], within the International Electrotechnical Commission (IEC) Technical Committee TC 114 “Marine energy - Wave, tidal and other water current converters”, has been published in August 2016. These documents give the process for the design evaluation of blades in composite materials and associated safety coefficients. However, the long term performance in the marine environment of this kind of structure is difficult to predict.