



OTC 19954

A Goal-Based Solution to Offshore Drilling Challenges in Arctic Environments

Rod Allan, SNAME, Aaron Barr, SNAME, Alan Browning, SNAME, Norman Howard, SNAME, Chip Keener, SPE, and Colin Nelson, SNAME, Transocean Offshore Deepwater Drilling, Inc.

Copyright 2009, Offshore Technology Conference

This paper was prepared for presentation at the 2009 Offshore Technology Conference held in Houston, Texas, USA, 4–7 May 2009.

This paper was selected for presentation by an OTC program committee following review of information contained in an abstract submitted by the author(s). Contents of the paper have not been reviewed by the Offshore Technology Conference and are subject to correction by the author(s). The material does not necessarily reflect any position of the Offshore Technology Conference, its officers, or members. Electronic reproduction, distribution, or storage of any part of this paper without the written consent of the Offshore Technology Conference is prohibited. Permission to reproduce in print is restricted to an abstract of not more than 300 words; illustrations may not be copied. The abstract must contain conspicuous acknowledgment of OTC copyright.

Abstract

A drilling contractor has developed a design and specifications for a mobile offshore drilling unit to work in Arctic marine environments. Major operational challenges were identified in the development of the functional specifications. Existing solutions were considered inadequate in terms of seasonal extension, logistical restraints, water depth ranges, and especially well construction performance. A niche market was identified where the best solution would be a new design mobile unit, incorporating the well construction performance of new generation units, with the specific requirements of harsh Arctic environments.

Economics necessitate a drilling unit that is capable of operations in a longer time frame than is currently available in Arctic regions of the world. Moreover, considerations for off-season availability outside the Arctic dictate efficient open water transits and deepwater performance similar to the latest generation of drillships. The extended season (beyond the benign Arctic summer) experiences weather more analogous to a North Sea wind and wave environment. To take advantage of the full open water season at the well location, early approach to the Arctic (as well as late exodus) dictate hull and thruster designs to suitable Polar Class guidelines. The transit escort and ice management strategies can greatly enhance the operability as designed into the solution. Logistic constraints in Arctic regimes dictate evaluation of self sufficiency, with much greater efficiencies in space utilization. Winterization measures must consider potential of severe icing and exposure of the hull and industrial systems to frozen seas and extreme air temperatures.

The major operational challenges have been addressed, and in the process, several new approaches have been evaluated for current solutions no longer deemed effective. The ship structural design has been revamped with a monocoque approach to integrate the substructure and drilling package into a winterized box girder. Turret mooring, while considered a relic of long-past drillships, has been reintroduced to enhance stationkeeping performance at shallow water depths. A thorough risk assessment has been used as a tool to adapt proven drillship operations with the existing rules and guidelines normally associated with ships and icebreakers. Environmental considerations have brought forth a step change in the applications normally applied to offshore drilling, especially emissions and discharges.

Goals and Objectives

The Arctic Class MODU is a high specification Drillship capable of drilling in both Arctic and conventional locations. It is targeted specifically for North American Arctic operations during the summer/autumn season and deepwater operations worldwide during the northern hemisphere winter/spring season. Water depth goals range from a shallow 45 m in the active pack ice zones in the US and Canadian Beaufort and US Chukchi Seas, to 3000 m in open water.

The drill ship must transit efficiently between summer (Arctic) and winter (open water) drilling locations, thus requiring excellent open water speed. Moreover, as the ship must remain competitive in a deepwater dynamic positioning (DP) mode, station keeping performance dictates the solution for propulsion equipment without compromise to the additional Arctic mission. For the shallow water objectives, the unit must be positioned in a moored mode through the use of a turret based mooring system located at the main well center. Thruster assist is available for these scenarios.