SPE/IADC 105454: Use of a Micro Flux Control method could offer a better way to address kick detection in oil- and synthetic-based fluids.

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.

SPE/IADC 105851

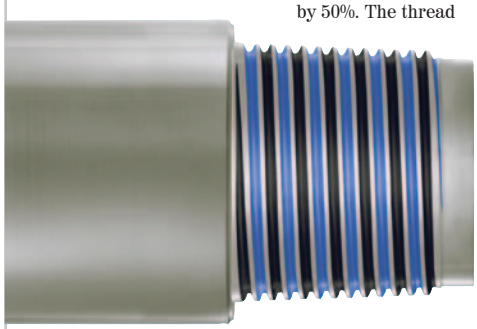
Dope-Free Tubular Connections, Through Research and Development to Field Trial and Implementation: A North Sea Case History. H.B. Andersen, M.P. Hummer and R.C. Engell, Maersk Oil; L. Verdillon and A. Pardé, V&M Tubes.

This paper describes work involved in developing dope-free tubular connections DTCs from research and development through field trails and finally to implementing DTCs as standard for all casing, liners and tubing where DTCs are available.

SPE/IADC 105866

Drill Faster, Deeper and Further with Ultra-High Torque, Third-Generation Double-Shoulder Connections. R.B. Chandler, A. Muradov and M.J. Jellison, Grant Prideco; M.E. Gonzalez and J. Wu, Chevron.

A third-generation, ultra-high torque connection has been developed. This paper will present the results of a 2 ½-year effort to design, test, manufacture and field-trial a family of connections engineered to meet the specific needs of each drill pipe size. Extensive laboratory tests and results from two field trial programs are presented. The thread form is a double start thread that reduces the number of revolutions to assemble the connection by 50%. The thread form also provides a unique dual thread root radius that offers a step-change improvement in fatigue resistance.



SPE/IADC 105866: An ultra-high torque connection uses a double start thread that reduces the number of revolutions to assemble the connection by 50%.

SPE/IADC 105067

Tubing Buckling Analysis with Expansion Joints. R.F. Mitchell, Halliburton.

A new type of tubing completion used in the North Sea is a fixed packer with an expansion joint several joints upstream of the packer. The expansion joint installation may be either pinned closed, or sheared and spaced out after packer installation. The joint may or may not have a stop to prevent jump-out. If the joint is pinned close, a shear rating needs to be specified for the shear pins. Additional information necessary for expansion joint analysis includes the joint stroke length, joint seal bore diameter, and installation space out, if sheared. There are distinct differences in the analysis of expansion joints compared with conventional packer installations.

This paper details the tubing movement and stress calculations for both pinned and sheared expansion joints. The pinned joint is designed to fail at a specified tubing load. After pin shear, the tubing has free movement until either the joint closes, jumps out, or is restrained by a stop. The sheared joint movement calculation is distinct from conventional tubing movement calculations because there are two piston loads. Both the tubing below and above the joint may buckle. Bending due to buckling may cause binding and friction loads in the expansion joint.

Several example cases are presented that give insight into the potential benefits and problems of expansion joints in comparison with conventional tubing completions.

SPE/IADC 104471

Casing Collapse Strenth Reduction Under Lateral Loads from Yielding Shales in the Daqing Oilfield. C. Ai and W. Zhao, Daqing Petroleum Inst.; B. Guo, U of Louisiana at Lafayette.

Casing failure has been found in nearly 20% of production wells in the Daqing Oilfield after 45 years of oil production. Plastic failure of casing strings has been recognized in the zones of yielding shales overlaying reservoir pay zones in the field. This type of casing failure is one of the most costly problems in the field. No research has been done to study the resistance of casing string against the lateral loads from the yielding shales. This paper fills the gap.

Assuming a lateral load uniformly distributed along a casing section from a shale zone clamped between an upper and a lower sandstone zone, a mechanistic model was developed in this study. Results of the model indicate that the resistance of casing string to the lateral loads drops sharply in the early stage of development of radial deformation. The resistance of casing string to the lateral loads is not sensitive to the length of the deformed casing section. The remaining strength of casing string also depends on properties of the casing string.

