Understanding Reservoir Architecture: Combining Continuous Fluid Facies Mapping, Pressure Measurements, Downhole Fluid Analysis, and Geochemical Analyses

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Identifying compartmentalization and understanding reservoir structure are of critical importance to reservoir development. In deep water and similar high cost operating environments, the traditional methods, drill stem tests (DST) and extended well tests (EWT) often become impractical, with costs approaching the costs of new wells and with emissions becoming increasingly undesirable. Thus, compartments often have to be identified by some other means. Individually, fluid analysis while drilling (FAWD), pressure measurements, Downhole Fluid Analysis (DFA), and geochemistry are known to provide important information about reservoir architecture. When these powerful methods are systematically combined and applied to the dataset, the synergy delivers a much more robust picture of the reservoir.

In this paper, we review a number of case studies in which we have successfully combined continuous fluid facies mapping, pressure and gradient measurements, downhole fluid analyses, and geochemistry for reservoir continuity assessment in a diverse range of geological settings including a wide range of field sizes, structural environments, reservoir lithologies, and oil types.

Particular emphasis is placed on comparing the strengths and limitations of the different techniques in revealing reservoir architecture, especially vertical permeability barriers. We present a number of unambiguous cases, for which the multiple data streams might be viewed as being somewhat redundant. More ambiguous cases, in which the multiple data streams are required to make a robust assessment of key reservoir properties, are also presented.