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Editorial

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Editorial

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The complexity of the marine environment and the uncertainty of placing structures and systems at nearshore and offshore locations has systematically opened different lines of research and ground-breaking applications that represent remarkable milestones in the relationship of humankind with the sea. Ports and harbours, novel sea energy harvesting technologies and offshore platforms are clear examples of such fields of research and practical engineering. The present issue of *Maritime Engineering* compiles a set of novel works on such topics. This represents a continuity of former issues published on similar applications and case studies, the most recent ones being Correia *et al.*, (2019, 2019b, 2020, 2020b) and Fazeres-Ferradosa *et al.*, (2019, 2020).

A key topic of research on marine structures is the analysis of fatigue induced instability. Such research lines becomes particularly important when it comes to designing a wide variety of offshore structures and devices, from oil and gas platforms (e.g. Wang *et al.*, 2017, Mourão *et al.*, 2019) to wind energy structures (e.g. Campos *et al.*, 2016), or even wave energy converters and other dynamic devices in sea conditions (e.g. Fazeres-Ferradosa *et al.*, 2021). In this issue, Shabakhty *et al.*, (2021) provide a detailed investigation on the fatigue damage calibration factors for offshore structures, which are crucial for further fatigue ultimate state analysis and the study of other design and damage components, such as dynamic behaviour and crack propagation estimates. Shabakhty *et al.* (2021) estimate the fatigue damage on tubular steel members and respective joint location, typical of a common offshore platform as a jacket or tower type structure. The damage is estimated based on an initial size crack, whose propagation growth is analysed in surface and depth of the tubular steel member. The S-N curves obtained from the fracture mechanics crack propagation method are compared between two standards, the DNVGL-RP-C203 and the API-RP2A-WSD (DNVGL, 2014 and API, 2014). The authors show that both standards show considerable deviations between their S-N curves, thus justifying the need to properly calibrate the fatigue damage factors. New calibration factors are proposed while the effects of initial crack depth and the critical crack depth are found to significantly affect the

determination of the calibration factors. The present work provides an interesting comparison between widely used standards, highlighting differences in fatigue damage estimation that ultimately affect the overall layout and costs associated to such practical wonders of maritime engineering.

As widely showed by former research developed on extreme phenomena and extreme response of marine structures and systems, the introduction of more accurate models to obtain design environmental loads is also another critical aspect for design, operation and maintenance aspects (e.g. Fazeres-Ferradosa *et al.*, 2018). This has been recently shown and addressed by *Maritime Engineering* latest publications, for example in Hames *et al.*, (2019, 2020), Myrhaug and Lader (2021) or Vanem *et al.*, (2019). Therefore, updated models to establish load conditions remain as an important requirement in the scientific and professional literature. This becomes even more evident in light of the climate change scenarios and the need to properly model joint events. Regarding this topic, Wang (2021) addresses the extreme dynamic response of wave energy converters (WECs) by introducing a novel non-parametric copula-based method to derive the environmental contours required to estimate extreme responses. In this article, the statistical modelling of met-ocean conditions is combined with the design needs of WECs, which is another research line of growing importance, as recently reviewed in Taveira-Pinto *et al.*, (2020). The novel method outperforms commonly used models in the literature for similar purposes, namely, the broadly diffused models based on Clayton and Gumbel copulas. In this case, the authors propose a bi-variate kernel density estimation approach to generate the design environmental contours. The method is then validated using a WEC device for two offshore locations, one near the southeast of Portland (Maine, USA) and the other one near the southeast of Nantucket (USA). This study shows that environmental design values can vary up to almost 16% with the new model when compared to the ones formerly applied. Hence, this article is an interesting application for future research on the met-ocean statistics applied to offshore WECs for both design and optimisation purposes.

Finally, moving a bit closer to shore, Cooper *et al.*, (2021) provide a very interesting analysis of the famous centenary Whitby Harbour and its £6.76 million refurbishment of the west and east piers at the mouth of the River Esk estuary (North Yorkshire, UK). This is indeed a unique practical case study with high value for further applications in similar harbour infrastructures, which are key locations of anthropogenic pressure in coastal areas (Taveira-Pinto *et al.*, 2020b, 2021). This article is aligned with former contributions for *Maritime Engineering* with a particular focus on emblematic field cases, for example Bolle *et al.*, (2015), Reedijk *et al.* (2015) or Melchers and Howlett (2021) among numerous others. Cooper *et al.*, (2021) give a detailed analysis of the refurbishment works carried out, including a parallel analysis of the heritage related to the harbour, which in one form or another has a history of about 800 years. The project's work included the stabilization of the sandstone facing blocks, voids' filling, deck surface repairs and the inclusion of a new flood deflector wall for flooding protection. Flooding phenomena were quite recurrent at the location and the new flood deflector was given as an alternative solution to the more visually intrusive flood gate alternative. Description of the marine operations carried under hostile marine environment is given, with detailed reference on actions taken, equipment and operation planning elements. The physical setting and historic development of the harbour at Whitby is analysed and the authors draw lessons from an earlier refurbishment of another grade II listed marine structure. As a result, these lessons were applied to the refurbishment of the Whitby harbour piers to ensure that the works remained sensitive to the heritage values and iconic aesthetic setting of the area. Hence, this article reveals itself as an interesting case study, not only for maritime engineering purposes, but also for those who seek applications on heritage preservation and maintenance under adverse environmental conditions typical from coastal regions.

Either on remote locations or closer to shore, marine structures and systems remain as an appealing topic in maritime engineering. These recent contributions show that there is still an evident need for research and development encompassing numerous aspects related to their design, maintenance and overall analysis. In this sense, the present issue aims to provide clear examples of some of the challenges and recent practical cases that can be used as a reference for future applications towards the enhancement of knowledge related to Marine Structures and Systems, which are expected to continue growing for the next decades to come.

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