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, MI-Swaco.

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 ½-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 specially treated micronized barite weight material. This paper presents the background work performed leading up to the field trial.

SPE/IADC 105730

Lubricants Enabled Completion of ERD Well. J. Holand, S.A. Kvamme, T.H. Omland, A. Saasen and K. Taugbøl, Statoil; J. Jamth, Intertek West Lab.

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

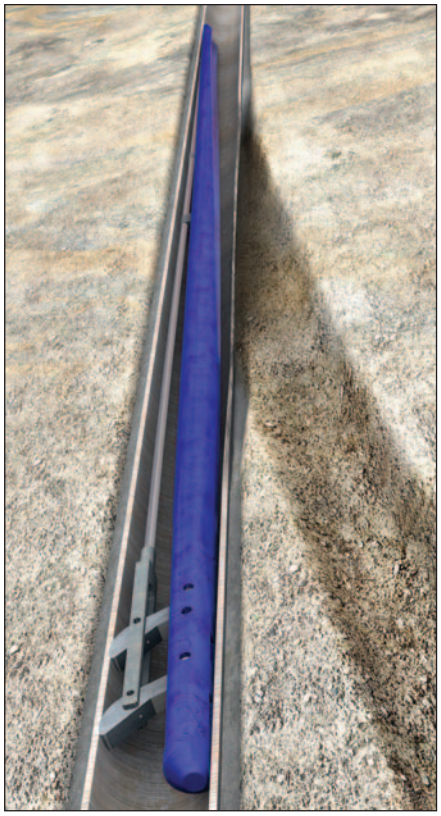
Drilling and Completing High-Angle HPHT Wells in High-DensityCesium Formate Brine: The Kvitebjørn Experience, 2004-2006. P.C. Berg, E.S. Pedersen, A. Lauritsen, N. Behjat and S. Hagerup-Jenssen, Statoil; S. Howard, G. Olsvik, J.D. Downs, M. Harris and J. Turner, Cabot Specialty Fluids.

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 Huldra 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 Mature Field Development. G. Garfield and G. Mackenzie, Baker Oil Tools.



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 105021

Field Test Results of An Acoustic Telemetry MWD System. J.M. Neff, XACT Downhole Telemetry; P.L. Camwell, Extreme Engineering.

Acoustic telemetry (AT) MWD systems are finally coming of age as a commercially viable alternative to mud pulse and electro magnetic 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 BHAs. A variety of operational modes and configurations were tested. The system performance was evaluated for various carrier frequencies and baud rates while signal, battery, decoding and reliability data were recorded and evaluated.

SPE/IADC 105000

New Assembly Drills Without Reactive Torque. R. Southard, Southard Drilling Technologies.

A new type of drilling assembly has been designed, built and tested that drills and produces no reactive torque to the drill string. It uses a simple set of planetary gears to drive a center bit in the conventional clockwise direction and an outer, concentric bit in the counter-clockwise direction. The 2 bits offset each other's torque, resulting in a new zero reactive torque into the drillstring.

This new type of drilling assembly will make directional drilling more efficient by allowing all drilling to be done in the desired direction, instead of moving constantly as reactive torque changes. Less time will be spent waiting for toolface orientation, resetting toolface after motor stallout, making a connection, etc..

SPE/IADC 105400

Drilling Tests of an Active Vibration Damper. M.E. Cobern, C.A. Perry, J.A. Barbely, D.E. Burgess, APS Technology; M.E. Wassell, APS Oilfield Services.

Drillstring vibration is a serious problem, particularly in deep and hard rock drilling; it can reduce ROP, shorten bit life and damage expensive downhole components. Testing of an active drilling vibration damper (AVD) system under conditions designed to induce vibration demonstrated that the use of the AVD reduced vibration, maintained more consistent weight on bit (WOB) and increased ROP.

The AVD has a structure similar to that of a shock sub with the shock absorber filled with magneto-rheological fluid (MRF) rather than hydraulic oil. Under the influence of a magnetic field, MRF instantaneously increases its viscosity. Using a series of coils to induce intense electromagnetic fields across the fluid gap, the damping coefficient can be changed in milliseconds by a factor of 7 to 10. A linear motion detector provides feedback to control the AVD in response to bit motion.

Technical Session 4: Drilling Optimisation

SPE/IADC 105201

Deployment of an SeROP Predictor Tool for Real-Time Bit Optimization. C.A. Guerrero and B.J. Kull, Chevron.

