

## **SPWLA TOPICAL CONFERENCE hosted by SPWLA KUWAIT CHAPTER**

### **ROLE OF PETROPHYSICS IN IMPROVING PRODUCTION EFFICIENCY**

**The Regency Hotel and Resort, Kuwait, 24-27 October 2011**

#### **CHAIRMAN'S REPORT**

The conference opened with a keynote overview of how petrophysics can feed into the production chain from the assessment of initial hydrocarbons in place through to tertiary recovery. The technical sessions began with an examination of the role of core analysis in managing log-evaluation and EOR programs. Conventional core data in the form of porosity vs. permeability crossplots require refinement by identifying the major influencing factors: there should be a migration away from using absolute permeability. Digital rock physics supports core analysis by guiding sample selection: an ultimate goal is to upscale to whole core.

Special core analysis (capillary pressure with pore throat size distribution) forms a grounding for rock typing to enhance log evaluation, especially through links to electroporefacies in carbonates. Specific developments for interparticle storage and flow include the use of core-derived mercury-injection parameters to identify pore facies, with subsequent extension to the log scale, and the establishment of log-derived electrofacies, with subsequent refinement through mercury-injection data. Thus, core-log integration can move both ways. It is noteworthy that lithology-based data groupings differ substantially from those based on pore character. In some cases, the complexity of the pore system is subordinate to hydrocarbon viscosity as the dominant control on producibility. Another controlling factor is the geomechanical regime, which can be studied using standard logs with core calibration in order to assure production rates.

The handling of geological uncertainties in real-time geosteering brought together all the key disciplines of geoscience in identifying and reaching meaningful targets. Once penetrated, comparisons of log-derived and test-derived transmissibilities allowed an assessment of the degree of fracture flow. The evaluation of net pay has to be data-driven because no two reservoirs are the same. All these matters will become more challenging in the face of high-temperature/high-pressure conditions for which measurement technology and interpretation capability are limited.

Fluid identification through the conjunctive use of pulsed-neutron sigma and carbon/oxygen (C/O) logs can deliver a three-phase solution provided there are good C/O statistics and lithological control. This allows depletion efficiency to be assessed, especially in secondary and tertiary recovery. Another highlighted use of pulsed-neutron technology was oxygen activation to detect water flow due to tubular problems in the wellbore, leading to remedial action with a subsequently reduced water cut and thence increased production. Dielectric measurements were featured as allowing shallow, salinity-independent estimates of remaining oil saturation. There is a thrust to conduct supporting displacement experiments downhole using state-of-the-art instrumentation.

Oil viscosity can be estimated using nuclear magnetic resonance (NMR) logs in conjunction with standard logs, although the need to resolve bound-water and viscous oil signals remains a challenge. During IOR/EOR, the diagnosis and prevention of potential asphaltene problems relies on the design of inhibitors once oil analysis has shown that the onset of asphaltene will occur. An example was given of a field producing at a high rate below the laboratory-predicted asphaltene onset pressure with no indications of asphaltene in the reservoir. This suggests that static laboratory experiments may not properly simulate a dynamic reservoir situation. A second example showed how miscible gas injection of a black oil reservoir could be designed to mitigate the onset of asphaltene on the basis of improved reservoir characterization.

The conference was preceded by a field trip to historic Failaka Island and followed by a golf tournament at the Sahar Golf Resort. Social functions included a wholesome encounter with Kuwaiti cuisine at a leading restaurant with panoramic views of Kuwait City and a coastal barbeque at which the conference sponsors were honoured and formally thanked. The organisers are to be congratulated on a successful first-ever SPWLA topical conference in Kuwait. There are tentative plans to hold a second conference in 2013.

**Paul F Worthington**

Conference Chairman

27 October 2011