TECH REPORT

IRAQ

Background

An operator conducting a carbonate oilfield appraisal needed to better understand the formation's pore-scale flow dynamics by obtaining realistic multiphase flow data at reservoir conditions, which is not possible with conventional laboratory methods. Forty-four percent of the reservoir has absolute permeability of less than 1 mD. Characterizing this tight rock using conventional techniques is time consuming and, most importantly, challenges data reliability. Decreased data reliability reduces forecast quality of the hydrodynamic model and leads to the large discrepancy between the minimum and maximum estimates of geological and recoverable reserves. A study combining laboratory tests and digital rock (DR) analysis successfully determined the flow properties of the field's entire oil-bearing matrix.

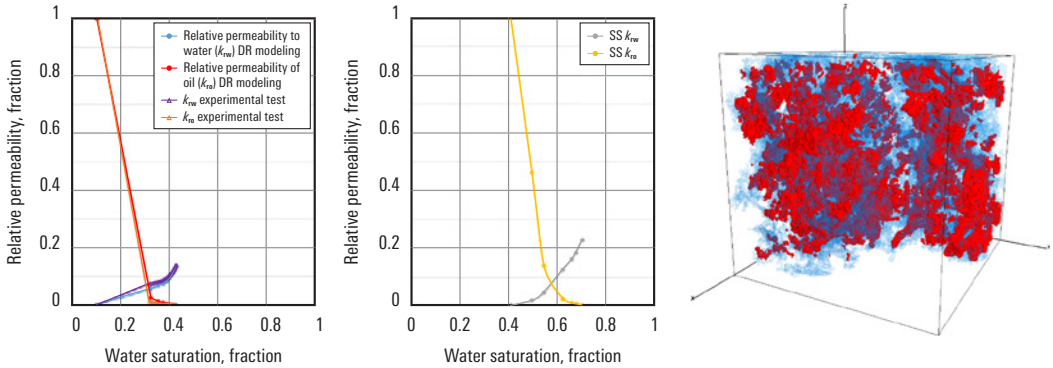
Technologies

- CoreFlow* digital rock and fluid analytics services
- DHD* direct hydrodynamics pore flow simulation

Schlumberger

Digital Rock and Fluid Analytics Reduce Uncertainty in Field Development Planning

CoreFlow services accelerate obtaining critical multiphase data unattainable via conventional physical lab analysis



An unsteady-state (USS) test was performed on two carbonate samples that were used in experimental USS core flooding. Experimental and digital tests were performed with dead oil at ambient conditions. Oil recovery and relative permeability data were compared with experimental data, and a close match was achieved (left). Next, digital steady-state (SS) relative permeability tests performed on all major reservoir rock types used live oil fluid data at reservoir conditions, leading to a mixed-wet condition and initial water saturations that matched estimated reservoir water saturation. Relative permeability normalized using oil phase permeability at initial water saturation (middle). Digital modeling of oil and water pore transport enabled a view of dynamic phase saturation changes (right); SS tests were up to 50 times faster than with conventional physical lab analysis.

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