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Editorial

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Preface: Offshore Structures and Subsea Technologies

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Although the endeavour of placing offshore structures dates back to the late nineteenth century (see e.g. Fazeres-Ferradosa *et al.*, 2019, 2020), the last three decades have seen amazing growth in the number and complexity of offshore structures and subsea technologies. While many remain related to the exploitation of oil and gas, a remarkably large and increasing proportion are now a result of rising sectors of the Blue Economy. In particular, the offshore wind sector is playing a key role in this picture. Additionally, the growing investments in demonstration projects of wave and tidal energy, coupled with investments going into offshore aquaculture represent good prospective for the upcoming scenarios concerning these fields of engineering.

Recognizing the importance of this topic on the growth of sustainable, renewable and more balanced energy sources, and owing to the several scientific and practical contributions published in our journal over the last years, it is our pleasure to introduce this special issue entitled Offshore Structures and Subsea Technologies. It provides a set of four articles selected from 'The International Conference on Computational Methods & Ocean Technology and Oil and Gas Technologies in Cold Climate,' hosted by University of Stavanger November 25–27 of 2021.

The first article of this issue by Akwaa and Gao (2023) provides a very practical contribution to the analysis of the dynamic response of offshore wind turbines founded in monopiles under the combined load of waves and wind. This is often a problem that requires a very costly physical modelling approach, or, alternatively, a computational resource- and time-consuming numerical model. To address the need for good estimates of the dynamic response, Akwaa and Gao proposed a new analytical model in a straightforward manner. Their new model showed a degree of error of less than 10% when compared to Abaqus finite element software.

Among the challenging problems facing offshore structure design and the installation of subsea technologies is the estimation of loads for submarine pipelines, which are vital for many purposes in oil, gas or marine renewable energy infrastructures. The challenges are exacerbated in the case where complex materials are applied to these elements, such as fibre-reinforced polymers (FRP). The second article of this issue by Pavlou (2023a), aims to offer practical help. It provides an open-source code to design offshore S-lay FRP pipeline installations. As discussed in the article, the anisotropic nature of multi-layered FRP pipelines considerably increases the difficulty of estimating their bending curvature, which can be quite severe during the installation phase. The literature on this topic is scarce and the calculation methods are complex and difficult to use. This article addresses this problem by providing a free code in Mathematica software (open-source), including the application and discussion of representative design cases, which is hoped will be very useful for professionals acting in this domain.

Continuing with the subsea pipelines topic, Pavlou (2023b) provides an important contribution on the topic of dynamic instability under axial flow. For such structures, instability caused by cross-flow has been widely studied. However, the instability caused by axial flow, resulting from fluids' transportation, is yet to be fully studied. Pavlou (2023b) shows that it is relevant to account for the interaction of the axial flow forces of a fluid element with the forces of the corresponding pipe element during pipeline flexural motion. This article goes on to provide a method for estimating the critical flow velocity that causes dynamic instability in a pipeline or riser by means of a case study, which hopefully can be useful for practitioners.

This issue ends with a very appealing review paper on the structural health monitoring of offshore and marine structures, presented by Pezeshki *et al.* (2023). As the number of offshore structures increases, the need to monitor them and ensure proper service conditions during their lifetime becomes more evident. Additionally, for those which have reached their design life, structural health monitoring can become a necessary requirement to ensure avoidance of economic and environmental losses

(reviewed *e.g.* in Fazeres-Ferradosa *et al.*, 2019). From oil rigs to vessels, pipelines to offshore wind structures and vibration-based methods to machine learning algorithms, Pezeshki *et al.* (2023) gives a very detailed review of health monitoring methods, including numerous examples and, more notably, supplying practical guidelines for selecting and establishing structural health monitoring for several marine structures.

We hope that this collection of excellent papers can be of value to you, and encourage readers to look forward to our future themed issue later this year devoted to the topic of sustainability. On behalf of the *Maritime Engineering* team, thank you for reading.

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