Executive Summary

Serving as Executive Editor of *SPE Journal* continues being a great experience and I am delighted for the privilege to serve the SPE Membership in this manner. As humanity keeps battling the COVID-19 pandemic, it gives some solace to learn that 2020 marks the 25th volume of *SPE Journal*. The first issue was published in March 1996 and included 11 peer-reviewed articles. Since then, technology has been advancing at a rapid pace as well as the number of papers published in the journal.

This issue of *SPE Journal* contains 30 peer-reviewed articles. They are organized in six categories, although obviously there is overlapping among some of the categories, which include drilling, completions, production and facilities, unconventionals, reservoir engineering, and data analytics. A brief description of articles in each category is presented next**.**

Drilling. There are two papers in this category, one discussing uncertainty in the prediction of the mud-weight window, and the other one discussing borehole breakouts and shapes during drilling operations.

- Lothe et al. present a case study of the North Sea, where they use a digitized workflow from predrill pore-pressure modeling with a Monte Carlo approach, which has the potential to reduce the uncertainty in the predicted mud-weight window ahead of the bit.
- Li et al. present numerical examples to investigate the impact of several drilling operational parameters that can substantially alter breakout volume and shape using dynamic wellbore hydraulics.

Completions. There are eight papers in this category that discuss different topics including hydraulic fracturing, proppant-transport, acidizing, fault reactivation, and stimulation of naturally fractured reservoirs and vuggy carbonates.

- Yi et al. discuss a multifracture simulator with a novel wellbore-fluid and proppant-transport model. The simulator is applied to quantify treatment distribution among multiple perforation clusters in a plug-and-perf operation.
- Wang et al. modify the commonly used true tri-axial hydraulic fracturing system for investigating the influences of various factors on the injection pressure response and resultant fracture geometry during diversion treatments.
- Burton et al. discuss a series of small-block tests and one large-block test under geomechanical stresses conducted to characterize wormholing in outcrop-chalk samples. They also present and analyze field data on acid-pumping and post-stimulation pressure-falloff for evaluating stimulation effectiveness.
- Ali et al. use a 3D radial field-scale model to study the flow of acid in the presence of vugs (pore spaces that are significantly larger than grains) and natural fractures (breaks in the reservoir that were formed naturally by tectonic events).
- Liang et al. discuss a conceptual approach used for improving hydraulic fracturing treatments in tight carbonate reservoirs for enhancing the well productivity by minimizing closure of the microfractures and enlarging fracture apertures.
- Liu et al. discuss hydraulic fracturing of a naturally fractured reservoir composed of an impermeable rock matrix and a system of permeable discrete natural fractures (NFs). Injection during hydraulic fracturing opens the NFs and/or creates new fractures that extend along the maximum-principal-stress direction.
- Manchanda et al. present a formulation and results from a coupled finite-volume (FV)/finite-area (FA) model for simulating the propagation of multiple hydraulically driven fractures in two and three dimensions at the wellbore and pad scale.
- Zhang et al. present a case study of fault reactivation and induced seismicity during multistage hydraulic fracturing in Sichuan Basin, China. The field microseismicity data delineate a fault activated near the toe of the horizontal well.

Production and Facilities. There are seven papers in this category that discuss pipelines, ESP hydraulic pumps, demulsifiers, asphaltene deposition, flowback in the Marcellus shale, and SAGD wedge wells.

- Pasqualette et al. use a commercial simulator for studying flow of carbon dioxide (CO_2)-rich crude-oil in a typical offshore production pipeline under steady-state scenarios. Mixtures with 20–50 mol% CO_2 and gas/oil ratio (GOR) of 300–600 std m^3/std m^3 were thermodynamically modeled in the study.
- Jujuly et al. simulate and analyze the effect of gas-hydrate flow in pipelines with a computational-fluid-dynamics (CFD) model that uses ANSYS Fluent multiphase-flow-modeling techniques. The model is integrated with an existing commercial subsea-pipeline-visualization tool.
- Zhu et al. present a new mechanistic model that accounts for viscosity effects of working fluids on ESP pump hydraulic heads. The model is validated with a wide range database collected from different pump types. This is important as EPS are the second most widely used artificial lift method in petroleum production (and first in produced amount).
- Abdelfatah et al. indicate that although several demulsifiers have been proposed to treat bitumen that contains many surface-active components that tend to form water-in-oil (w/o) emulsion stabilized by fines and/or asphaltenes, these demulsifiers are sometimes not effective. The authors propose ionic liquids (ILs), whose composition has been designed to enable effective treatment of such emulsions.
- Kar et al. investigate the effect of water in both asphaltene deposition and removal by functional molecules. The authors investigate efficient removal of deposited asphaltenes on the surface of metallic flowlines using nonionic and ionic surfactants at low concentrations.
- Zhang et al. focus on investigating flowback water/rock interactions during hydraulic fracturing in Marcellus Shale. Simple deionized water (DI)/rock interactions and complicated flowback water/rock interactions are studied under static and dynamic conditions.
- Irani and Ghannadi address the drilling of a single, horizontal infill well (called a wedge well by some) late in the life of the steam-assisted gravity drainage (SAGD) process. The challenge addressed by the authors is producing such wells from the nonuniform drainage area and local hot spots that can be readily created in the first year of their operation.

