Session - Risk

Title: **Risk Mitigation Effects on Dynamic Positioning Control System in the Arctic**

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Abstract

Offshore marine and oil and gas operations in the Arctic face unique challenges for the design of the dynamic positioning (DP) system intended to perform normal station keeping operations under harsh environmental conditions. Maintaining, maneuvering and positioning a complex vessel in ice-covered waters is very different than those in open waters. When working with sea ice, the Arctic DP system development personnel should pay attention to the ice strengthening design of the ship. It should include ice management and effective strategies for the DP control system to compensate ice loads. These added challenges pose additional risks to the control system. The combination of software development practices, risk management processes, software updates and operating parameters influence the operation and efficiency of the DP system, and therefore the asset. These combined risks are traditionally identified on offshore assets operating in open seas through the hardware failure mode and effect analysis (FMEA), and are managed using risk mitigation procedures. These are verified during the FMEA proving trials. However, software controls the DP system with added functions to such an extent that a software-focused FMECA is needed to determine if programmed actions are appropriate for a particular vessel.

Current dynamic position control systems do not integrate the influence of these new risk areas such as prediction of ice on vessel movements and constantly changing course to avoid hazardous ice conditions. This creates additional complications in applying thruster compensation on the vessel because of the constant changing of course necessary in avoiding the breaking of the ice. Although substantial knowledge in DP is available through the offshore and the shipping industry in this area, this should be applied to develop verification of DP software that will sustain in Arctic conditions.

Risk mitigation, traditionally occurring through a hardware-focused FMEA, should be followed by a software-focused FMECA. The software-focused FMECA should be based on related hardware-focused FMEA outcomes, and should investigate failure management of both the controlled equipment and the software itself. When coupled with the hardware FMEA, software FMECA will more fully inform the owner of the reaction to degraded equipment conditions. The software FMECA is designed to identify and resolve core issues that is often masked by workaround solutions. The key to delivering a robust DP system that can handle challenging environments like the Arctic is to combine this software-focused risk analysis with a comprehensive DP simulator that verifies all the functions.