SPE/IADC 105822: Casing installation technology using a new-generation top drive casing running system permits changes in conventional well construction methods.

SPE/IADC 105822

Improved Well Construction Enabled by Next-Generation Top Drive Casing Running and Drilling Tools. E. Abrahamsen and D. Reid, Weatherford.

This paper discusses casing installation methods using a new-generation top drive casing running system versus conventional and mechanized casing running methods. The enabling technology permits changes in conventional well construction methods through the ability to rotate casing strings at high speed, instantly circulate and reciprocate on demand, and even ream casing into the well. The paper highlights how this technology, when combined with drilling with casing tools and expertise, can significantly reduce well construction costs providing earlier production at less risk.

Applications include drilling with casing from rigs with top drives; casing installation in pre-drilled wells; risk mitigation for casing installation in extended-reach, deviated and troublesome wells; reducing flat spots in the well construction through improved hole cleaning with casing and other related problems.

Technical Session 13: Managed Pressure Drilling

SPE/IADC 105599

Demonstrating Managed Pressure Drilling with the ECD Reduction Tool. R.K. Bansal, D. Brunnert and R. Todd, Weatherford; P.A. Bern, R.V. Baker and C. Richard, BP.

The ECDRT was designed to counter increased fluid pressure in the annulus due to friction loss and cuttings loading. A prototype was recently tested in a BP onshore operation in southeast Oklahoma. The ECDRT was field-tested by drilling 8 ¾-in. hole with the tool at a depth of 4,500 ft. Wellbore pressure management was clearly demonstrated in the field trial. The ECDRT consistently reduced ECD by about 0.7 ppg at 4,500 ft. Drilling performance was not limited by the ECDRT. Fluid return and wellbore cleaning were normal throughout the drilling operation. The ECDRT processed all of the cuttings generated by the drilling at 100 ft/hr. Over 500 ft was successfully drilled before the team decided to pull the tool due to an issue that caused difficulties with the directional drilling system.

Post well analysis of the tool revealed that there are still a number of issues that must be addressed to secure the longevity and sustained performance of the tool, but overall results are encouraging.

SPE/IADC 105454

Kick Detection and Control in Oil-Based Mud: Real Well Test Results Using Micro Flux Control Equipment. H. Santos and E. Catak, Impact Solutions; J. Kinder, Secure Drilling; P. Sonnemann, Chevron.

Kick detection in oil- and synthetic-based fluids has been a major concern for the industry for decades. Due to solubility issues, kicks detection may be delayed, and resulting well control operations may be problematic. Use of a Micro Flux Control (MFC) method potentially offers a better way to address this problem.

To check the performance of the MFC method while using oil-based mud (OBM), tests were conducted at Louisiana State University using natural gas injected into test wells containing an 11 ppg 70/30 diesel/water OBM. Results were compared with previously good results obtained with water based fluids. The paper presents the results obtained during one week of live well testing. Also included will be details of the first field test of the MFC system on an actual well being drilled with OBM.

SPE/IADC 105490

Managed Pressure Drilling Reduces China Hard-Rock Drilling by Half. C. Shen and X. Niu, Sinopec; S. Nas and C. Holt, Weatherford.

This paper describes the experiences during 15 months of MPD operations in sandstone formations in remote southern China. A two-well project was commissioned in Puguang, the largest gas field in China, to determine if percussion air drilling technology could provide ROP benefits. Because the feasibility report determined that wellbore stability could be an issue, a certain amount of project risk was involved. In addition the main reservoir is sour, with sweet gas secondary zones above. Conventional 5,500 m wells were being drilled and completed in about 200 days. The first well was spud in March 2006, and immediate benefits were realized. In the main section, over 60 days were saved. Future wells are expected to eliminate an additional 40 days.

As the project progresses, MPD techniques will be employed in the secondary gas reservoir with the goal to improve ROP performance. Planning is currently underway, and results will be presented.

SPE/IADC 105583

Hydraulic Predictions for Polymer-Thickened Foam Flow in Horizontal and Directional Wells. Z. Chen, M. Duan, S.Z. Miska, M. Yu and R.M. Ahmed, U of Tulsa; J. Hallman, Weatherford.

Foam has proven effective and economical in underbalanced operations (UBO) and is gaining wider applications in many areas. However, knowledge of rheology and hydraulics of polymer-thickened foams is still limited. This paper summarizes the significant effects of polymer on foam rheology and hydraulics and presents a mathematical background

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and results of foam hydraulics predictions for directional and horizontal wellbores.

SPE/IADC 105471

The Introduction of Electromagnetic LWD Technology in Saudi Arabia — A Case History and Future Application to Underbalanced Campaigns. M.A. Muqeem, C.M. Jarrett, A.M. Jeffri, Saudi Aramco; D. Weisbeck, M. Mallahy, N. Forge, A.J. Branch, Weatherford.

The first Electromagnetic Logging While Drilling (EM LWD) Triple Combo operation with the Extended Range set-up was successfully completed in Saudi Arabia. The 6 1/8-in. horizontal section of the Hawiyah 473 well was drilled underbalanced in one run.

