Drilling equipment automates, streamlines well construction

SPE/IADC 52767

"Start-up of a New Generation Mechanised Drilling Package for Platform Drilling Operations—the Brent Charlie NDES Story

In March 1997, the Brent Charlie New Derrick Equipment Set began drilling and workover operations on the Shell/Esso Brent Charlie platform in the North Sea. Expectations were very high for this new breed of mechanised drilling package. Unfortunately, the initial performance was disappointing and the anticipated time/cost savings were not realised.

Through the project approach of a dedicated performance improvement team, a step change in performance was achieved. A structured Hazop analysis of the mechanised functions in the derrick played a major role in the reduction of the high potential incidents.

A need for specialised crew training to operate this new breed of mechanised drilling package was recognized. No longer is hands-on training sufficient. Underpinning knowledge of the mechanised operating system needs to be taught, understood and tested. Simulators must be developed to acquaint crews with the systems behind the equipment, to safely gain experience away from the workplace.

This paper presents the Brent Charlie NDES story. Lessons learned, equipment upgrades to the new rig and enhanced crew training is discussed with a final look at the way ahead.

—S D Porteous, H van Elst, D Leil, Deutag Overseas (Curacao)
—H Hindriks, Nederlandse Aardolie Mij
—N Shuttleworth, Shell UK

SPE/IADC 52770: This new casing-running tool, developed by QCD, Deutag and their partners, employs the top drive as a torque wrench.

SPE/IADC 52768

"Conductor System Design for a Deepwater Jackup in Cantilever Mode Over the ETAP Platforms"

Increasingly, field developments in the 80 m-100 m depth range are utilising deepwater, harsh-environment jackups in cantilever mode over fixed platforms near to their operating limits. In such water depths, there could be substantial relative movements between the jackup and fixed platform under the action of wind, wave and current loading. Any such relative movements cause very high loadings within the conductor system, in the surface equipment, and on the jacket conductor guides. Such loadings often exceed those caused by environmental loading on the conductors themselves. Consequently, all of the above loadings must be accounted for in the design process, in appropriate combinations.

The above issues were addressed in the design of the conductor systems for 2 platforms located in UKCS Central North Sea, Marnock and Mungo which form part of the ETAP development, A thorough understanding of the key issues was prepared, and analytical and design solutions developed to maximise drilling operability. Operating procedures were prepared, to ensure that the conductor systems will remain within acceptable operating envelopes. These procedures are now being used in the field.

This paper describes the analytical work performed for both Marnock and Mungo, summarises the key issues, and describes the operating procedures developed. The paper also outlines the topics which should be addressed when designing such systems for use on deep water jackups working in cantilever mode.

—K Burton, UWG Ltd
—M Odgers, C Nehring, BP Exploration
—W Boon, Schlumberger Oilfield Services

SPE/IADC 52769

"Case History: Utilizing 5 ½-in. Drill Pipe in a Deepwater Gulf of Mexico Drilling Program"

This paper describes lessons learned while implementing a string of 5 ½-in. drill pipe with special clearance outside diameter connections in a long-term deepwater drilling program in the Gulf of Mexico. Actual field data, including hydraulics, fishing guidelines, trip-speed, and completion pumping uses will be chronicled. The paper will also discuss use of the pipe to drill inside a 9 ⅝-in. drilling liner along with tieback and completions inside 9 ⅝-in. casing strings. Savings will be presented. Inspection results and all damage reports will be discussed. A comparison of drilling loads and hydraulics (drilling and completion) will also be made on this particular string of 5 ½-in. vs 5-in. and 6 ⅝-in. drill pipe strings. Running and handling aspects will also be analyzed and discussed. A specific well that utilized the 5 ½-in. string that was drilled to below 25,600 ft will be described as the example case for the program.

—R W Jenkins, Texaco E&P
–J F Greenip, Hydril Co
–B A Adams, Oil & Gas Rental Services Inc

SPE/IADC 52770

"Casing Running Tool"

A new casing-running tool has been designed to minimize the risk of accidents with the stabber and snubbing board, as well as to increase efficiency.

The top drive is used as a torque wrench and several functions are integrated. A flush mounted spider is used, integrated with a fill up and circulating device, power tongs, top snubbing and casing hoisting device. The tool is remotely operated, cutting risk, simplifying the driller's work and reducing operational time.

—G van Wechem, QCD, et al

SPE/IADC 52771 (ALT)

"Modern Use of Closed Loop Hydraulics for Controlling and Powering of Cylinder Based Hoisting Systems

The RamRig drilling rig concept of Maritime Hydraulics A/S is based on cylinders as actuators powered by up 3-4 MW of hydraulic power in a closed loop hydraulic system. This synthesis of well-known technology allows for the use of integrated active and passive heave compensation, as well as storing and reuse of energy from the lowering phase of an operation.

The RamRig concept make mechanical brakes and clutches obsolete, since hoisting and lowering of the load is controlled solely by the closed loop hydraulics. This decreases the number of critical mechanical components in the hoisting system to a minimum.

Safe handling and emergency shut down of extreme amounts of hydraulic power is handled by cartridge valves, which make rerouting of hydraulic power possible with minor losses of transferred effect.

—E Framnes, Maritime Hydraulics

SPE/IADC 52772 (ALT)

"Rig Control Systems to Improve the Drilling Process"

The drilling process causes lateral, vertical and torsional drillstring vibrations, This results in poor rate of penetration, premature bit wear or at worst drillstring failure.

A soft torque system which controls the drive motor of the rotary table or the top drive eliminates the torsional vibrations of the drillstring. To control the drive motor and negate torsional vibrations, a microprocessor calculates vibration parameters. These data are used to tune electronic circuitry, which produces a correction signal. This signal is looped into the rig's SCR unit, which controls speed and torque of the drive motor. Then the drive system for drillstring rotation can be transformed from a stiff amplifier for torsional vibrations to an active dampening system. The feed-off control system provides the driller with the ability to more precisely control the rate of penetration, weight on bit and pump pressure. The soft-pump system synchronizes the mud pumps, resulting in minimum pressure fluctuations.

The combination of the 3 systems helps increase penetration rate, reduce drillstring failure, improve bit life, reduce pump wear and improve MWD signal quality.

—W Lange,
Bentec Drilling and Oilfield Systems GmbH
—R Schwarzmeier, C Chur,
Deutag Drilling■