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Design to First Deployment: Pressure-Activated Sliding Sleeve for Single-Trip Completion
A. Dikshit, A. Kumar, and G. Woiceshyn
Executive Summary

Drilling
In the study Fracture Prevention Following Offshore Well Blowouts: Selecting the Appropriate Capping Stack Shut-In Strategy, analytical models are used to simulate the loads on the wellbore during the different stages of loss of control. Using these models, the critical capping pressure for a well is determined, and subsequent critical discharge flow rates are calculated. The models are useful for drilling and wellbore integrity engineers for making contingency plans for dealing with loss of well control situations.

Mitigation of kick is extremely crucial to enhance the safety and efficiency of drilling. In the study Early Detection and Estimation of Kick in Managed Pressure Drilling, an unscented-Kalman-filter (UKF) -based estimator is used to simultaneously estimate the bit-flow rate and kick in a managed-pressure-drilling system. In the proposed UKF formulation, hidden states and unknown inputs were concatenated to an augmented state vector. The magnitude of the kick is estimated using only available topside measurements.

Very little is known regarding the impact of wellbore inclination on the stability of foams. The paper The Effect of Inclination on the Stability of Foam Systems in Drilling and Well Operations investigates the effects of wellbore inclination on the stability of various types of foams and develops a method to account for the effect of inclination on foam stability in inclined wells. The information provided in this paper will help to account for the effect of inclination on foam stability and subsequently improve the performance of oilfield operations involving foam as the working fluid.

Using a field case, the paper Matrix Acidizing: A Laboratory and Field Investigation of Sludge Formation and Removal of Oil-Based Drilling Mud Filter Cake covers the methodology used to ascertain the source of formation damage from acidizing, studies the different factors that influence the formation of acid/oil emulsion and sludge formation mechanism, and show how they can be removed. The methodology can be expanded to cater the many acidizing failure cases faced in the industry worldwide.

Understanding of material properties for tubular design under high-pressure/high-temperature conditions goes well beyond the basics of the classic methods routinely used in the industry. The paper Special Considerations for Well Tubular Design at Elevated Temperatures raises an awareness of the importance of strain-rate effects, and recommendations are made on a few special considerations to account for these effects in well tubular design for elevated temperature applications.

Predicting rate of penetration (ROP) has gained considerable interest in the drilling industry. The paper Prediction of Penetration Rate for PDC Bits Using Indices of Rock Drillability, Cuttings Removal, and Bit Wear considers three factors to predict ROP—aggressiveness or drillability, hole cleaning, and cutters wear. Considering the drilling parameters and formation properties, ROP is initially estimated by use of a new equation. Then, lifting the produced cuttings to the surface and evaluating how that affects the bit performance is proposed in the second part of the process. Finally, wear index is introduced in the third part to predict the reduction of ROP caused by cutter/rock friction.

The existing American Petroleum Institute (API) equation for internal leak predicts the internal pressure to overc

Completion
In the study Comparative Evaluation of Bismuth-Silver and Bismuth-Tin Alloys for Plug and Abandonment, the authors investigate the feasibility of BiAg alloy for plug and abandonment. The bond quality of the alloy-shale cores is evaluated through shear, tensile, push-out, and permeability tests, and compared with those of BiSn alloy-shale and cement-shale cores. Results for cement-shale cores are also reported for comparison. The authors contrast the performance of BiAg and BiSn alloys at 21, 65, 80, and 110°C to determine the crossover temperature for deployment suitability.
One Stage Forward or Two Stages Back: What Are We Treating? Identification of Internal Casing Erosion during Hydraulic Fracturing—A Montney Case Study Using Ultrasonic and Fiber-Optic Diagnostics presents a case study with field examples in which unexpected casing erosion occurred at the setting depths of the dissolvable fracturing plugs during hydraulic fracturing and subsequently resulted in loss of interstage isolation. By integrating the analysis of distributed acoustic sensing, distributed temperature sensing, step-down tests, and ultrasonic imaging, it was determined that the frac plug bypass was creating a loss of casing integrity at the plug set location.

In the study Unplugging Standalone Sand-Control Screens Using High-Power Shock Waves, the authors assess the performance of high-power shock waves generated from an electrohydraulic-stimulation (EHS) tool on cleaning completion tools plugged during oil production. These devices were extracted from different wells in Canada, Europe, and the US. The cleaning performance of the EHS tool increases by increasing the number of pulses and the output energy applied to the tool. This paper provides a better understanding of the performance of shock waves on damage removal from plugged completion tools.

The study Quantifying Erosion of Downhole Solids Control Equipment during Openhole, Multistage Fracturing aims to understand the effect of hydraulic fracturing on the erosion of completion equipment with an objective of improving the design to, as much as possible, prevent erosion failure. Computational fluid dynamics (CFD) is used to evaluate the root cause and identify more robust design solutions. Design modifications are implemented, and improved products are then manufactured and field tested.

Wells are sometimes deformed due to geomechanical shear slip, which occurs on a localized slip surface, such as a bedding plane, fault, or natural fracture. Shear slip will usually deform the casing into a recognizable shape, with lateral offset and two opposite-trending bends, and ovalized cross sections. From examples studied in the paper Well Shear Associated with Conventional and Unconventional Operations: Diagnosis and Mechanisms, shear deformations in unconventional reservoirs are found to result from slip on bedding planes and natural fractures. Models, field data, and physical reasoning suggest that slip occurs primarily due to fluid pressurization of the interface.

The study Extending Openhole Gravel-Packing Intervals through Enhanced Shunted Screens discusses the development and testing of a modified shunted screen that could extend openhole gravel-packing lengths to more than 7,000 ft with zonal isolation. The first step is to use CFD simulations to investigate the erosion-prone areas in the existing conventional shunted-screen-technology (SST) manifold design. The SST is enhanced according to CFD results and test results. It is observed that the proposed enhanced-SST (ESST) had no erosion failure after 450,000 lbm of proppant at a slurry rate of 5 bbl/min. The proposed ESST is successfully tested for 10,000-psi burst pressure after the erosion test.

Interest is high in a method to reliably run single-trip completions without involving complex/expensive technologies. In the paper Design to First Deployment: Pressure-Activated Sliding Sleeve for Single-Trip Completion, a unique pressure-activated sliding side door valve is developed and field tested to open without intervention after completion is circulated to total depth and a liner hanger and openhole isolation packers are set. This technology can be used in carbonate as well as sandstone wells.

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