The objective was to evaluate the feasibility of EM transmission utilised in conjunction with LWD triple combo and annulus pressure sensors in the 6 1/8-in. horizontal section. This particular well was drilled UBD with single phase fluid; future wells will require the use of gas injection to achieve UBD conditions. The injection of gas through the drill pipe precludes the use of mud pulse telemetry. EM telemetry was required to be proven to allow a continuation in the UBD planning process to include real-time LWD technology.

EM transmission of LWD triple combo and annulus pressure data in real time allowed 3,089 ft of 6 1/8-in. horizontal section to be successfully geosteered and drilled in one bit run while maintaining underbalanced conditions.

Technical Session 14: Cementing

SPE/IADC 105781

Self-Healing Cement — Novel Technology to Achieve Leak-Free Wells. P. Cavanagh, Suncor Energy; C.R. Johnson, S. LeRoy-Delage, G. DeBruijn, I. Cooper, D. Guillot, H. Bulte and B. Dargaud, Schlumberger.

The number of wells worldwide that leak or have sustained casing pressure is an astonishingly high percentage. Throughout the lifecycle of a well, unplanned changes can contribute to unknown damage to the cement sheath integrity, or the generation of a microannulus. With a flow path, hydrocarbons can either migrate to surface, or become trapped below the wellhead leading to pressure build-up.

The paper will describe a novel isolation solution that is activated only when a cement integrity problem occurs. The solution will automatically and rapidly form a complete hydraulic barrier by swelling in the presence of hydrocarbon flow, sealing damage caused by a change in wellbore conditions, and one that continues to re-seal if further damage occurs.

SPE/IADC 105437

Mathematical Temperature Simulators for Drilling Deepwater HTHP Wells: Comparisons, Applications and Limitations. D. Stiles and M. Trigg, ExxonMobil.

The widespread application and acceptance of mathematical simulators to model wellbore temperatures during drilling operations has grown in recent years. Limited work has validated some of these models against measured well temperatures, but no comparison among the results, applications and limitations of the various models has been published.

Part one of this paper presents a comparison of cementing temperature results from 3 models widely used. Part two presents the circulating temperature model and temperature surveillance program utilized to drill and test a deepwater HTHP well. Additionally, the functionalities of each of the temperature simulators and how those functionalities may impact the results are discussed.

SPE/IADC 105227

Enhanced Cementing Practices Address Unique Issues Found with Solid Expandable Tubular Applications. J. Heathman, Halliburton; E. Arredondo and A. Olufowoshe, Enventure.

This paper will examine the evolution of cementing processes and products for solid expandable tubulars. Emphasis will be placed on best practices and lessons learned. It will also discuss foreseeable application trends in expandable use and logical modifications and enhancements in cementing procedures, technology and chemistries. Checklists for key slurry design issues and how they correlate with the job logistics of the expansion operation will also be included.

SPE/IADC 105648

Application of Enhanced Ultrasonic Measurements for Cement and Casing Evaluation. C. Morris, L. Sabbagh, R. van Kuijk and B. Froelich, Schlumberger; R. Wydrinski and J. Hupp, BP.

The hydraulic isolation of the wellbore casing and cement is critical. Current acoustic evaluation techniques may be limited by the acoustic properties of the material behind casing and by the inability to see beyond the cemented region near the casing. A new ultrasonic imaging tool has been developed that combines the classical pulse echo technique with a new ultrasonic technique that provides temporally compact echoes arising from propagation along the casing and also reflections at the cement formation interface.

A field study was performed to evaluate the results provided by both sonic and ultrasonic tools in the different cement materials, drilling fluids, and casing sizes. Field examples are presented to illustrate the actual response of the new ultrasonic tool to these various completion environments.

SPE/IADC 105903

Are Preflushes Really Contributing to Mud Displacement During Primary Cementing? D.J. Guillot and J. Desroches, Schlumberger; I. Frigaard, U of British Columbia.

During a primary cementing operation, direct contact between the drilling fluid and the cement slurry that is to be placed in the wellbore must be prevented because these fluids are usually incompatible. To do this, special fluids — called preflushes and/or spacers — are pumped ahead of the cement slurry This paper illustrates how an advanced numerical fluid placement simulator helps understanding how these preflushes work. It clearly demonstrates that, in a number of cases, preflushes do not prevent direct contact between the drilling fluid and the cement slurry, even when industry accepted rules are used to design them. In such circumstances the cement slurry is directly displacing the drilling fluid, with all the risks associated.

Technical Session 15: Tubulars II

SPE/IADC 105602

Effect of Length: Diameter Ratio on Collapse Test Results and Frame Design. P.D. Pattillo, BP.

Conventional design equations for well tubular collapse assume the tube to be of infinite length. By contrast, the experimental test fixtures used to derive collapse design equations are of finite length, introducing the possibility of the sample's collapse resistance being influenced by the constraint at the sample ends. The current study is an extension of a previous modeling effort that employs a set of nonlinear cylindrical shell equations to investigate the effect of length to diameter ratio on collapse. The discussion begins with a review of the governing equations. A numerical model based on the shell theory is used to discuss the behavior of collapse samples, illustrating sensitivities to geometry and mechanical constitution. The discussion then focuses on a proper model of test fixture end constraints. The practical example of tieback stem design completes the discussion.