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Editorial

Fatigue Life and Integrity of Ships and Offshore Structures

C. Guedes Soares[1]

The assessment of the fatigue life of floating structures is an essential step in their design process, and thus it is included as one of the checks in the Rules of Classification Societies. Different methods have been developed for that purpose, and new approaches are continuously being proposed, as simplified methods dully calibrated and validated or very heavy computational approaches. Integrity of these structures has to be ensured during their lifetime by checking their strength in light of existing cracks, eventually coexisting with other types of structural degradation. This special issue addresses this type of problems.

The first two papers are review papers that set the stage for what comes afterwards. Dong et al. (2022) reviews various approaches that have been adopted recently for fatigue life assessment. Fatigue loading is reviewed first, and then the factors influencing fatigue strength are discussed, including the geometrical parameters, material, residual stress, and ones related to the environment. Different approaches for fatigue analyses of seam-welded joints are covered, i.e., the structural stress or strain approach, the notch stress or strain approach, notch intensity approach, and the crack propagation approach

The paper by Garbatov et al. (2022) deals with a more specific aspect, addressing fixed offshore wind platforms, reviewing the artificial intelligence-aided life extension assessment methods. It focuses on the intelligent risk-based life extension management of offshore wind turbine support structures. In this regard, big data analytics, advanced signal processing techniques, supervised and unsupervised machine learning methods are discussed within the structural health monitoring and condition-based maintenance planning, the development of digital twins.

A group of papers deal with various approaches for fatigue life assessment dealing also with the modelling uncertainty (Mell, 2022). The effect of weld geometry on fatigue failure of load carrying cruciform joints in ships is investigated using Effective Notch Stress (ENS) approach in Korupoju et al. (2022). Sambo et al. (2022) studies the stress distributions and the location of hot spots stress in the vicinity of the intersection lines of the tubular elements of the tubular TY-joints.

Gledic et al. (2022) represent the total fatigue life using the two-phase model consists of crack initiation phase, calculated by strain-life approach, and crack propagation phase, calculated by fracture mechanic's approach. Calibration of the fatigue parameters is performed for each phase by fitting numerical to the experimental results. Comparative analysis of calculated and measured fatigue lives is then conducted for different stress ratios, in both stress-relieved and as-welded conditions.

Sun et al. (2022) propose an improved unique curve model on the unique curve model, while a summarized general guideline to aid decision making of choosing the type of fatigue analysis approach, best suited for modelling and evaluating high-cycle fatigue damage in welded structural joints is presented in Pargalgauskas et al. (2022).

Several papers deal with the applications to tubular structures (Pargalgauskas et al., 2022). The Local Joint Flexibility (LJF) of steel K-joints reinforced with external plates under axial loads is investigated in Nassiraei and Yara (2022), while in Erfani (2022) the structural integrity assessment of offshore jackets is studied.

The dynamic response of a fixed offshore platform subjected to the underwater explosion is studied in Emamzadeh (2022), while other paper that deals with the dynamic response of the tethers of a TLP. Renewable energy platforms are still considered in Kang et al. (2022).

This set of papers have presented approaches that deal with fatigue assessment in ships and offshore platforms, looking at different aspects of the applications. In this way it is expected that the special issue can be a valuable reference to those who are interested in this type of problems.

✉ C. Guedes Soares
c.guedes.soares@centec.tecnico.ulisboa.pt

[1] Centre for Marine Technology and Engineering (CENTEC), Instituto Superior Técnico, Universidade de Lisboa, 1409-001 Lisboa, Portugal

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