April
2014

Salt Lake
Petroleum Section

Luncheon Meeting

Well Performance Prediction and Analysis for Liquid-rich Shales

The Salt Lake Section of the Society of Petroleum Engineers will host a meeting on **Wednesday, April 16, 2014** at the Energy & Geoscience Institute (EGI), located at 423 Wakara Way, Suite 300, Salt Lake City, 84108. A map is provided at the end of this meeting announcement.

Dr. Ian C. Walton of the Energy & Geoscience Institute is the lecturer.

Participants should plan on gathering and paying for lunch starting at 11:30 a.m.; the presentation starts at noon. The cost is $15.00 for members and guests, complimentary for students. Please RSVP to John McLennan, email: jmclennan@egi.utah.edu or (801) 634-4412 by close-of-business on Monday, April 14, 2014. Please try to adhere to the deadline for reservations in order to keep costs down**.**

Abstract:

In previous work undertaken at EGI we developed a semi-analytic production analysis technique for gas shales. The analysis is based on the dual porosity/dual permeability formulation for flow in reservoirs that contain a complex fracture network. The analysis has provided many insights into the production drivers, leading to better characterization of the production process than can be readily obtained using numerical reservoir simulations. A key finding of this investigation was that three stages of the production regime may be readily identified:

1. Early-time stage in which the production rate is heavily influenced by the drawdown characteristics.
2. Intermediate stage similar to "classic" transient linear flow into fractures.
3. Late time regime in which fractures begin to compete for production.

Each stage has a characteristic signature on an appropriate plot of the data. Analysis of the intermediate stage provides insights into the role of the natural fractures and enables a new production metric to be identified. The new technique has been used to analyze production data from many wells across many shale plays and to make a better prediction of the EUR.

Here we describe an extension of these semi-analytic techniques to shale liquids production, leading to appropriate extensions of the stages 1-3 listed above. Preliminary analysis of data from liquids-rich shale plays suggests similar production characteristics, though made more complicated by the potential for phase changes within the reservoir or in the fractures; in this respect the GOR is found to play a critical role. Emergence of two-phase flow leads to a reduction in relative permeability and a concomitant reduction in production rate. The impact of the rate at which wells are brought on production, linked to the variation in bottom hole and near-fracture pressures, may be key in maximizing liquids (as opposed to gas) production.

In analyzing production data we can often identify the equivalent of Stage 1 followed by a short period of linear flow, which seems to modify when the GOR begins to increase into a period of steeper decline (quite distinct from the exponential decline associated with boundary-dominated flow). Interpretation of this effect is a key element in the analysis and it will likely have a profound impact on long-term recovery.

Biography:

Dr. Ian C. Walton is a Senior Research Scientist in the Energy and Geoscience Institute at the University of Utah and is also an Adjunct Professor in the Department of Chemical Engineering. Ian holds a Ph.D. in Applied Mathematics from the University of Manchester and a B.Sc. in Mathematics from University College London. He has a total of 11 years academic experience between Imperial College London, and UCLA, where he was a Visiting Professor.

Before joining EGI in 2010, Ian accumulated 25 years of oil industry experience beginning with BP Research in Sunbury and continuing at various Schlumberger locations including Schlumberger Cambridge Research; Dowell Tech Center, Tulsa; Perforating Research in Rosharon, Texas; and, most recently, the Regional Technology Center for Unconventional Gas in Dallas. He currently specializes in fluid flow and production analysis from shale reservoirs. He has published more than 70 technical papers and has been awarded eight patents.

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Directions:
423 Wakara Way, Suite 300
Salt Lake City, Utah 84108