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Editorial

Dynamics of FPSO in the Horizontal Plane

The Floating Production Storage and Offloading (FPSO) system is a novel application for hydrocarbon production, which is usually designed to stay permanently moored in an offshore, open sea location. The traditional FPSO has been designed for quick intervention and for temporary applications in a well-defined environment in benign waters. The prevailing FPSO hulls are ship-shaped and their permanent applications are, in a way, a ''back-to-the-past'' scenario. The ship form often has inadequate station-keeping and seakeeping behavior. This led to the invention and development of alternative hull shapes, such as Semi-Submersibles, TLPs and recently, Spars. In fact, the list now includes FPSOs adapted from Very Large Crude Carriers' (VLCC) hulls, which, due to their size (of more than 320 m), may be considered the forerunners of Very Large Floating Structures (VLFS). However, with these latter developments came several traditional pitfalls that were earlier considered solved.

The station-keeping of FPSOs with regard to dynamic stability and consequences to mooring line sizes and arrangements as well as offloading operations are being re-stated and solved nowadays in a different context. This new effort became apparent during the organization of OMAE2001. For this reason, a Special Session, which is reflected in this Special Issue, was organized including experts presently dedicated to the dynamics of FPSO in the horizontal plane.

Basically, there are several complementary but competing ways that this problem may be understood. The so-called Cross Flow Principle was well developed for FPSO, and several time-domain analysis software programs were based on it. On the other hand, due to their continued support to the Simulators for ship steering training, the maneuvering models have also been implemented both for stability analysis and for time-domain numerical analysis. The maneuvering models may be either cubic and usually used for fast motions or quadratic (meaning $|v|v$ to maintain its odd nature) and used for slow motions. Sometimes, even fifth order models have been suggested.

Besides these techniques, the intrinsic dynamic quality of the three degrees of freedom system must also be realized. This was pioneered into directional stability for moving ships, and what gave the initial elements for the Single Point Mooring (SPM) system, and subsequently, for the turret mooring system. This requires evaluations in a multi-component environment with wind, waves and current acting simultaneously, each one imposing its own dynamic condition, in a vessel with ever-varying draft due to the offloading requirement. Finally, it is also important to mention another aspect of this technology development that is the small-scale model testing, since besides the traditional ones, new ones are being proposed.

These combinations of traditional and novel approaches for an FPSO as a permanent platform in open sea are difficult to find in one collection. Hence, by organizing this special JOMAE issue, we hope to be contributing to further developments.

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