weighting material. Laboratory experiments have shown that the technique can increase the cake’s permeability by more than 50-fold.

SPE/IADC 105487
Field Result of Equivalent Circulating Density Reduction with a Low Rheology Fluid. N. Bolivar and J. Young, Hibernia Management and Development; S. Dear, ExxonMobil; J. Massam and T. Reid, MiSwaco.

Prior to being considered for use on a world record ERD well, a field trial well was selected to demonstrate the technical benefits of using a uniquely designed low rheology, synthetic-based drilling fluid. The 8 7/16-in. production hole section was 1,755 ft (535 m) long and drilled to 20,472 ft (6,240 m). Prior to drilling this section, a low rheology drilling fluid was selected. Selection analysis was based on assessment of key drilling parameters as compared with wells drilled previously using a conventional API barite weighted synthetic fluid. A unique characteristic of the low rheology drilling fluid is its use of a specially treated micronized barite weight material. This paper presents the background work performed leading up to the field trial.

SPE/IADC 105730

Lubricants are sometimes added to drilling or completion fluids to obtain well objectives. The paper shows how the addition of a lubricant to an oil-based drilling fluid affected the lubricity significantly in 2 comparable track runs, resulting in historically low coefficients of friction. The paper discusses significant drag reduction when adding lubricant to the brine in the completion phase and compares drag obtained with the use of rollers.

SPE/IADC 105733

Cesium formate brine is a high-performance drilling and completion fluid for HPHT wells. Its benefits as a reservoir drilling fluid for high-angle offshore HPHT wells were first demonstrated by Statoil in their Hildr field development. Statoil found low-solids drilling fluids based on cesium formate brine reduced risk and improved well economics by providing extremely good well control, lowering ECDs, increasing trip speed, avoiding surge and swab, reducing time for flow checks, and improving hole cleaning. Cesium formate brine was also found to make an excellent completion fluid for standalone sand face completions, creating 6 highly productive wells with low skins. The use of cesium formate brine as a combined drill-in and completion fluid simplified operations, reduced waste and avoided introducing fluid compatibility issues. This paper describes how cesium formate brine has now been taken to the next level as an HPHT drill-in and completion fluid.

Technical Session 3: Downhole Drilling Technology

SPE/IADC 105853
Coiled Tubing Re-Entry Whipstocks: The Next Evolutionary Step in Drilling Practices for Various Carrier Frequencies and Band Rates while Signal, Battery, Decoding and Reliability Data were Recorded and Evaluated.

SPE/IADC 105853: A whipstock system uses the conveyance method of coiled tubing to create a casing/liner window.


Creating a sidetrack out of the main wellbore has become a more common oilfield drilling practice. In the past, re-entry applications have used a sidetrack philosophy governed by threaded tubular drilling conveyance; however, from the standpoint of a coiled tubing methodology, the practice of sidetracking a well may still be seen by some as being in its infancy. It was a natural desire to be able to exploit the inherent advantages of coiled tubing and marry it to the practice of being able to perform a sidetrack.

The paper will discuss utilizing a whipstock system with the conveyance method of coiled tubing to create a casing/liner window. The overview will also discuss general practices and tool selection criteria and provide case history demonstration of each.

SPE/IADC 105853: A whipstock system uses the conveyance method of coiled tubing to create a casing/liner window.


Acoustic telemetry (AT) MWD systems are finally coming of age as a commercially viable alternative to mud pulse and electromagnetic propagation systems. A high data rate, acoustic telemetry system has been developed for drilling assemblies. In this paper we describe the field test program used to evaluate its performance and to demonstrate practical and commercial applications.

