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Structural Monitoring for Offshore Structures: A challenge needs to be undertaken

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Abstract:

Offshore Structures, including the widely used steel platforms related to the Oil and Gas industry as well as the wind turbines, are constantly exposed to a multi-hazard environment that threatens their structural integrity and may question their functionality even until the end of the designed lifetime. Stormy conditions and extreme waves can impose high risk for extensive structural failures, while various deterioration mechanisms, such as the corrosion and scaling commonly observed for structural members at marine environment, may degrade substantially the available capacity of the offshore structures. Therefore, none reliable decision can be reached regarding the current and future (either short-or-long term) operation and survivability of the offshore structures unless a deep and precise comprehension of their dynamic performance is robustly available. Such valuable information about the structures' current condition (i.e., health) is expected to enable: (a) assessing with increased accuracy the existing capacity, (b) predicting the remaining life-time, (c) undertaking interventions (if necessary) to extend the life-time and (d) scheduling maintenance strategies of high efficiency and reduced cost. Along these lines, the Structural Monitoring project, initiated within the framework of the DHRTC multi-dimensional portfolio, embraces a large variety of research activities aiming, via the utilization of the actual dynamic response measurements, to identify reliably the condition of the offshore systems and estimate the stress-and-force states of different structural members. The latter two objectives, facilitated by contemporary identification techniques (e.g., Operational Modal Analysis) and advanced numerical modelling, constitute the necessary ingredients for launching a successful Structural Health Monitoring campaign that, in turn, will allow for efficient structural integrity and reliability management.