

The Role of Wellsite Canister Core Desorption in Characterizing Unconventional Dry- and Liquid-Rich Shale Gas Reservoirs: An Indispensable Link from Laboratory Test to Field Production

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Summary

Exploitation of hydrocarbons from unconventional shale reservoirs requires proper reservoir characterization and resource in-place determination. In recent years, advanced technologies have been demanded to characterize unconventional reservoirs more effectively due to their high heterogeneity and complexity in mineralogical and geological fabrics on all scales, and macro- to nano-pore size distribution. Core-based laboratory tests are still the most reliable methods to determine porosity, permeability and fluid saturation for quantification of reservoir quality. Combined with laboratory core analyses, in-situ reservoir fluid composition and content can also be accurately determined through well-site canister desorption of retrieved cores. Canister desorption eliminates the prolonged waiting time for retrieving fluid samples through flow testing or the difficulties in down-hole fluid sampling. Wellsite desorption of cores or cuttings for determining the gas content of coalbed methane reservoir has been so successful that it became the primary technique for coal gas content determination in Canada & US and became a government regulated testing protocol for evaluating CBM fields in Alberta. The same approach has been adopted for shale gas and liquid-rich reservoirs but its usefulness in shale gas evaluation has not been fully evaluated. In this study, the importance of core desorption and laboratory core test data in dry and liquid-rich gas shale evaluation is investigated for different shale plays (e.g., Montney, Duvernay and Nordegg) in the Western Canada Sedimentary Basin. Application of desorption data is examined in context of determining in-situ reservoir fluid composition and content, PVT properties, condensate liquid/gas ratio and hydrocarbon resource in place estimates. Desorption time and desorbed gas volume of different plays vary significantly but correlate well to core-based porosity, permeability, and fluid saturation. Dynamic evolution of hydrocarbon composition of desorbed gas is also studied with numerical simulation of the core desorption process. The results provide insightful information not only on hydrocarbon in-place evaluations but also on the dynamic evolution of wellhead hydrocarbons from a producing well. Overall, if properly designed, executed and analyzed, wellsite canister core desorption can significantly enrich our understanding of the play and act as an indispensable link from laboratory core data to field production.