The field test program was limited to shallow, vertical and directional land wells (<2,500 m) drilled with jointed pipe using both Kelly and top drive systems. The AT tool was placed in a number of different locations in both rotary and steerable RHAs. A variety of operational modes and configurations were tested. The system performance was evaluated for various carrier frequencies and band rates while signal, battery, decoding and reliability data were recorded and evaluated.
Lateral in the field was successfully drilled. Well, ROP increased by 46%, the distance drilled per ing areas, reduce stress on the drillstring and enable reduce the risk to drillstring and extend the reach of the directional drilling. A good BHA program enables many critical applications and can significa ntly improve drilling performance. Several methods have been developed to build BHA models. The model complexity is probably based on the finite element method. However, many of the finite element based BHA programs have been shown to be inaccurate for modeling steerable assemblies such as motor or rotary steerable systems. Thus, the semi-analytical methods are often required, but such methods are usually cumbersome to run and restricted in simple BHA configurations.

This paper will present a newly developed BHA program using a generic algorithm based on Lubinski’s equations. The strength of this new BHA program are the flexibility and accuracy compared with conventional BHA programs.

**SPE/IADC 104623**


The Panna Field offshore West India is a tight limestone drained using multilateral wells. There are significant drilling challenges. First, well trajectories are complex, and laterals are three-dimensional profiles requiring precise steering control to maintain position in the productive zones. Second, total fluid losses to the fractured limestone are frequently encountered. Third, high levels of vibration and high drilling torque threaten the integrity of the drillstring and ultimately limits the laterals’ reach. The desire to improve gross drilling performance, reduce the risk to drillstring and extend the reach of the laterals prompted introduction of a new drilling system that was being tested in the North Sea. This new system integrates a high-performance drilling motor with a high-gauged rotary closed loop system to improving overall drilling performance in challenging areas, reduce stress on the drillstring and enable wells to extend past prior reach limits. On the first well, ROP increased by 80%, the distance drilled per BHA increased by over 300%, and the longest ever lateral in the field was successfully drilled.

**SPE/IADC 105594**

Effects of RPM and ROP on PDC Bit Steerability. S. Ernst, P. Pastusek and P. Lutes, Hughes Christensen.

Directional drilling is a critical necessity in many of today’s wells, and accurate prediction and awareness of achievable build rates is vital in controlling costs. The science behind controlled wellbore deviation has advanced beyond prediction based solely on BHA geometry. Although BHA configuration is an important factor, interaction between each of the 4 primary components — bit, BHA, operating parameters and formation — must be evaluated thoroughly. This paper presents how changes in bit characteristics, BHA configuration and various formations influence build rates. With regards to operating parameters, weight on bit (WOB) is well known to be beneficial in increasing the desired build rate under certain drilling conditions and yet does not help in other situations.

We propose that most of the WOB effects are actually due to its influence on ROP and bit tilt. However, the influence of operating parameters has not been fully investigated. RPM has been neglected as a significant influence on steerability. These properties have been measured and quantified with the use of a full-scale drilling laboratory and commercially available PDC bits. This paper investigates the effects of RPM and ROP on build rate and illustrates the importance of these parameters.

**SPE/IADC 105578**


Deepwater drilling programs regularly include hole opening applications to provide room for intermediate casing strings. In directional wells drilled with rotary steerable systems, the borehole is typically opened with concentric reaming devices with hydraulically activated ribs. However, drilling with the additional rock cutting device in the bottomhole assembly (BHA) with the associated lack of stabilization in the BHA in the enlarged borehole significantly increases the risk of the operation. In particular, high lateral vibrations can result in failures of BHA components and subsequently in costly trips or fishing operations.

Detailed analysis of downhole weight on bit, torque, bending moment and vibration signals measured between bit and hole opener have provided clear insight into the dynamic response of hole opening BHAs in interbedded formations. Based on real-time information from an advanced downhole multi-sensor data acquisition and processing system, application specific drilling procedures have been developed to avoid or to identify and overcome critical dynamic situations downhole.

Applying these procedures, several bore sections in the GOM were drilled for the first time in one run. In the same field, all previous attempts had resulted in failures of the drilling equipment including several twist offs. For the first time, the paper will show the changes in downhole weight on bit versus weight on reamer when drilling interbedded formations.