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Editorial Notes

*SPE Drilling & Completion* readers will notice some changes in 2021, beginning with the enhanced functionality and reading experience in OnePetro. As well as providing a new modern look, OnePetro offers improved search and browsing functions along with the ability to read articles in screen view without the need to download PDFs.

We also note changes in our Editorial Board by offering our thanks and appreciation to outgoing Editor-in-Chief Russell Johns, Pennsylvania State University, for his service to SPE journals and the improvements made under his guidance, and welcome incoming EIC Birol Dindoruk, University of Houston.

Executive Editor Shilin Chen will continue to bring you high-quality papers in thoughtfully constructed quarterly issues. This month’s issue holds 15 papers, covering topics such as directional drilling automation and rigless well plug and abandonment.

*SPE Drilling & Completion* Impact Factor: 1.053

Average time to first decision: 27 days
Executive Summary

I am glad to announce that Mr. Ashu Dikshit, a completion expert at Schlumberger, has accepted our invitation to serve as an associate editor for SPEDC. Mr. Dikshit will be mainly involved in reviewing manuscripts related to completion, especially to sand-control technologies.

Drilling
SPE DSATS organizes the annual Drillbotics competition for university teams to design and develop laboratory-scale drilling rigs. The competition requires each team to create unique downhole sensors to allow automated navigation to drill a directional hole. In the paper Directional Drilling Automation Using a Laboratory-Scale Drilling Rig: SPE University Competition, the winning team present the surface equipment, downhole tools, data and control systems, and lessons learned. They demonstrate how a laboratory-scale rig can be used to study drilling dysfunctions and challenges. The novelty of the winning design is in the use of a small-scale cable-driven downhole motor with a bent sub and quick-connect-type swivel system.

In the paper entitled Investigation of PDC Cutter Structural Integrity in Hard Rocks, the authors evaluate the robustness of round and V-shaped polycrystalline diamond compact (PDC) cutters against mechanical and thermal load. Forensic analysis is used to estimate the range of loads and depths of cut (DOC) that cause structural overload of PDC cutters. Finite-element analyses (FEAs) are calibrated against these data and used to estimate the integrity of cutters. The conclusion based on FEA, laboratory, and field data is that in most cases, this shaped cutter shows the same or better dull as its base grade.

In the paper A Semiempirical Model for Rate of Penetration with Application to an Offshore Gas Field, the authors present a semiempirical rate of penetration (ROP) predictive model for PDC bits. The model is inspired by the model of Bourgoyne and Young (B&Y) and follows an exponential form with 10 different drilling functions to account for various factors affecting ROP in drilling operations. The authors extend the B&Y model to the PDC bits and discuss that a different predictive model should be obtained for each formation.

In the paper Large-Scale Deployment of a Closed-Loop Drilling Optimization System: Implementation and Field Results, the authors present a closed-loop drilling optimization system with results from more than 1,700 wells in the field. The closed-loop system builds on industry-proven advisory technology and is designed uniquely for petroleum drilling. Because formation characteristics can change rapidly with depth, a fast optimization algorithm based on input signal is used to continually adjust drilling parameters to search for the highest possible ROP and lowest possible mechanical-specific energy (MSE). Drilling dysfunctions, such as stick-slip and formation stringers, are treated as discrete time events and mitigated using software protocols triggered by accurate detection algorithms.

In the study Modeling Cuttings Lag Distribution in Directional Drilling To Evaluate Depth Resolution of Mud Logging, a simple formulation of lag-depth distribution for the entire depth of a well is derived mathematically. Simulation studies of lag depth for a realistic model of a directional well based on field data are conducted to evaluate depth resolution of mud logging. The key finding is that cuttings sampled at the surface can be contaminated by cuttings originating from other unintended depths to the extent of being non-negligible.

Minimizing formation damage using appropriate drilling-fluid additives that can generate good-quality filter cake provides one of the key elements for the success of the drilling operation. The study Formation-Damage Assessment and Filter-Cake Characterization of Ca-Bentonite Fluids Enhanced with Nanoparticles focuses on assessing the effect of using different types of nanoparticles (NPs) with calcium-(Ca-) bentonite on the formation-damage and filter-cake properties under downhole conditions. The results of this study show that the filtrate invasion is affected by the type of NPs, which is also affecting the disk porosity.
In the paper **A Novel Method of Removing Emulsion Blockage after Drilling Operations Using Thermochemical Fluid**, the authors present a novel approach to exploit heat and pressure generated from the exothermic reactions of the aqueous solution of thermochemical reactants, in removing emulsion blockage induced by oil-based mud. The proposed technology essentially concerns raising the temperature and pressure of the formation above the kinetic stability of emulsions using thermochemical fluid. From the batch experiments, to assess the energetics of the thermochemical reaction, it was observed that the temperature of the system could be raised above 170°C at a pressure of 1,600 psi.

