TG05

Tight Gas Reservoirs Exploitation with Underbalanced Drilling Technology

J. Ramalho* (Shell International E&P), D. Elliott (Shell International E&P), P. Francis (Shell International E&P) & R.S. Medeiros (Shell International E&P)

SUMMARY

This presentation will outline the rationale for Shell deploying the technology for dynamic reservoir characterization and the lessons learned in applications to date. Several case studies will be illustrated and discussed.
To meet future global energy demand, access to deeper and harder to get at hydrocarbon reservoirs requires innovative and cost effective technical solutions. Managed pressure drilling (MPD) is one such solution that can best be described as an adaptive drilling process that is engineered to safely address exploitation challenges related to reservoir uncertainty issues and cost.

MPD is a catchphrase for a whole suite of techniques (including underbalanced drilling (UBD)) that enhance operational safety, reduce costs, improve reservoir performance and ultimately increase asset value and profitability.

MPD delivers economical solutions across the spectrum of drilling operations; managing top hole losses and well control problems in vugular carbonates, managing kick-loss challenges in narrow pore pressure, fracture gradient situations; improving production performance in fractured carbonate oil reservoirs; improving rate of penetration and production performance in tight-hard-rock gas reservoirs; enabling real-time dynamic reservoir characterisation and superior drilling and completion decision making. MPD in general relies upon a closed or semi-closed circulating system whereby flow and pressure in the well bore can be precisely controlled thus enabling a safer, sustainable operation in higher risk environments.

Shell has to date deployed MPD-under balanced drilling (UBD) in over 415 tight gas wells globally. Specifically, Shell has used underbalanced drilling for dynamic reservoir characterization (DRC) on tight gas wells since 2005. The knowledge and insight gained was key to the decision in June 2008 by the global exploration and drilling management teams for the strategic deployment of UBD for reservoir characterization on all exploration and appraisal tight gas wells. Tight gas exploration plays typically have the following primary objectives; identify if the reservoir is gas charged; identify if the gas is mobile within the reservoir; identify the flow mechanism and flow units and identify the producible GIP associated with the flow units. While the gas charge issue can often be determined from static logs and core, the remaining objectives deal with dynamic gas mobility uncertainty. The ability to characterize the reservoir with UBD constitutes a new tool to collect data and reduce project risk for the remaining dynamic gas behavior objectives.

Since this decision was taken, UBD DRC has been, or is being deployed on 10 projects in 7 different countries. Shell considers integration of UBD deliverables into the exploration play planning and sub-surface team decision making critical and an area where the operating company must take the lead. This has resulted in optimized equipment specifications specific for tight gas plays to reduce contract services cost and the use of Geo-mechanical analyses to validate UBD feasibility and to enhance borehole stability management in a UBD environment. Production from intervals not previously considered productive has been observed and some insight into the behaviour of dual porosity systems has been acquired.

This presentation will outline the rationale for Shell deploying the technology for dynamic reservoir characterization and the lessons learned in applications to date. Several case studies will be illustrated and discussed.