"Sheet Sands" Revisited: A Potentially Misleading Concept at Production Scale

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Abstract

The term "sheet sand" is an architectural term that is used to describe the geometry of sand beds at the mid to downdip portions of basin-floor fans. Sheet sands are often described as composed of thick, amalgamated, structureless to crudely stratified and graded sandstone beds, often with non-erosive bases that have conformable bed contacts. These deposits are considered the best deep water reservoirs because of their good lateral continuity, high aspect ratio, low diversity of reservoir facies, and narrow range of grain sizes. These characteristics allow these reservoirs to produce in high rates and with high recovery factors.

In fact, the industry has been quite successful in exploring for these reservoirs and the concept holds well at exploration scale. Unlike other DW reservoir elements, sheet sands commonly have an areal extent that exceeds the area of the trap and sealing capacity of interbedded shales is potentially important. However, at production scale this reservoir model seems to be too simplistic. The lateral extent of sandstones in these settings can be long but the thinner, interbedded mudstones can have even longer correlation lengths, often causing baffles and barriers in the reservoirs. Reservoir architecture is further complicated by the presence of scours. Scours are common in more proximal areas and may connect reservoirs in proximal positions, or cause lateral barriers in cases where scours are filled with muddy debrites. These issues could cause different depletion rates and multiple fluid contacts, affecting also the positioning of injector/producing pairs.

We propose moving away from use of the term "sheet sands" because of the misleading implication that the term carries for reservoir characterization in production projects. Instead, we propose to use the term depositional lobes as defined by Mutti and Ricci Lucchi (1972) and later modified by Mutti and Normark (1987, 1991). Geometries of these deposits can be better appreciated in vertically exaggerated cross-sections and downdip views. Depositional lobes are thick and amalgamated close to the mouth of the distributary channels, tapering downdip and laterally from that position. Mud drapes are preserved away from proximal positions, where scours are common and often laterally and vertically stacked. Depositional lobes can form sizable deposits and are often the flow units in production settings. We will present examples from modern and ancient systems, as well as case studies from producing fields.