SPE/IADC 105842

A New Drillstring Fatigue Supervision System. O. Vincké and D. Averbuch, Inst. Français du Pétrole; S. Tollet, Cybernetix; B. Lefevre, Vam Drilling; D. Dupuis, Pride International.

With the development of complex, extended-reach and deep wells, drillstring elements are subject to several kind of cyclic stresses. Induced fatigue accumulation over time may generate drill pipe failure while drilling. This requires a follow-up of the fatigue of each element of the drillstring by tracking the mechanical and dynamic history of each drillstring element over its life. The team developed a way to acquire necessary data, model and memorise the fatigue of each element.

Technical Session 16: Casing While Drilling

SPE/IADC 105773

Two Salt-Dome Wells Sucessfully Drilled with Casing While Drilling Technology. D. Veltri, Yuma; T. Warren and R. Tessari, TESCO.

While formations around salt domes provide good hydrocarbon traps, the high tectonic stresses and complex geology make drilling especially difficult. Yuma and its partners have drilled about a half-dozen conventional wells in the Chachaloula field in South Louisiana. Each proved difficult to drill. Two new salt dome wells in this field were successfully drilled with Casing while Drilling (CwD). A small footprint rig was used. Both wells successfully reached the target depth, and both utilized rotary steerable directional technology for directional control. The paper will describe the operations and compare it to previous wells.

SPE/IADC 105413

Cementing Considerations for Casing-While-Drilling Operations: Case History. R.D. Strickler, ConocoPhillips; P. Solano, Halliburton.

Casing while Drilling (CwD) is an emerging technology. It conflicts with conventional cementing practices such as the use of centralizers attached to the casing to provide a good pipe stand-off. In CwD operations, centralizers are required to be robust enough to drill the entire open hole section without losing their stand-off ability.

This paper describes the methodology developed to successfully cement surface, intermediate and production casings in more than 100 wells in South Texas where CwD was used.

SPE/IADC 105403

Drilling With Liner On Horizontal Oil Wells. M. Terrazas, M. Estrada, V.M. López and A. Jardines, Pemex; E. Diaz, Hydril; M. Fisher, Weatherford.

This paper describes lessons learned and results obtained while applying a rotary drilling with liner system in operations offshore the Mexican coasts of the Gulf of Mexico. Problems such as lost circulation, stuck pipe, cave-ins of holes and bad casing cementing jobs were experienced. The application of the system allowed PEMEX to drill down to the objective depth with high angle, cement the liner and drill out the following interval horizontally, steering in the reservoir. The results of the technique are presented utilizing a liner of 9 5/8 in. and a bit of 12 ¼ in.

SPE/IADC 105595

PDC Casing Drilling Improves HS&E, Cuts Drilling Costs, West Africa. K. Hartsema, Shell; E. Aliko, J. Campos, L. Clark, F. Delgado, P. Folling and J. Wingate, Hughes Christensen.

Conventional drilling was used by the operator in Gabon to drill wells until 2004. Then a cost-cutting initiative with casing drilling was initiated. It was recommended that a PDC drillable casing bit that was designed to be screwed onto the bottom of the casing be used. Two sizes have been run successfully to date. The paper will describe the PDC casing drilling system, its performance in Gabon, the positive economic impact and HSE benefits.

SPE/IADC 105457

Combination of Drilling with Casing and Stage Tool Cementing: A Unique Approach to Mitigating Downhole Conditions. R. Robinson, SandRidge Energy; S. Rosenberg, B. Lirette and A.C. Odell, Weatherford.

This paper demonstrates the combination of rotary drilling with casing and stage tool cementing to drill and cement surface casing in place, providing a solution to the operator's hole stability and cementing issues in surface intervals in the Piceance Basin of northwestern Colorado.

SPE/IADC 105678

Applying Risk Analysis to Casing While Drilling. B. Houtchens, J. Foster and R. Tessari, TESCO.

Many companies are moving to explicit risk models where risk and its economic impact are quantified. Risk is composed of 2 components: the probability of an event occurring, and the economic consequences if it occurs. Applying a risk model to new technology is difficult because there is no experience base. This is particularly true when the technology has operational components that go against normal practices.

Such is true with Casing while Drilling. This paper will show the results of more than 280 wells and over 2 million ft of hole drilled with casing over the last 8 years. Comparisons will be made to conventional drilling methods in several of the areas where the technology has been applied.