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Coupling Time-Domain Analysis for Dynamic Positioning during S-Lay Installation

Authors : Sun Li-Ping, Zhu Jian-Xun, Liu Sheng-Nan

Abstract : In order to study the performance of dynamic positioning system during S-lay operations, dynamic positioning system is simulated with the hull-stinger-pipe coupling effect. The roller of stinger is simulated by the generalized elastic contact theory. The stinger is composed of Morrison members. Force on pipe is calculated by lumped mass method. Time domain of fully coupled barge model is analyzed combining with PID controller, Kalman filter and allocation of thrust using Sequential Quadratic Programming method. It is also analyzed that the effect of hull wave frequency motion on pipe-stinger coupling force and dynamic positioning system. Besides, it is studied that how S-lay operations affect the dynamic positioning accuracy. The simulation results are proved to be available by checking pipe stress with API criterion. The effect of heave and yaw motion cannot be ignored on hull-stinger-pipe coupling force and dynamic positioning system. It is important to decrease the barge's pitch motion and lay pipe in head sea in order to improve safety of the S-lay installation and dynamic positioning.

Keywords : S-lay operation, dynamic positioning, coupling motion, time domain, allocation of thrust
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