Simulation-Based Control Module for Offshore Single Point Mooring System

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Abstract : SPM (Single Point Mooring) is one of the mooring buoy facilities installed on a coast near oil and gas terminal which is not able to berth FPSO or large oil tankers under the condition of high draft due to geometrical limitation. Loading and unloading of crude oil and gas through a subsea pipeline can be carried out between the mooring buoy, ships and onshore facilities. SPM is an offshore-standalone system which has to withstand the harsh marine environment with harsh conditions such as high wind, current and so on. Therefore, SPM is required to have high stability, reliability and durability. Also, SPM is comprised to be integrated systems which consist of power management, high pressure valve control, sophisticated hardware/software and a long distance communication system. In order to secure required functions of SPM system, a simulation model for the integrated system of SPM using MATLAB Simulink and State flow tool has been developed. The developed model consists of configuration of hydraulic system for opening and closing of PLEM (Pipeline End Manifold) valves and control system logic. To verify functions of the model, an integrated simulation model for overall systems of SPM was also developed by considering handshaking variables between individual systems. In addition to the dynamic model, a self-diagnostic function to determine failure of the system was configured, which enables the SPM system itself to alert users about the failure once a failure signal comes to arise. Controlling and monitoring the SPM system is able to be done by a HMI system which is capable of managing the SPM system remotely, which was carried out by building a communication environment between the SPM system and the HMI system.

Keywords : HMI system, mooring buoy, simulink simulation model, single point mooring, stateflow

Conference Title : ICOOAE 2016 : International Conference on Ocean, Offshore and Arctic Engineering
Conference Location : Tokyo, Japan
Conference Dates : May 26-27, 2016