Unconventionals. There are three papers in this category that discuss minimum miscibility pressure (MMP), molecular dynamic simulation, and the use of a Green element method in complex reservoirs.

- Zhang et al. present results showing that the calculation of the MMP for reservoirs with nanopores is affected by the gas/oil capillary pressure, owing to alteration of the key tie lines in the displacement; however, the change in the MMP is found to be not significant.
- Perez and Devegowda use molecular dynamics simulations to investigate the interactions during soaking time between an organic solvent (pure ethane) initially in a microfracture and a mixture of hydrocarbons representative of a volatile oil, and their implications in enhanced oil recovery (EOR) projects.
- Wu et al. present a novel edge-based Green element method (eGEM) for modeling real heterogeneity and large numbers of fractures in complex reservoirs. This is important because the boundary-element method (BEM) widely used in these problems is computationally extremely expensive.

Reservoir Engineering. There are eight papers in this category that discuss the use of foam in EOR processes, surfactants, simulation models, hydrates, control of water production from fractured wells, and SAGD.

- Dong et al. demonstrate the feasibility of using a low-interfacial-tension (low-IFT) foam process in fractured low-permeability limestone reservoirs and to investigate relevant geochemical interactions. This is important because typical mobility control agents, such as polymers and gels, are impractical in tight sub-10-md formations due to potential plugging issues.
- Qian et al. evaluate the synergistic interaction of one type of nanoparticle and a surfactant to increase foam stability, using the concentration ratio of the two components to tune the affinity of the nanoparticle for the gas/liquid interface. This is important because of the poor volumetric sweep efficiency during EOR gas injection projects stemming from the high gas mobility and reservoir heterogeneity of the reservoir.

- Gong et al. present a coreflood study of injectivities of multiple gas and liquid slugs in a surfactant-alternating-gas (SAG) process in a field core. Nitrogen and surfactant solution are either coinjected or injected separately into the sandstone core sample. Results suggest that, in radial flow, the small region of foam collapse very near the well greatly improves injectivity.
- Liu et al. present a novel and efficient hybrid model, consisting of a modified embedded discrete fracture model (EDFM) and a vug model for simulating multiphase flow in 3D complex fractured vuggy reservoirs. The modified EDFM improves the fracture-discretization process by using two sets of independent grids for matrix and fracture systems.
- Srivastava et al. conduct flow-loop tests under both continuous-pumping (CP) and shut-in and restart (RS) conditions, using Conroe crude oil with three different water fractions (30, 50, 90 vol%) at 5 wt% salinity, over a range of mixture velocities (from 2.4 to 9.4 ft/sec). Results of this work can potentially aid in an improved mechanistic understanding of RS operations, involving unplanned shut-ins and restarts.
- Sun et al. propose to combine curable resin-coated particles (CRPs) with preformed-particle-gel (PPG) to control water production from fractured wells. Results provide a promising approach to reduce the high-water-cut problem in high-temperature high-salinity fractured carbonates.
- Lu and Chen investigate the benefit of recognizing and accounting for model error when an iterative ensemble smoother is used to assimilate production data. The correlated “total error” (a combination of model error and observation error) is estimated from the data residual after a standard history-matching using the Levenberg-Marquardt form of iterative ensemble smoother (LM-EnRML).
- Ansari et al. review prior publications that are related to the SAGD process and the modeling approaches, as well as works that studied the emulsification process at reservoir conditions. The primary outcome of this review strengthens the idea that a multiphase-flow scenario needs to be considered when studying all flow-related phenomena in enhanced-oil-recovery processes and, hence, in SAGD.

Data Analytics. There are two papers in this category that discuss petrophysical data while drilling and interwell numerical simulation.

- Gupta et al. relate drill-bit- and drillstring-performance data in a machine-learning (ML) workflow to predict the lithology at the bit while drilling. The authors indicate that their algorithms were able to predict lithology in test wells in the Volve Field in the North Sea with more than 80% accuracy.
- Zhao et al. present a new data-driven model, which allows for characterization of a reservoir by history matching the historical well flow-rate data without having detailed petrophysical properties of the reservoir. The model provides an automatic and systematic workflow that incorporates Delaunay triangulation and imaginary wells to construct the model connection map.

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Editorial Notes

Drilling in the North Sea… Acid stimulation… Asphaltene deposition… Unconventional resources… As we celebrate *SPE Journal*'s 25th year, join us in reading the April issue, which offers 30 high-level research papers on these topics and more as personally selected by Executive Editor Dr. Roberto Aguilera.

Commitment to Authors

SPE's journals boast rapid peer review, sustaining a 29-day time-to-first decision average since November 2019. In addition to improved timeliness, we are committed to further enhance authors' experience. Over the next few weeks, we will roll out a variety of **author resources**, including submission checklists, manuscript templates (Word or LaTeX), language editing and figure preparation services, and more. Stay tuned!

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2018 *SPE Journal* Impact Factor: 3.095