**Completion**

In the paper **Modeling Validation of Tubing Compaction for Rigless Well Plug and Abandonment**, the authors investigate the viability of accessing casing by means of pushing or compacting tubing to extend rigless well plug and abandonment. The viability of pushing and compacting North Sea sizes and grades were confirmed in real-scale physical-compaction simulations of production-tubing joints pulled from offshore wells.

In the study **Practical Considerations in Alternate Fracturing with Shift/Fracture/Close Operation: Learnings from Geomechanical Modeling and Downhole Diagnostics**, the solutions to 3D Kirsch equations are provided for both low and high stress anisotropies to analyze the differences in breakdown gradient, failure angle, and fracture orientation under various geomechanical and treatment-design conditions. The results are analyzed in the context of the downhole-measured pressures and temperatures. With a net fracture-extension pressure greater than the reduced stress anisotropy, fracture complexity can be created by allowing the fracture to grow with different failure angles.

Reliability-based design (RBD) explicitly quantifies the risk of failure of a given design. The paper entitled **A Reliability-Based Approach for Survival Design in Deepwater and High-Pressure/High-Temperature Wells** describes RBD and the prevalence of its use in other structural design codes and shows how it can be used for survival design in critical wells. It is shown that designing to an acceptable probability of failure leads to more robust and risk-consistent designs. Such an approach allows designers to focus on the specific design or well construction changes that enhance survival. It is noted that the approach is applicable in its entirety to HPHT wells, where similar challenges are present.

In the paper **Leakoff and Flowback Experiments on Tight Carbonate Core Plugs**, the authors investigate the change in oil effective permeability ($k_{o,eff}$) caused by fracturing-fluid (FF) leakoff after hydraulic fracturing of tight carbonate reservoirs. They perform a series of flooding tests on core plugs with a range of porosity and permeability collected from the Midale tight carbonate formation onshore Canada to simulate fracturing-fluid-leakoff/flowback processes. It is found that adding appropriate surfactants in FF not only significantly reduces $k_{o,eff}$ impairment caused by leakoff, but also improves $k_{o,eff}$ compared with the original baseline for a low-permeability carbonate plug.

The growing problem of well-to-well fracture interactions in North American shale plays dictates the need for more accurate interlateral spacing measurements. In the paper **Precise Interlateral Spacing for Optimal Stimulation and Enhanced Production in North American Shale**, the authors compare the conventional survey technique with a commercially proven long-distance active magnetic ranging system that supplements the traditional MWD system. They apply relevant survey error models to two exemplary well pads—an actual well pad from a West Texas shale play and a realistic, although hypothetical, example—and compare them with relative ranging uncertainty. With the magnetic ranging applied while drilling, the ranging uncertainty stays practically the same throughout the whole well, enabling tenfold improvement in interlateral spacing accuracy.

Mitigating the negative impact of fracture hits on production from parent and child wells is challenging. The work **Preloading Depleted Parent Wells To Avoid Fracture Hits: Some Important Design Considerations** shows the impact of parent-well depletion and repressurization on child-well fracture propagation and parent-well productivity. A method is developed to better manage production/injection in
the parent well so that the performance of the child well can be improved by minimizing fracture interference and fracture hits.

The paper *Experiments with Stand-Alone Sand-Screen Specimens for Thermal Projects* presents the results of tests on wire-wrapped screen (WWS) and slotted liner (SL) test coupons for typical onshore Canada McMurray formation sand. A unique sand control evaluation apparatus has been designed and built to accommodate all common stand-alone screens that are 3.5 in. in diameter and 12 in. in height. This work discusses the significance, procedure, challenges, and early results of physical modeling of stand-alone screens in thermal operation. It also provides insight into the fluid flow, fines migration, clogging, and bridging in the vicinity of sand screens.

Kazakhstan owns one of the largest global oil reserves (approximately 3%). In the paper *Challenges and Potentials for Sand and Flow Control and Management in the Sandstone Oil Fields of Kazakhstan: A Literature Review*, the authors investigate the challenges and potentials for production from weakly consolidated and unconsolidated oil sandstone reserves in Kazakhstan. Weakly consolidated and unconsolidated oil reserves in Kazakhstan were studied in terms of the depth, pay-zone thickness, viscosity, particle-size distribution, clay content, porosity, permeability, gas cap, bottom water, mineralogy, solution gas, oil saturation, and homogeneity of the pay zone. This paper could be used as an initial step for further investigations regarding the sand control and sand management in Kazakhstan.

Shilin Chen, *SPE Drill & Compl Executive Editor*,
Distinguished Engineer/Chief Technical Advisor, Halliburton Drill Bits and Services
Thank You to Our 2020 Reviewers

*SPE Drilling & Completion* extends its sincere appreciation to everyone who provided a technical review for at least one paper during 2020. Many of our reviewers contributed their expertise to more than one paper during the year. We recognize the time commitment these individuals have made in agreeing to review papers and appreciate the impact that their efforts have had on the published papers throughout the year. Volunteers such as these individuals are essential to ensuring that the journal publishes manuscripts of high quality and lasting value. Thank you to our dedicated reviewers for their contributions.

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