IOR Conference Highlights Methodologies To Produce More Oil

A tradition that spans more than 40 years continued in April in Tulsa as the Society of Petroleum Engineers held its 20th biennial Improved Oil Recovery Conference. The theme of the 2016 event was “New Challenges, New Solutions,” reflecting the uncertain market that industry has been navigating.

Traditional improved oil recovery methods can be costly upfront, however, they generally have a track record of long-term success and payout. Even with this established track record, organizers of the 20th IOR conference say many operators are re-examining proposed projects. To respond to this concern, research continues to advance technology in ways that improve traditional IOR techniques, including applying them in unconventional reservoirs.

Additionally, organizers state that even though IOR sometimes can be perceived as an expensive process, it has been gaining ground over the past 40 years, including being embraced by an increasingly global industry audience that participated in and presented at this year’s event.

Among more than 150 papers presented, two that stood out for me represented the work that continues every day to make innovations in IOR. The first paper was titled, “Toward 70 Percent Recovery Factor: Knowledge of Reservoir Characteristics and IOR/EOR Methods from Global Analogs (SPE 179586),” by Lu Xiaoguang, Sun Shaoqing and Rich Doods at C&C Reservoirs. It highlights the basic reservoir characteristics and IOR methods used in a sandstone reservoir to achieve almost 70 percent recovery.

In this study, researchers created an analog knowledge base for fields that had achieved recovery factors around 70 percent. Using both static (primary recovery, well spacing, drive mechanism, etc.) and dynamic (oil rate, water cut, etc.) data for more than 700 sandstone reservoirs, researchers divided cases into heavy- and conventional-oil reservoir groups. Looking at key factors such as reservoir and fluid properties, wettability, development strategies and IOR methods, researchers identified trends in the wells with the highest recoveries.

For heavy oil, researchers found that excellent reservoir properties, horizontal well technology, high-efficiency steamflooding, and tight well spacing all contributed to recovering more than 50 percent of the oil in place. Additionally, researchers found that in homogeneous sandstone reservoirs with good lateral correlation, waterflooding and closer well spacing could increase recovery to as high as 79 percent.

Researchers hope industry can use this global knowledge base to identify better opportunities in mature fields, and with the help of solid reservoir management and IOR technology, recover up to 70 percent of the oil in place.

In another paper, titled “Laboratory Study on Using Produced Water in Cross-Linked Gel-Based Hydraulic Fracturing (SPE 179553),” by Ahmed Elsawawy and Hisham Nasr-El-Din at Texas A&M University, and Kay Cawiezal with BP America Production Co., researchers investigated using produced water to formulate cross-linked, gel-based fracturing fluid. Specifically, researchers looked at the compatibility of the produced water with the fluid system, as well as the effect of salts on fluid flow.

One of the major challenges with using produced water for frac fluid is the amount of total dissolved solids in the water, which can damage the formation and impact how the fluid flows. Produced water samples were examined, then synthetic water samples were developed using different salt concentrations to develop the fracturing fluid. The fluid consisted of natural guar polymer, a borate-based cross-linker, biocide, surfactant, clay controller, scale inhibitor, and pH buffer. The formulas were tested using a high-temperature/high-pressure rheometer, followed by a fluid breaking test to ensure high propped-fracture conductivity.

The analysis indicated that using produced water with 125,000 parts per million total dissolved solids could cause formation damage. Researchers diluted the produced water with freshwater to formulate the fracturing fluid, and different concentrations of ions were measured. Key findings include that using produced water by itself can cause formation damage. Precipitation can be avoided by diluting with freshwater, and reducing the amount of calcium improves the fluid rheology. Finally, among other results, researchers found that high salt content had no effect on the fracturing fluid breaking.

After 40 years, the SPE-IOR conference continues to showcase innovations in improved and enhanced oil recovery. More than 600 papers were submitted this year, and more than 150 were selected from presenters representing more than 35 countries.

The 2016 event also recognized five Pioneer Award recipients for their contributions to IOR. This year’s winners were:

• Richard Hutchins for his work in water shut-off and conformance;
• Sada Joshi in horizontal well drilling and production;
• Jenn-Tai Liang for his contributions to pioneering work in EOR and IOR;
• Lanny Schoeling for EOR field application; and
• Ali Yousef for his work in developing the “smart waterflood.”

These awards show that innovation is alive and that technology development will continue to be the hallmark of IOR’s success.

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