Since 1965, Specific Energy principles have been used to predict bit performance and analyze ROP and bit efficiency. Factors that create drilling inefficiency include bit dull, bit balling, bottomhole balling/cleaning issues, torque and drag and drillstring vibrations. These are often evident with high specific energy values. Based on these principles, Chevron has established proprietary relationships for bit-specific coefficient of sliding friction and mechanical efficiency as a function of the rock's confined compressive strength (CCS). CVX then uses these relationships to predict reasonable and achievable ROPs with associated bit torque for several bit types. The effect of mud weight, blade count and cutter size to the coefficient of sliding friction and efficiency are considered in the ROP predictions. The relationships have proven to be of high value. This paper will present a number of global case histories showcasing CVX's rapid deployment of the SeROP tool maximizing its value and reducing drilling costs.

SPE/IADC 105521

Implementation of ROP Management Process in Qatar North Field. S.M. Remmert and J.W. Witt, RasGas; F.E. Dupriest, ExxonMobil.

In March 2005, the ExxonMobil Fast Drill Process (FDP) was implemented in the Qatar North Field. Training material was adapted to the local operating environment, and a customized surveillance package was introduced to monitor energy efficiency and vibrations simultaneously. Energy surveillance led to changes to equipment and practices and significant learning about the drilling operating environment. This paper will focus on the learning cycle, changes in drilling procedures and associated results. While technical learnings specific to the Qatar North field will be presented, the information is considered applicable to many drilling activities.

SPE/IADC 104502

Maximizing Drilling Performance with State-of-the-Art BHA Program. D.C. Chen and M. Wu, Halliburton.

Bottomhole assembly modeling is an essential part of the directional drilling. A good BHA program enables many critical applications and can significantly improve drilling performance. Several methods have been developed to build BHA models. The most common approach 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 strengths of this new BHA program are the flexibility and accuracy compared with conventional BHA programs.

SPE/IADC 104623

Application of Novel Technology Improves Drilling Performance in Multilateral Field Development Offshore West India — Reducing Risk and Increasing Production. A. Jaggi, S. Gera and S. Upadhyay, BG Group; M. Gupta, A. Thorat and J. Ruszka, INTEQ; S. Tatake, Hughes Christensen.

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 high-speed 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 46%, 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. Previous papers have described 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.

SPE/IADC 105521: RPM has been neglected as a significant influence on steerability. A new study investigated the effects of RPM and ROP on build rate.

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

Achieving Shoe-to-Shoe Drilling Performance in Hole-Opening Applications with Rotary Steerable Systems. G. Heisig, J. Hood, S. Okewunmi and E. Robnett, Baker Hughes INTEQ.

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 hole 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.

SPE/IADC 105566

Detailed Post-Event Analysis of Drilling Problems Significantly Alters the Root Cause Reality for Technical Sidetracks. M. Blaasmo, A.V. Singelstad and K. Bekkeheien, Statoil.

A major Norwegian operator has drilled an average of 30 technical sidetracks every year since 2000, and a significant portion of the total drilling and well technology costs is related to these operations. A project was initiated to investigate the causes for the technical sidetracks. A total of 24 detailed analyses have been concluded with a direct cause and a corresponding root cause. The three major findings from these analyses were: (1) Little consistency between reasons for sidetrack reported in daily drilling reports compared with root causes found from the detailed analyses; (2) Major reduction in formation related root causes; (3) Operational practice accounts for about 44% of the technical sidetrack root causes. The paper presents why this knowledge is of great value during both planning and operations phase and how it may be implemented most efficiently and successfully in both phases.

SPE/IADC 105565

Aggressive Drilling Parameters Capitalize on Cutter Technology and PDC Frame Advancement in Mature Field. P. Langille, Marathon Oil; J. Hildebrand and K. Massie, Hughes Christensen.

In many fields, the mere introduction of standard PDC technology can result in monumental performance improvements. However, in southwest Washita County, Oklahom, the conversion to a PDC-dominated drilling program has proven difficult utilizing standard PDC technology and operating procedures due to the shallow showing (5,000-6,000 ft TVD) of the highly abrasive weathered granite conglomerate. Recently, however, the combination of new bit technology and operational practices has resulted in performance improvements, allowing for a 41% reduction in drilling time.

In much of the surrounding Anadarko Basin, the interval to 11,000 ft (where the Granite Wash is typically encountered) is dominated almost exclusively by PDC bits. However, as recently as 9 months, all operators in the southwest Canute area were forced to use a drilling program comprised solely of roller cones due to the shallow arrival of the Granite Wash and the inability of standard PDC technology and operating parameters to drill this formation. This paper will document how a major operator in the area utilized the concept of aggressive high WOB/low RPM drilling parameters, typically reserved for roller cone bits, coupled with innovative PDC bit frames to replace the typical 6-8 roller cones required to drill to 10,700 ft with just 2 PDCs.

Technical Session 5: Well Planning & ERD

SPE/IADC 105839 PP

Floatation of 10 ¾-in. Liner — A Method Used to Reach Beyond 10 km. J. Eck-Olsen, R. Haugom, G. Løklingholm and H. Sletten, Statoil.