

Title: Planning of Drilling Operations in Extreme Ocean Currents: Experience from Time-Domain Simulations and Full-Scale Validation on *Maersk Venturer*

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Abstract

Most of the drilling operations in deep water are performed in Dynamic Positioning (DP) mode and the ability of the DP system to maintain position and heading within the required accuracy is one of the critical aspects to evaluate in the planning phase.

The aim of this paper is to share experiences in planning DP drilling operations in a harsh environment dominated by extreme ocean currents. The paper will present the full-scale trials performed with the drill ship *Maersk Venturer*, an enhanced Samsung Drilling V-class series drill ship belonging to Maersk, outside South Africa where the environmental conditions were particularly harsh, including high current speeds and large waves. *Maersk Venturer* is installed with an advanced Thruster and Engine control, which is governed by a specially designed Power Managements System, including fast blackout recovery and enhanced blackout prevention devices. This differentiates it from the standard series of Samsung drill ships, making the total DP system very robust and enhanced.

The primary project goal was to understand the performance of the drill ship in such challenging environmental conditions. The secondary goal was to evaluate if the use of comprehensive dynamic operability analyses performed by time-domain simulations could provide important results for understanding the vessel performance and limitations, in turn providing valuable input to operational risk assessment and planning.

The paper will touch upon the challenges of choosing the most robust heading strategy when both high ocean currents and large waves occur at the same time, the robustness of the positioning strategy upon environmental direction changes, the resulting vessel footprints during and just after the worst case single failure (transient), and how to include the results from these analyses in the Well Specific Operating Guidelines. A comparison between the full-scale trials and simulations will also be provided.